SPIDER

EU-LAC Digital Partnership

Guidelines for human-centred and sustainable cooperation on digital transformation

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LIST OF ABBREVIATIONS

Abbreviation	Description
AI	Artificial Intelligence
BELLA	Building the Europe Link to Latin America and the Caribbean
CoP	Community of Practice
CORDIS	Community Research and Development Information Service
DEI	Diversity, Equity and Inclusion
DESI	Digital Economy and Society Index
DIF	Digital Dialogues Implementation Forum
DIH	Digital Innovation Hub
DPA	Data Processing Agreement
EOSC	European Open Science Cloud
EU	European Union
EU–LAC	European Union–Latin America and the Caribbean
HPC	High-Performance Computing
LAC	Latin America and the Caribbean
LLM	Large Language Model
MSME	Micro, Small and Medium-sized Enterprise
NREN	National Research and Education Network
RPO	Research-performing Organisation
NREN	National Research and Education Network
SDG	Sustainable Development Goal
VRE	Virtual Research Environment
WG	Working Group

EXECUTIVE SUMMARY

This deliverable presents a set of co-created guidelines that enable sustainable and human-centred digital cooperation between the European Union (EU) and Latin America and the Caribbean (LAC). Given the acceleration of digital transformation, this cooperation is critical to ensure that technological development is aligned with our shared values: inclusion, human rights, sustainability, and equitable access to digital opportunities.

Despite the growing number of EU-LAC digital dialogues, policy frameworks, and cooperation initiatives, a gap persists between high-level political commitments and their implementation. Addressing this gap requires structured, actionable, and context-sensitive guidance to translate strategic ambitions into operational practices. The present set of guidelines responds to this need by providing a framework to support more coherent, impactful, and sustainable bi-regional collaboration.

This deliverable synthesizes the collective efforts of the SPIDER consortium, building on three cornerstone outputs: the Concept Note, the Mapping of Digital Dialogues and Agreements, and the Survey Report on the BELLA infrastructure. Together, these inputs provide the conceptual, empirical, and operational foundations that inform the guidelines proposed here.

The Concept Note establishes the strategic vision for EU-LAC digital cooperation, highlighting the importance of aligning bi-regional efforts with the potential of the BELLA infrastructure. It identifies six key technology areas — Artificial Intelligence, 5G, Blockchain, Cloud Computing, Cybersecurity, and Virtual Research Environments (VREs) — as priority domains for collaboration. It therefore proposes qualitative indicators to support policy alignment and stakeholder engagement.

The Mapping Report analyses over 100 digital cooperation agreements across bilateral, regional, and multilateral levels. It highlights the complexity and richness of the EU-LAC digital cooperation landscape, while also revealing structural challenges, particularly the lack of clear mechanisms to translate the outcomes of dialogue into concrete actions.

The Survey Report, based on responses from 357 stakeholders across Europe and LAC, provides insights into the current use and perception of the BELLA infrastructure. The findings confirm its strong potential to support data-intensive and collaborative technologies such as AI, Cloud, and VREs, while also identifying key barriers, including limited awareness, funding constraints, and differing regional expectations regarding security and governance.

Bringing these three insights together, this deliverable identifies key pillars that underpin effective EU-LAC digital cooperation: bridging policy and practice, embedding human-centred design principles, promoting the sustainable use of digital infrastructure, strengthening cooperation instruments and modalities, and establishing structured frameworks for monitoring and evaluation.

These guidelines are both a synthesis of SPIDER's findings, and a practical and adaptable framework to support policymakers, research and innovation actors, and digital ecosystem stakeholders in advancing a more inclusive, coordinated, and impactful EU-LAC digital partnership.

1. INTRODUCTION

1.1 Context and Rationale

The ongoing digital transformation represents one of the most profound socio-technical shifts of the twenty-first century. Beyond its technological dimensions, it is redefining how societies produce, communicate, learn, govern, and interact. For both the European Union (EU) and Latin America and the Caribbean (LAC), digitalisation offers a double opportunity: to advance regional development goals, and to strengthen a bi-regional partnership based on shared values. This transformation must not be reduced to a technological upgrade; it is also intrinsically linked to issues of human rights, democracy, inclusion, sustainability, and economic competitiveness.

While the EU has advanced a value-driven approach to digitalisation — emphasising human-centred design, ethical use of emerging technologies, and regulatory frameworks — the LAC region brings to this dialogue a vibrant innovation ecosystem, strong traditions of community-driven connectivity, and a growing digital market. However, both regions face structural challenges, including persistent inequalities in access, uneven digital skills, fragmented governance, and limited alignment between policy initiatives and concrete pathways for policy implementation. Given this background, structured cooperation can provide mutual benefits, enable the sharing of good practices, the pooling of resources, and the co-creation of innovative solutions.

1.2 The Role of EU-LAC Cooperation

The strategic partnership between the EU and LAC has consistently recognised digital transformation as a priority domain. This recognition reflects the understanding that digital interconnectivity and technological collaboration are not only instruments for economic growth, but also necessities of sustainable development, social inclusion, and democratic resilience. Key initiatives such as the BELLA Programme — interconnecting Europe with Latin America via high-capacity transatlantic and regional research and education networks — embody the tangible potential of EU-LAC cooperation.

The Building the Europe Link to Latin America and the Caribbean (BELLA) Programme is a strategic EU–LAC connectivity initiative, initially implemented by RedCLARA and GÉANT and co-financed by the European Union, to address the long-term interconnectivity needs of research and education communities in Europe and Latin America. Through BELLA-S and BELLA-T, the Programme enabled direct high-capacity connectivity between Europe and Latin America and strengthened RedCLARA's regional backbone. Its ongoing phase, BELLA II, expands this ambition to the Caribbean and seeks to strengthen the wider digital ecosystem for education, science, technology, and innovation across LAC and Europe. As such, BELLA exemplifies how EU–LAC digital cooperation can translate strategic vision into tangible infrastructure and operational collaboration.

National Research and Education Networks (NRENs) on both sides of the Atlantic are critical catalysts [for projects like BELLA]. They ensure equitable access to advanced connectivity and provide the trust frameworks required for cross-border collaboration in science, education, and innovation. These infrastructures, while technical in nature, underpin the social and political aspirations of both regions to build sovereign, inclusive, and sustainable digital ecosystems.

2. OBJECTIVES AND SCOPE

This report sets forth a strategic and operational framework to guide a sustainable and human-centered digital cooperation between the European Union and Latin America and the Caribbean. Its primary objective is to provide actionable, co-created, and empirically grounded guidelines that advance the effective implementation of digital transformation agendas, building on the shared political vision and technological capacities of both regions.

These guidelines respond to four interconnected purposes:

- To address the persistent gap between digital policy talks and their practical implementation, by articulating structured mechanisms that translate high-level commitments into context-sensitive action, particularly across domains such as artificial intelligence, cloud computing, and cybersecurity.
- To optimise the strategic use of the BELLA interconnectivity infrastructure in support of collaborative research, innovation, and data-sharing initiatives — particularly those that promote cross-border knowledge ecosystems and equitable access to high-speed digital services.
- To embed human-centred values and sustainability principles into bi-regional digital transformation efforts, in alignment with the United Nations Sustainable Development Goals (SDGs), notably:
    - SDG 9 – fostering inclusive innovation and resilient infrastructure,
    - SDG 10 – addressing digital inequalities across and within regions,
    - SDG 17 – strengthening institutional partnerships and shared governance.
- To enable multilevel and multi-actor engagement, through inclusive modalities that bring together governmental institutions, National Research and Education Networks (NRENs), academic and research communities, civil society organizations, and the technical community. These modalities include co-creation platforms, policy matchmaking tools, and adaptable cooperation templates.

As illustrated in figure 1, the scope of the guidelines encompasses both strategic orientation and implementation practice. They are designed not merely as a reference document, but as a **living framework** — capable of evolving alongside emerging technological trends, institutional innovations, and the evolving policy landscape of EU-LAC digital cooperation.

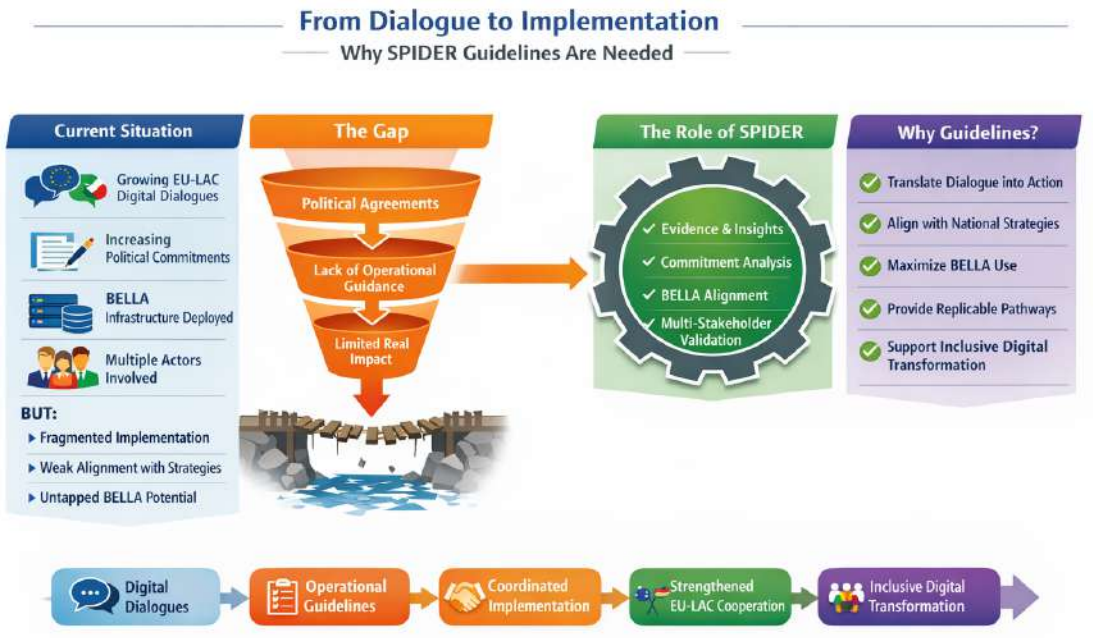

Figure 1. Guidelines rational framework

This deliverable is informed by a rigorous synthesis of three core outputs of the SPIDER project:

- **The Concept Note** outlines the foundational strategic vision, identifies thematic cooperation areas, and proposes an operational matrix for coordination;
- **The Mapping Report** offers a detailed inventory and analysis of more than 100 bilateral, regional, and multilateral digital cooperation agreements, highlighting key synergies, gaps, and opportunities to enhance EU–LAC cooperation in digital transformation;
- **The Survey Report** provides empirical insights from over 350 stakeholders on the usage, barriers, and potential of the BELLA network as a key enabler of digital integration.

Together, these inputs ensure that the guidelines reflect not only political aspirations, but also the institutional capacities, infrastructure realities, and cooperation dynamics that shape the digital ecosystem across the EU and LAC regions.

This deliverable builds upon complementary SPIDER actions that contribute to bridge analysis and implementation. These actions include the **Digital Dialogues Implementation Forum (DIF)**, which captures multi-stakeholder perspectives on governance, policy alignment, and cooperation challenges; the **Twinning Programme**, which provides practical evidence on how cooperation can be carried out through structured partnerships; and the **Community of Practice (CoP)**, which supports ongoing knowledge exchange and capacity-building. Together, these actions enrich the evidence base of this report by integrating both analytical insights and real-world experimentation, reinforcing the transition from dialogue to actionable cooperation.

3. METHODOLOGICAL FRAMEWORK

The development of these guidelines was grounded in SPIDER's overarching commitment to human-centred, inclusive, and evidence-informed cooperation. This document was specifically designed to reflect the methodological principles of design thinking, co-creation, and participatory governance, ensuring that the resulting recommendations are both contextually grounded and operationally relevant.

3.1. Design Thinking and Co-Creation Approach

The guidelines were developed through Design Thinking. This lens emphasises **problem framing, empathy, ideation, prototyping, and iteration**. Such an approach was suitable to address the complex and evolving nature of EU-LAC digital cooperation, while aligning with SPIDER's goal of fostering innovation through structured dialogue and cross-sector engagement.

Four interdependent **co-creation pillars** guided the methodological process:

Shared Vision and Values
Our foundation is the normative and strategic framework articulated in the SPIDER Concept Note (D1.1). This document establishes the principles of human-centred digital transformation, ethical innovation, and bi-regional partnership, which serve as anchoring values for the entire guideline development process.

Stakeholder-Driven Inputs
The content of the guidelines was informed by key empirical findings from the Mapping Report and the BELLA Survey Report. These deliverables provided robust, data-rich insights into the current state of cooperation, and into systemic barriers that hinder implementation. Institutional feedback collected through structured partner contributions was also synthesised at this stage.

Collaborative Development
The guidelines were co-developed through a series of internal workshops, including thematic sessions held via Miro boards, guided working groups, and targeted bilateral exchanges among SPIDER partners. This phase allowed for the integration of diverse perspectives across policy, research, and infrastructure domains.

Iterative Refinement
A structured drafting and review cycle was implemented, consisting of peer review rounds, asynchronous feedback mechanisms, and validation sessions within the consortium. Each iteration refined the content, sharpened the operational logic, and ensured consistency with the project's broader objectives.

This methodology not only ensured the integrity and relevance of the guidelines but also supported partner ownership, which is essential for their future implementation and adaptation.

3.2. Multi-Stakeholder Engagement

The development of the guidelines benefited from the active engagement of all SPIDER consortium members, who brought together expertise from national research and education networks (NRENs), policy and regulatory bodies, research-performing organisations (RPOs), and academic institutions. This transdisciplinary structure enabled the integration of multiple lenses — technical, political, social, and organisational — into the guideline design process.

This co-creation process also sought to uncover and bridge regional asymmetries, ensuring that the perspectives and priorities of both Latin American and European partners were reflected equitably. While the guidelines' core development took place within the consortium, they were designed with future multi-actor usability in mind, including governments, regional organisations, digital alliances, and funding bodies.

By combining Design Thinking with structured multi-stakeholder dialogue, this methodological approach ensured that the SPIDER guidelines are analytically rigorous, and

practically grounded, co-owned, and adaptable across diverse institutional and regional contexts.

3.3. Digital Intelligence Methodology

A critical innovation of SPIDER is the transition from manual mapping of digital dialogues to AI-assisted processing (LLMs). Modern governance demands the transformation of unstructured documents into actionable, structured data.

- Multidimensional Extraction: A specialized prompt framework was implemented for the automated distillation of key actors, themes, commitments, and practical applications from over 100 cooperation documents. This process enables a level of scalability that would be unattainable through traditional methods.
- Confidence Validation (Human-in-the-Loop): To ensure data integrity, a cross-validation model was integrated where a second AI agent evaluates the output. If the generated analysis scores below the operational threshold of 70/100 in terms of fidelity, consistency, and completeness, the system automatically triggers mandatory human curation to correct discrepancies.
- Global Quality Metric: The reliability of the system is calculated using a weighted linear aggregation function, ensuring that alignment with the original source remains the predominant factor

3.4. Qualitative Monitoring Framework

Unlike traditional frameworks based solely on quantitative KPIs, SPIDER introduces Qualitative Monitoring to measure the health of the cooperation. This approach shifts the focus from simple outputs to the relational and adaptive dimensions of the partnership.

- Micro Level (Institutional): Evaluates the satisfaction and engagement of individual actors, focusing on the quality of participation and institutional commitment.
- Meso Level (Projects): Measures the effectiveness of Twinning Programmes and collaboration across specific technical domains such as AI and Cybersecurity.
- Macro Level (Policy): Analyzes strategic alignment with the UN's SDGs (specifically SDGs 9, 16, and 17), data sovereignty, and the long-term impact on regional policy frameworks.

3.5. Validation and Sustainability Instruments

Our methodology's endpoint is the creation of governance structures designed to ensure that institutional knowledge and strategic momentum are preserved beyond the project's lifecycle:

- **DIF (Digital Dialogues Implementation Forum):** The political and strategic body responsible for translating high-level policy dialogue into actionable implementation pathways through dedicated Working Groups.
- **SPIDERHUB:** The digital observatory that provides "intelligence" to the system through advanced visualizations of collaboration networks, thematic trends, and temporal evolution.
- **CoP (Community of Practice):** The peer-learning engine led by **RedCONARE**, designed to foster horizontal exchange and sustained stakeholder engagement.

The analysis presented in this report is based on statistical inference and qualitative interpretation of aggregated data, drawing on SPIDER project outputs as well as complementary sources, including platforms such as CORDIS and Grafana, and a range of cooperation documents and policy materials. The identified patterns are indicative and

contextual and should not be interpreted as deterministic or as definitive assessments of individual countries, institutions, or stakeholders.

4. MAIN RESULTS

This section synthesises the core analytical and empirical output of the initial stages of the SPIDER project. Its main result is a framework to enhance EU-LAC cooperation on digital transformation and expand the potential of the BELLA network for R&I cooperation. It provides a consolidated interpretation of the strategic insights, implementation challenges, and institutional configurations gathered in the following **formal deliverables**:

- Concept Note on EU–LAC Digital Cooperation[1]
- Mapping of Digital Dialogues and Agreements[2]
- Survey on the use of BELLA Infrastructure[3]

Together, these deliverables define the strategic architecture, cooperation ecosystem, and technical readiness landscape that underpin bi-regional efforts toward digital transformation. They establish both the normative vision and empirical grounding for the operational guidelines presented in later sections of this report.

The analysis proceeds through a consistent interpretative lens, organised around the following thematic dimensions:

- Strategic scope and normative vision
- Enabling conditions and systemic gaps
- Key actors, instruments, and governance frameworks
- Innovations in monitoring and digital intelligence
- Opportunities for institutional sustainability and learning

This section also integrates insights from other formal components of the SPIDER project, including the SPIDER Twinning Programme, the EU–LAC Digital Dialogues Implementation Forum (DIF) and the Community of Practice (CoP). These instruments contribute directly to the project's implementation architecture and provide operational grounding for the proposed guidelines.

The Twinning Programme functions as a pilot mechanism for structured peer learning and institutional co-creation across the EU–LAC space, offering practical validation of strategic focus areas and capacity-building approaches. Meanwhile, the DIF and CoP constitute transnational governance mechanisms to facilitate iterative stakeholder engagement, ensure the participatory development of indicators and tools, and foster long-term institutional memory.

Altogether, this section presents a coherent, evidence-based foundation for advancing a **feasible, inclusive, and sustainable model of EU–LAC digital cooperation**, fully aligned with SPIDER's strategic objective of enabling a human-centred, resilient, and operationally integrated digital transformation across both regions.

4.1. Concept Note on EU-LAC Digital Cooperation

The Concept Note is the strategic foundation of the SPIDER project. It articulates a shared EU-LAC vision for digital transformation that is both values-driven and infrastructure-enabled. It frames digital cooperation as a mechanism for advancing technological sovereignty, inclusive development, and human-centred governance, anchored in the

[1] https://zenodo.org/records/12793122
[2] https://zenodo.org/records/15655133
[3] https://zenodo.org/records/12793319

political commitment of both regions and supported by technical assets such as the BELLA infrastructure.

The document establishes a cooperation framework aligned with major policy agendas, such as the EU Digital Decade and CELAC's Digital Agenda 2024. The framework highlights the convergence on issues like open science, ethical AI, inclusive digital economies, and resilient research ecosystems. It presents digital transformation not simply as a technological transition, but as a multidimensional process that calls for political, institutional, and social realignments.

The Concept Note identifies several enabling factors that create fertile ground for bi-regional collaboration. These include a shared commitment to ethical, inclusive, and sustainable digital development, and a recognition of mutual benefits through interconnectivity, with BELLA positioned as a core enabler of high-capacity, equitable collaboration across research and innovation systems. The Concept Note also identifies six opportunity-rich technology domains as focal areas for cooperation:

- Artificial Intelligence
- 5G
- Blockchain
- Cloud Computing
- Cybersecurity
- Virtual Research Environments (VREs)

These domains represent strategic technological priorities and offer entry points for joint programming, governance alignment, and cross-border funding coordination.

To operationalise this vision, the Concept Note introduces a cooperation matrix that links thematic policy objectives with implementation actors, such as National Research and Education Networks (NRENs), innovation agencies, and research-performing organisations (RPOs). This model provides a structured but flexible framework for multi-level governance, enabling differentiated roles across actors while maintaining strategic alignment and institutional continuity. It also supports the development of adaptable implementation modalities, tailored to diverse national and sectoral contexts.

A key innovation proposed in the Concept Note of SPIDER is the integration of a qualitative monitoring framework, designed to capture the relational, participatory, and adaptive dimensions of cooperation. In contrast to purely quantitative metrics, these indicators focus on:

- The quality of stakeholder engagement
- Institutional alignment and perceived relevance
- Inclusivity in design and implementation
- Sustainability of partnerships
- Depth and frequency of knowledge exchange

These indicators are not intended solely for ex-post evaluation; rather, they are integral to the cooperation process itself, enabling iterative learning, mid-course correction, and context-sensitive adaptation. By embedding qualitative assessment as a structural element, the Concept Note reinforces SPIDER's commitment to cooperation that is effective and grounded in mutual learning.

4.2. Mapping of Digital Dialogues and Agreements

The Mapping Report is the critical empirical foundation for the SPIDER project's broader strategic framework. While the Concept Note outlines the normative rationale and policy ambition underpinning EU–LAC digital cooperation, offers a data-driven, systematic

analysis of the cooperation landscape as it currently stands. Drawing on over 100 formalised instruments — spanning bilateral, regional, and multilateral levels — the report examines the architecture and implementation characteristics of dialogues, agreements, and commitments related to digital transformation across both regions.

Rather than serving as a static catalogue, the mapping of dialogues functions as a decision-support tool. It provides policymakers, researchers, and institutional stakeholders with an integrated view of the bi-regional cooperation system, identifying areas of strategic convergence, structural gaps, and emerging instruments for enhancing alignment and implementation.

4.2.1. Strategic Scope and Vision

The results of the mapping situates EU–LAC digital cooperation within a highly heterogeneous yet increasingly convergent governance ecosystem. This landscape includes national ministries, regional bodies (e.g., CELAC, European Commission), international donors, research-performing organisations (RPOs), and national research and education networks (NRENs). Despite variations in mandate, scale, and priorities, the mapping reveals a shared interest in advancing cooperation in six high-impact technology domains:

- Artificial Intelligence (AI)
- Blockchain
- Cloud Computing
- Cybersecurity
- 5G
- Virtual Research Environments (VREs)

Moreover, a growing normative alignment is observed, centred on values such as ethical governance, openness, digital inclusion, and sustainability. These shared principles, referenced across many instruments, position digital transformation as both a technological and socio-political undertaking.

4.2.2. Enabling Conditions

The mapping instrument identifies structural enablers that provide a favourable context for enhanced cooperation, including:

- **Thematic convergence** across cooperation instruments, especially in digital infrastructure and innovation domains;
- **Normative alignment** on shared principles such as ethics, openness, and sustainability;
- **Latent implementation capacity** in the form of active RPOs, NRENs, innovation agencies, and other institutional actors across both regions.

However, these enabling conditions are underutilised due to fragmentation, institutional discontinuity, and the absence of mechanisms to convert strategic intent into action. Many instruments exist in isolation, lacking integration or feedback loops to ensure continuity over time.

4.2.3. Operational Instruments and Actors

The Mapping Report (D1.3) finds that over 60% of the reviewed cooperation instruments refer to at least one of the six strategic digital domains identified in the Concept Note (D1.1): Artificial Intelligence, 5G, Blockchain, Cloud Computing, Cybersecurity, and Virtual Research Environments (VREs). These references, while reflective of shared strategic interests, are typically presented at a high level of abstraction. In most cases, they lack

elaboration on concrete implementation pathways, resource mobilisation strategies, or institutional responsibilities.

Moreover, the mapping highlights a consistent absence of operational details, such as:

- Clearly defined implementation timelines or milestones;
- Mechanisms for joint monitoring or progress tracking;
- Dedicated funding channels or co-financing schemes;
- Assigned lead institutions or governance arrangements.

Only around 15% of the reviewed instruments include any form of structured monitoring or follow-up. Even fewer establish formal roles for execution or allocate resources for technical cooperation. As a result, many agreements remain politically relevant but operationally weak — high in ambition, yet low in actionable specificity.

To help overcome these challenges, the report documents several emerging institutional approaches and proposals, grounded in partner consultations and stakeholder interviews:

- The conceptualisation of a Digital Dialogues Implementation Forum (DIF): envisioned as a bi-regional coordination mechanism to synchronise digital dialogue outcomes with ongoing research, policy, and innovation processes.
- The development of policy–institution matchmaking tools: designed to bridge the gap between thematic priorities and institutional capacities by identifying suitable implementers, partners, and funders across both regions.
- The rise of co-creation and co-funding modalities: such as Living Labs, bilateral cooperation pilots, and multi-actor innovation platforms. These approaches offer concrete formats for implementing digital commitments through iterative experimentation, validation, and scaling.

These institutional innovations are not presented as one-size-fits-all solutions. Instead, they reflect a growing demand among stakeholders for implementation architectures that are flexible, inclusive, and responsive to regional diversity. By identifying these patterns, D1.3 contributes not only to diagnostic clarity but also to the design of forward-looking, structured cooperation models capable of sustaining and operationalising EU–LAC digital ambitions over time.

4.2.4. Qualitative Monitoring and Digital Intelligence

In line with the strategic direction set out in the concept note, the Mapping Report affirms the critical need for *qualitative indicators* to assess not only whether digital cooperation is occurring, but how it is unfolding in practice. It highlights the importance of evaluating:

- The degree and diversity of stakeholder engagement
- The inclusiveness and responsiveness of participatory processes
- The continuity and memory of institutional practices across policy cycles

To support this, the concept note introduces a qualitative monitoring framework designed to assess the *relational, adaptive, and participatory dimensions* of digital cooperation. This framework deliberately goes beyond traditional quantitative metrics, offering context-sensitive instruments that support iterative learning and course correction throughout the policy cycle.

From this foundation, a preliminary set of qualitative indicators was co-created during a dedicated workshop held in Madrid in February 2024 and further developed through iterative consultations. These indicators were designed to capture critical dimensions such as:

- Stakeholder satisfaction and engagement: Measured through surveys, interviews, and feedback loops that assess diversity of participation and active contribution in dialogue processes.
- Policy influence and implementation of recommendations: Monitored by tracking the uptake of dialogue outcomes into national or regional strategies and actions.
- Collaborative relationships and trust-building: Evaluated through indicators of sustained interaction, alignment of goals, and cross-institutional cooperation.
- Inclusivity of communication channels: Measured by transparency, accessibility, and frequency of communication mechanisms, especially in underrepresented or remote regions.
- Long-term impact and sustainability: Assessed by examining whether cooperation leads to enduring structural changes or improvements over time.

These indicators are structured across three analytical levels:

- Micro: Institutional practices and actor-level participation
- Meso: Project implementation and stakeholder collaboration
- Macro: Regional policy alignment, continuity, and impact

4.2.5. Digital Intelligence

To operationalise these dimensions and ensure long-term sustainability, the report supports the development of **SPIDERHUB**—an **AI-powered digital cooperation observatory** designed to map, monitor, and analyse EU-LAC digital dialogues in real time.

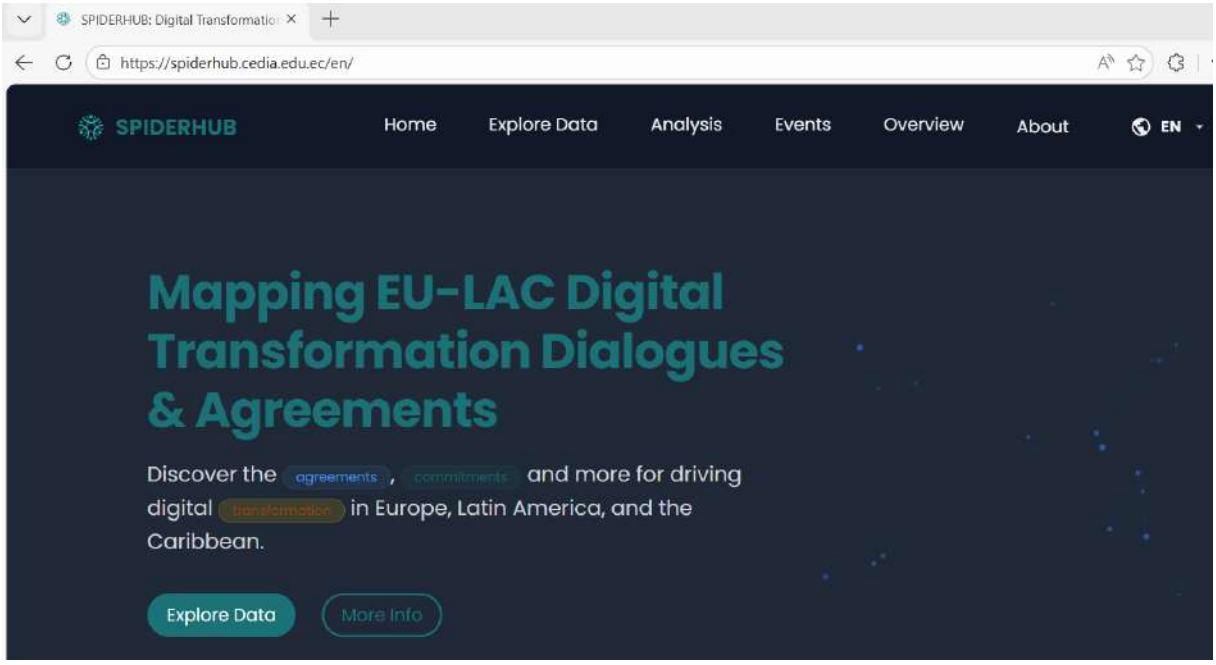

Figure 2. SPIDERHUB, available at www.spiderhub.cedia.edu.ec

AI-Driven Methodology for Mapping Digital Dialogues and Agreements

The mapping of digital dialogues and agreements within the SPIDER project was strengthened by applying AI-supported techniques for information extraction and validation. These techniques support the analysis of bilateral, regional, and multilateral commitments arising from dialogues between Europe and Latin America. Building upon the preliminary manual mapping and database (excel file), the methodology integrates Large

Language Models (LLMs) to enhance the accuracy, scalability, and efficiency of information extraction, validation, and structuring. A summary of the methodology is laid out below.

From Manual to AI-Assisted Processing

The original database (excel file) contains the materials and documents with website links.[4] This specific document (pdf) was uploaded to the AI web application, which then applied the same methodology with the key buzzwords shown in figure 6 with an illustrative outline as shown in the section 7.5 for the exemplary analysis of dialogues and agreements. The process was then repeated for the other documents (links, pdf's etc.) entailed in the original database.

AI-Based Information Extraction

The document processing phase was conducted using an LLM for automated extraction of structured data. A specialized prompt framework guides an LLM to distil five key elements from every document:
Key Actors: governments, regional bodies, private-sector stakeholders, civil-society organisations.
Key Topics: technical and policy areas such as AI governance, digital infrastructure, cybersecurity.
Resulting Commitments: policy agreements, financial mechanisms, regulatory frameworks
Practical Applications: identifiable initiatives or implemented projects.
Next Steps: proposed action plans or follow-up mechanisms.

Post-processing applies controlled vocabularies to topics, normalises actor-names and enriches each record with additional metadata e.g. leading country, SDG, and DEI alignment, qualitative and key performance indicators.

The extracted information was formatted into structured outputs, maintaining its alignment with the original analytical framework of the SPIDER project.

AI-Assisted Document Validation

To improve the reliability of the generated summaries, the pipeline includes a second LLM that reviews each summary against the original document. This additional validation step helps identify common problems in automated summarization, such as hallucinated content, missing information, or factual inconsistencies, which have been widely reported in the literature (Maynez et al., 2020; Zheng et al., 2023). The evaluator examines the summary across several key dimensions—fidelity to the source, consistency, completeness, and factual accuracy—drawing on criteria commonly used in recent work on summary and LLM evaluation (Dziri et al., 2022; Gupta et al., 2022; Pagnoni et al., 2021). These assessments are then combined into a single overall quality score from 0 to 100 for each document. Because the validation framework is model-agnostic, the same scoring logic can be used with both current and future LLMs, allowing the pipeline to remain flexible as language-model technology continues to evolve (Chiang et al., 2024; Gao et al., 2023).

Confidence Scoring and Manual Curation

The global score is a weighted composite of four evaluation dimensions:

- Fidelity (40 %) – alignment between the summary and the source text.
- Consistency (25 %) – absence of internal contradictions among extracted elements.
- Completeness (20 %) – coverage of the expected data fields.

[4] For example: https://www.consilium.europa.eu/media/59837/celac-ue-roadmap-2022-2023-final.pdf

- Accuracy (15 %) – factual correctness when cross-checked against the source.

Each dimension is first normalised on a 0–1 scale using similarity metrics and rule-based checks as explored in previous efforts (Goyal et al., 2022; Y. Wang & others, 2023). The overall score *(S)* is then computed as:

$$S = 100 \times (0.40 \times Fidelity + 0.25 \times Consistency + 0.20 \times Completeness + 0.15 \times Accuracy)$$

This linear combination ensures that the most critical factor — fidelity — carries the greatest weight (Jelinek, 1997; Manning et al., 2008), while still rewarding thoroughness and factual precision.

If a document scores below the operational threshold of 70/100, it is flagged for manual curation (Amershi & others, 2019). Human analysts review the AI output, amend any discrepancies and approve or reject the record, ensuring that low-confidence cases do not enter the repository.

Moreover, the global quality score follows a multi-criteria decision analysis framework, where multiple evaluation dimensions are aggregated into a single interpretable metric (Keeney & Raiffa, 1976). Fidelity is assigned the highest weight (40%) because alignment between the generated summary and the source document is the dominant risk factor in automated summarisation, as language models are prone to introducing unsupported content (Honovich et al., 2022; Maynez et al., 2020). Consistency and completeness capture logical coherence and coverage of expected fields, which are core data-quality dimensions (R. Y. Wang & Strong, 1996), while accuracy is weighted lower to avoid redundancy.

The dimensions are combined using a weighted linear aggregation, a standard and well-established approach in multi-criteria decision analysis and multi-objective optimisation (Edwards, 1977; Marler & Arora, 2004). This formulation ensures monotonicity, transparency and auditability, making the scoring function suitable for operational quality control and human-in-the-loop validation.

Structured Data Storage and Analysis

Following validation, the processed information is stored in a centralised structured database, replacing the original Excel-based repository on Google Drive. Hosted securely on CEDIA's server, this advanced system enables dynamic querying and longitudinal analysis, unlocking deeper insights into digital governance trends. The database stores both metadata and extracted data, which feed into interactive visualizations within the SPIDER web application. This centralized repository supports:

- **Thematic coverage,** with charts showing the distribution of agreements by main topics, actor types, or beneficiary categories.
- **Strategic alignment,** including radar charts tracking SDG coverage and pie charts showing legal bindingness and geographic scope.
- **Geographic visualisations,** such as world maps showing the distribution of lead countries or tree maps linking agreements to countries involved.

By leveraging AI for automated extraction and validation, the SPIDER project significantly enhances the efficiency, accuracy, and scalability of this mapping process. The AI-powered methodology allows for:

- **Time Efficiency**: Automating document parsing and structuring to eliminate repetitive manual tasks.
- **Data Accuracy**: Using AI-based cross-verification mechanisms to ensure consistency and factual integrity.

- **Scalability**: Enabling real-time tracking and analysis of emerging agreements and evolving policy landscapes.

Ultimately, this integration of AI and structured data workflows ensures evidence-based, future-proof decision-making in digital governance.

SPIDERHUB: Analysis Section

Illustrations of the SPIDERHUB[5] analysis section will be presented below. They aim to facilitate the analysis and decision-making involving cooperation in digital transformation.

First, a section of the Cross-Sector Collaboration Network is presented. The aim of this section is to represent how different actor types (in blue) collaborate on various thematic areas (in green) within EU-LAC digital transformation initiatives. Each connection represents documents where both an actor and theme co-occur, indicating active collaboration. Hover over nodes to see details, and over connections to see the number of shared documents.

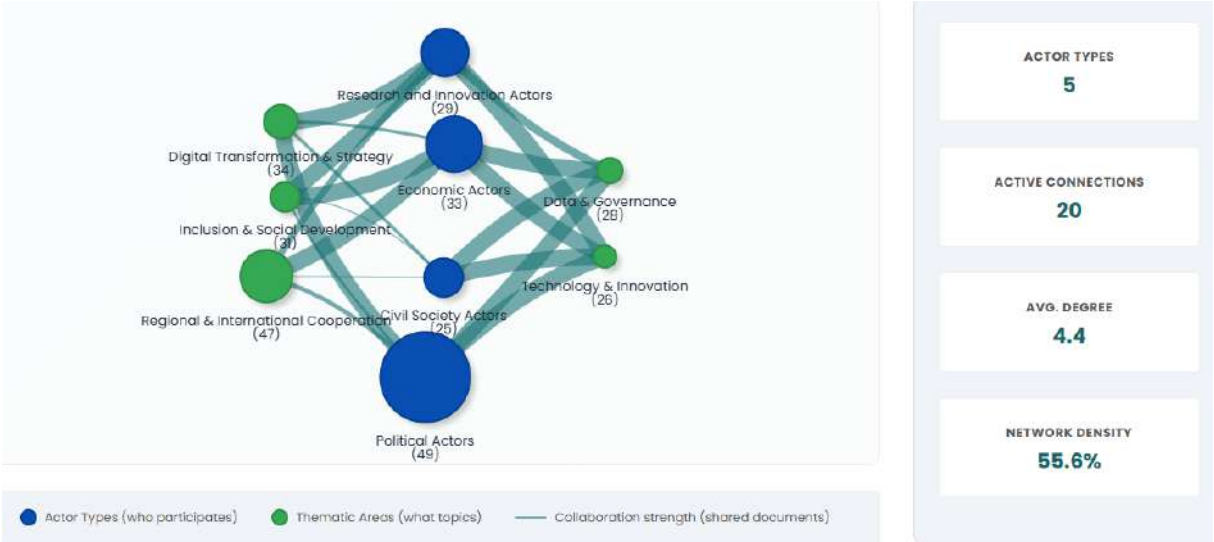

Figure 3. SPIDERHUB, Cross-Sector Collaboration Network

The following visual demonstrates how SPIDERHUB enables the assessment of digital cooperation initiatives in relation to the United Nations Sustainable Development Goals (SDGs). The dual-chart interface provides both a granular and aggregated view of SDG alignment across the corpus of mapped agreements.

On the left, the SDG Coverage & Intensity radar chart compares two dimensions of engagement for each SDG. The Document Count (in blue) indicates how frequently each SDG is mentioned across the cooperation instruments, and Average Intensity (in green) reflects the depth of engagement when the SDG is addressed, based on how prominently and substantively it appears within each document.

On the right, the SDG Global Relevance bar chart consolidates these two dimensions into a single relevance score for each SDG. This metric answers the question: *How important is this SDG to the EU–LAC digital cooperation ecosystem as a whole?* It considers both frequency and relevance across all documents. Notably, SDG 9 (Industry, Innovation, and Infrastructure), SDG 16 (Peace, Justice, and Strong Institutions), and SDG 17

[5] https://spiderhub.cedia.edu.ec/

(Partnerships for the Goals) reach the highest global relevance scores, which underscores their centrality to the cooperation agenda.

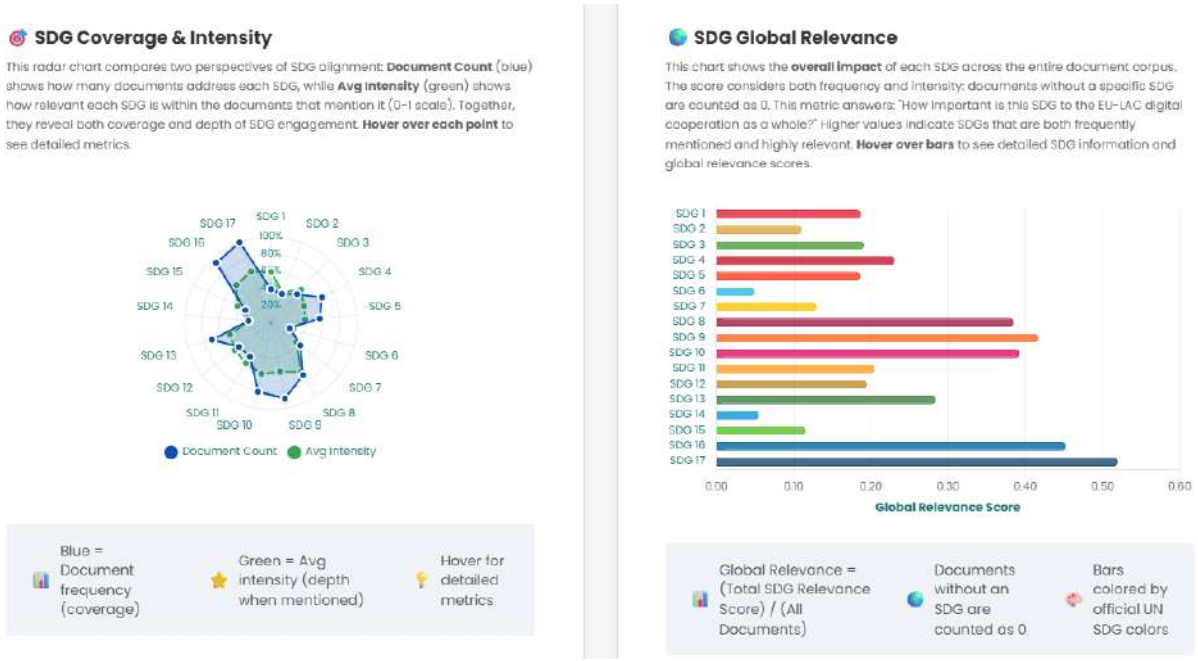

Figure 4. SPIDERHUB, SDG Coverage & Intensity and SDG Global Relevance

Similarly, Figure 5 illustrates how SPIDERHUB supports the analysis of institutional leadership and legal enforceability in EU–LAC digital cooperation frameworks. These metrics help identify the distribution of commitments across countries and assess the degree to which cooperation instruments are formalised.

On the left, the Legal Framework donut chart shows the classification of cooperation agreements based on their legal enforceability: Legally Binding (i.e. Strong) agreements (in red) represent enforceable obligations under international law, Politically Binding (i.e. Medium) commitments (in yellow) are based on political will and non-enforceable consensus, and Non-Binding (i.e. Soft) frameworks (in green) are voluntary and typically used for general cooperation or aspirational goals.

On the right, the Leading Countries bar chart highlights the top 15 institutional leaders in digital cooperation based on the number of documents initiated or led. Entities are colour-coded by region: EU countries (in blue), LAC countries (in green) and international actors (in grey).

Figure 5. SPIDERHUB, Legal framework and leading countries

Figure 6 provides insights into two key analytical dimensions within SPIDERHUB: thematic focus and temporal evolution of EU–LAC digital cooperation instruments.

On the left, the Thematic Focus bar chart categorises cooperation documents by their primary subject areas. The distribution reflects the diversity of policy agendas represented across agreements and dialogues. The most prominent themes include:

- **Regional and International Cooperation**, which dominates in frequency and reflects the emphasis on cross-border partnerships and multilateral engagement;
- **Digital Transformation and Strategy**, including structural frameworks for digitalisation;
- **Inclusion and Social Development**, highlighting the relevance of equity-driven policies;
- **Data and Governance**, with a focus on security, interoperability, and regulation;
- **Technology and Innovation**, encompassing AI, 5G, and emerging tech pilots.

These thematic categories are essential for understanding the policy logic and normative underpinnings of EU–LAC cooperation, while also indicating areas of convergence and gaps in thematic balance.

On the right, the Temporal Evolution line graph illustrates the progression of digital cooperation instruments over time, disaggregating total documents (in teal) into formal agreements (in blue) and dialogues (in green). The chart reveals a sharp increase in activity beginning in 2021, peaking in 2023, and slightly declining in 2024. This trend aligns with global shifts in digital governance, as well as the growing strategic focus on bi-regional partnerships.

The graph also provides insight into the nature of cooperation, distinguishing between dialogue-driven initiatives and binding or semi-binding agreements. These patterns enable users to assess not only the intensity but also the maturity of cooperation trajectories across policy cycles.

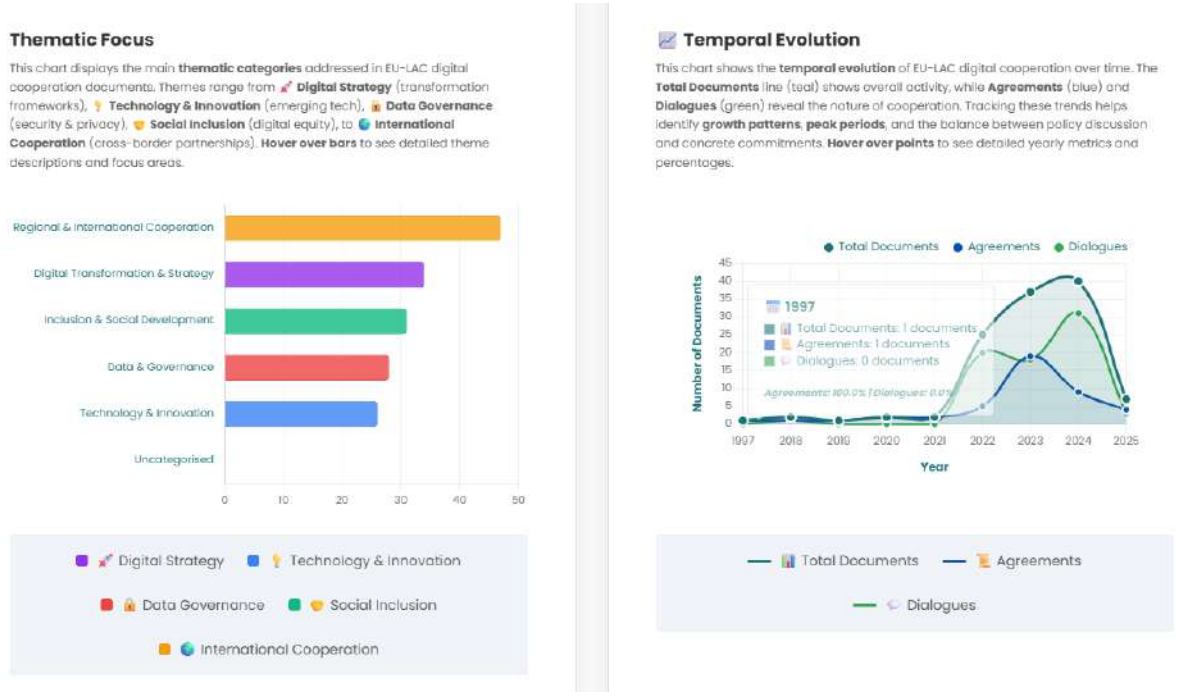

Figure 6. SPIDERHUB, Thematic focus, & temporal evolution

Finally, *figure 7* provides a detailed overview of the stakeholder ecosystem involved in EU–LAC digital cooperation, as mapped and analysed by SPIDERHUB. This analysis helps clarify who participates in the cooperation frameworks and who benefits from them, offering insight into both institutional engagement and equity considerations.

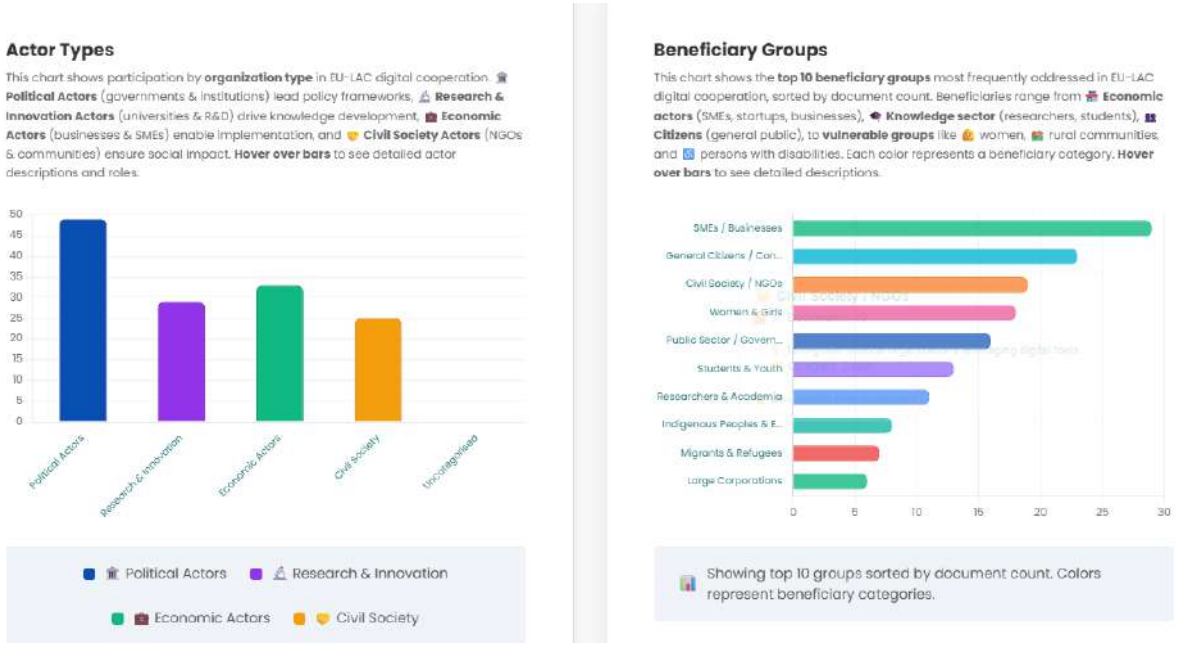

Figure 7. SPIDERHUB, Actor types and beneficiary groups

This analysis offers a multidimensional perspective on the governance and distributional aspects of EU–LAC digital cooperation. It clarifies the institutional architecture driving cooperation efforts while revealing how these initiatives align with societal needs and target populations. The observed patterns underscore both the strengths of current stakeholder engagement and the potential to further expand inclusion, particularly among civil society actors and vulnerable groups.

SPIDERHUB: Overview

The **Overview section** is an executive dashboard within SPIDERHUB designed to provide a country-specific analysis of digital cooperation between individual Latin American and Caribbean (LAC) countries and the European Union. Unlike general mappings or thematic dashboards, the Strategic Cabinet offers a **targeted and actionable overview** of each country's cooperation profile, highlighting its diplomatic engagement, legal commitments, strategic focus areas, and institutional partnerships.

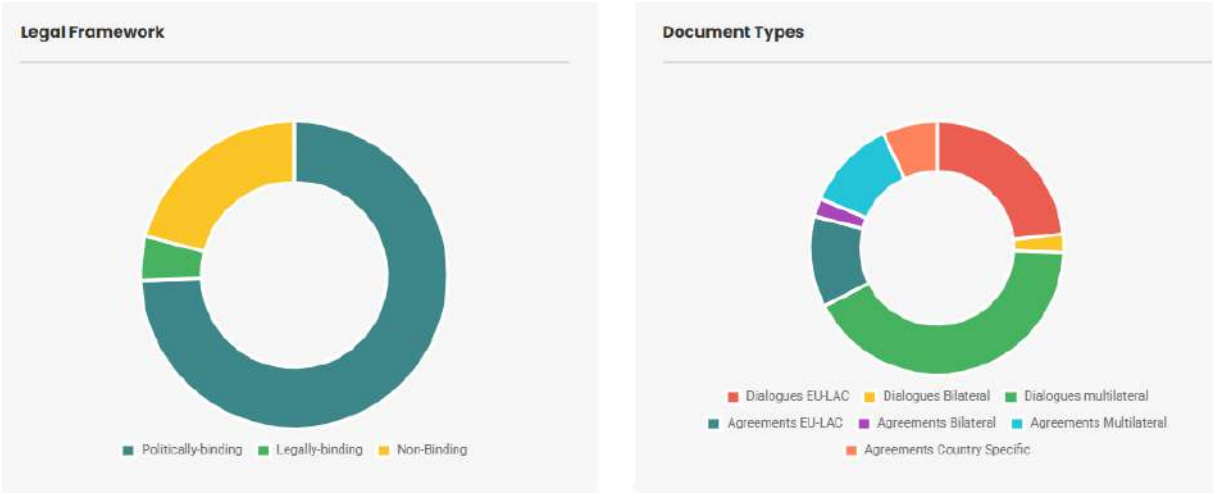

Figure 8. SPIDERHUB, Document composition

Strategic Priorities

This section presents an analytical view of a country's digital diplomacy profile, highlighting the thematic focus areas and institutional partnerships that shape its digital cooperation with the European Union and international actors.

This dual analysis helps illuminate where a country concentrates its digital cooperation efforts and with whom it collaborates most frequently, offering thus valuable inputs for strategic planning, partner matchmaking, and cross-sector policy alignment.

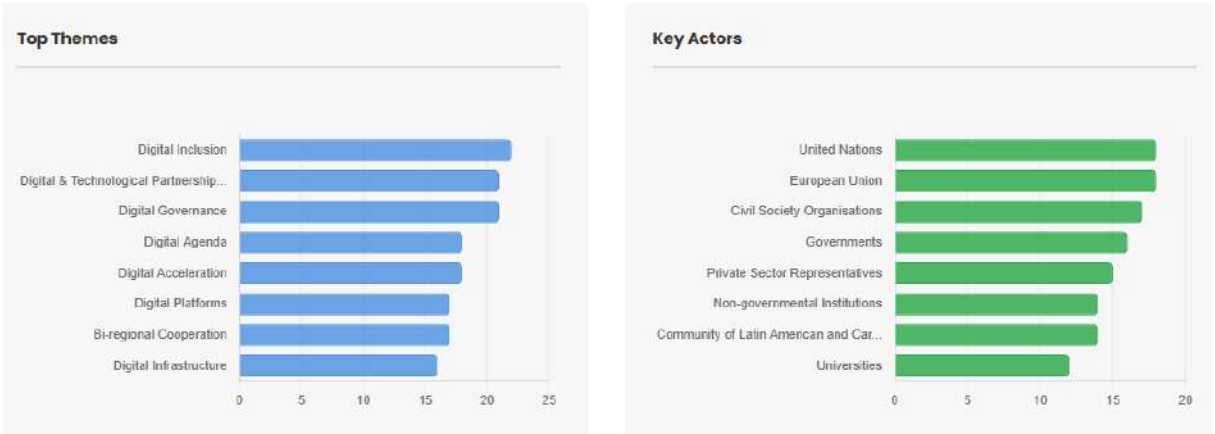

Figure 9. SPIDERHUB, Strategic Priorities

The components of the Mapping Report span strategic vision, enabling conditions, operational instruments, and the integration of qualitative monitoring. Together, they offer a comprehensive and empirical overview of the current EU–LAC digital cooperation

architecture. The report demonstrates both the potential and fragmentation within existing agreements and therefore highlights the need for institutional innovation to transform high-level commitments into sustainable, inclusive, and measurable actions. It affirms the value of structured governance mechanisms like the Digital Dialogues Implementation Forum (DIF), introduces practical tools for matchmaking and co-creation, and advances a monitoring framework rooted in qualitative intelligence. These findings directly inform the development of SPIDER's operational guidelines and provide a solid foundation to shape the next generation of digital cooperation practices across the bi-regional landscape.

Further implications

A further insight that emerges from the mapping concerns the growing relevance of multilingual, culturally responsive, and trustworthy AI for EU–LAC cooperation. The analysed dialogues already show that AI cooperation is not limited to regulatory convergence in the abstract, but increasingly recognises the importance of linguistic diversity, particularly in Spanish and Portuguese, as well as the need for responsible and inclusive AI practices. This suggests that future EU–LAC cooperation should pay greater attention to whether AI systems — including multimodal applications combining text, image, audio, and video — are able to operate effectively across different languages, cultural contexts, and social realities without reproducing exclusion, bias, or asymmetrical dependencies. The challenge is not only technological performance, but also the capacity of AI systems to reflect local contexts, respect human rights, and support trust through transparency, human oversight, and culturally sensitive design. SPIDER's mapping and DIF discussions therefore point to multilingual and ethical AI governance as a strategic area for future bi-regional cooperation.

4.3. Survey on the use of BELLA infrastructure by the digital ecosystem

The Survey provides a data-driven perspective on the awareness, readiness, and institutional capacity of EU and LAC stakeholders to engage in collaborative digital transformation initiatives. Its primary focus is the use and strategic potential of the BELLA interconnectivity infrastructure, which links European and Latin American NRENs through high-capacity broadband. It is envisioned as the technical backbone for enhanced EU-LAC digital cooperation.

The survey evaluates the current state of the digital ecosystem interconnectivity, as well as the awareness and use of the infrastructure and services provided by BELLA (Building the Europe Link to Latin America and the Caribbean) Infrastructure through the European and Latin America NRENs. To evaluate the potential of BELLA, the survey also explores technology areas and applications that may take advantage of BELLA to support digital transformation and identify key barriers to unlocking BELLA's full potential.

Conducted across Latin America, the Caribbean, and Europe, the survey analyses the connectivity requirements for daily activities in research and business, and the knowledge and connectivity provided by NRENs in both regions. The survey also sought to identify application and technology areas that can benefit from BELLA to support digital transformation and international collaboration.

4.3.1. Strategic Scope and Vision

The survey was conducted online using web-based tools and it was made available in English, Spanish, and Portuguese. The survey was answered by 357 people from Latin

America and the Caribbean (284 responses) and Europe (73 responses), including representatives from NRENs, Universities, Research Performing Organisations, Research Funding Organisations, private organisations, government organisations, innovation hubs and NGOs.
The survey's goals are as follows:

- Assess the **current levels of BELLA usage and awareness**;
- Identify institutional **barriers to infrastructure integration**;
- Explore the **relevance of BELLA for high-priority digital domains** such as AI, Cloud Computing, and Virtual Research Environments (VREs).

The resulting evidence reinforces the hypoyhesis that BELLA, while technically robust and policy-aligned, remains **structurally underutilised**, especially in LAC countries.

4.3.2. Enabling Conditions

The BELLA infrastructure is widely recognised among respondents as having transformative potential for research collaboration, data-intensive activities, and cross-border innovation. In particular:

- Collaboration opportunities, enhanced connectivity, and improved data transfer speeds were consistently rated as the most important benefits;
- Both regions reported similar expectations regarding the relevance of AI, Cloud Computing, and VREs, positioning these domains as prime candidates for BELLA-based cooperation.

Moreover, the existence of a shared physical infrastructure offers a unique opportunity to build a sustainable, inclusive, and interoperable research and education ecosystem, provided key barriers are addressed.

Relevance of high-speed internet connection

The great majority of respondents, 85.20%, indicated that a high-speed internet connection is extremely important for their activities. This highlights the critical role of reliable internet in business and research operations. Another group of responders (12.39%) said that high-speed internet connection is important. Only a minimal number of respondents (0.30%) indicated that they could operate without the internet for a couple of days, emphasising the pervasive need for constant connectivity in today's digital environment.

Degree of satisfaction with current internet connectivity

The largest group (40.48%) reported feeling moderately satisfied, closely followed by a significant percentage (36.85%) expressing high satisfaction. Dissatisfaction is also notable, with 21.15% expressing discontent, while a smaller percentage (1.51%) reported feeling very dissatisfied with their current internet connectivity. Out of these dissatisfied respondents, 66.67% are from universities, and 12% from government organizations.

Most respondents (59.21%) expressed the need for access to research infrastructures or computing resources hosted by research organisations, indicating a significant demand for remote access to such facilities in support of their institutional activities.

Among those who reported using these infrastructures or resources remotely, several referenced specific institutions, including:

- **CERN** (Switzerland)
- **REUNA network** (Chile)
- **CEDIA** (Ecuador)

In addition, it is worth noting that 64.00% of respondents dissatisfied with their current internet connection indicated that they rely on infrastructures or computing resources hosted remotely by a research organisation. This result underscores the importance of external access for those with limited connectivity.

Conversely, 40.79% of respondents reported no need for remote access, suggesting that their organisations may already possess adequate in-house capabilities or have established alternative arrangements to meet their computing and infrastructure requirements.

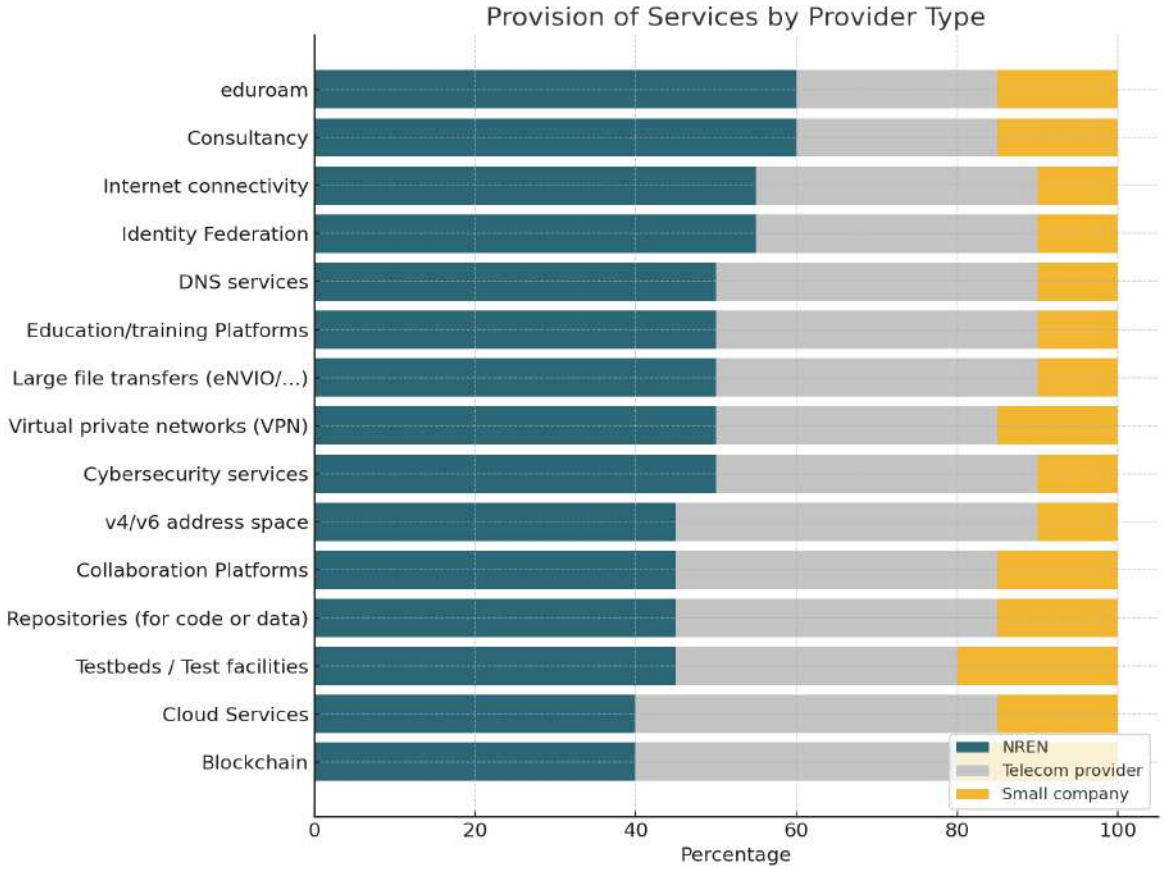

Figure 10. Provision of Services by Provider Type

The analysis of participants' usage patterns across key applications and services reveals notable trends in provider preferences, particularly among National Research and Education Networks (NRENs), telecommunications providers, and small companies.

services analysed include cloud services, testbeds, repositories, virtual private networks (VPNs), and blockchain platforms. Across this range, telecommunications providers consistently maintain a strong presence. This reflects their broad capacity and ability to offer scalable, high-volume solutions.

By contrast, NRENs play a crucial role in research and education-oriented services, where their specialised infrastructure and mission align with user needs, such as training platforms, federated access, and collaboration tools.

Small companies, although less prominent overall, make targeted contributions in niche domains including:

- Educational and training platforms
- Code and data repositories
- Cybersecurity services

Their presence in these areas reflects their agility and specialised offerings that complement larger provider capabilities.

4.3.3. Operational Instruments and Barriers

The report identifies **five principal barriers** limiting the full utilisation of BELLA:

1. Lack of awareness, particularly acute in LAC (reported by 77.11% of respondents);
2. Budgetary constraints, with 48.8% of LAC respondents citing funding limitations;
3. Technical limitations in local infrastructure or institutional capabilities;
4. Security and policy usage concerns, especially among European stakeholders;
5. Institutional disconnects with local NRENs, undermining access and continuity.

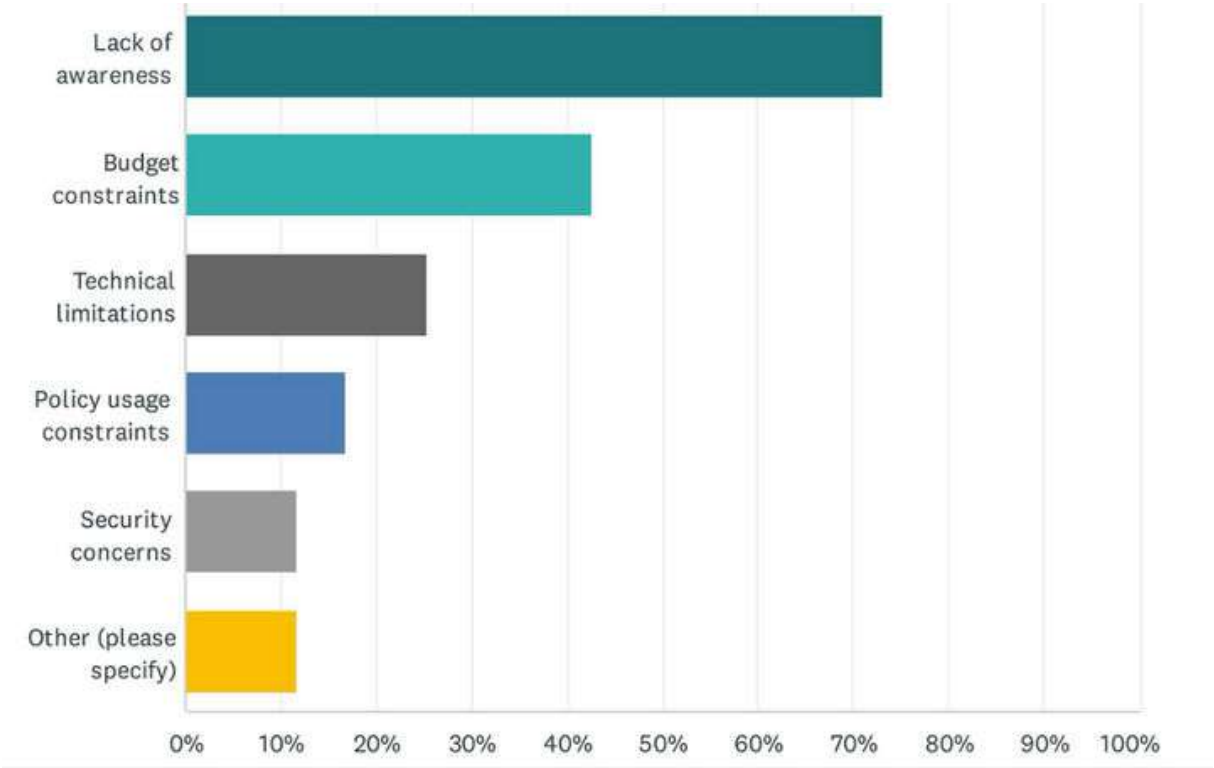

Figure 11. Survey, reported barriers to use the BELLA network

These challenges are compounded by low integration of BELLA into national digital agendas, a lack of visibility in policy dialogues, and limited interconnection with co-funding or co-creation platforms.

To overcome these barriers, the survey findings support a targeted intervention strategy, including:

- Awareness campaigns tailored to the specific needs of LAC research institutions;
- Policy and governance reforms to clarify usage rules, access models, and cross-border data governance frameworks;
- Co-funding schemes and capacity-building programmes to improve infrastructure access, especially in underserved regions;
- Use-case development in priority areas such as climate science, health data, and AI ethics.

Crucially, the report positions BELLA not merely as a network, but as a strategic enabler of SPIDER's broader vision, as it anchors long-term digital equity and fosters innovation at scale. The findings affirm the inclusion of BELLA as a central pillar in the operational components of the SPIDER guidelines and as a foundation for building sustainable, cross-regional digital research ecosystems.

4.4. SPIDER TWINNING PROGRAMME

The SPIDER Twinning Programme operationalises the project's strategic framework by enabling structured, bilateral cooperation between innovation hubs and digital ecosystems in Europe and Latin America and the Caribbean (LAC). It is designed as a practical mechanism to move from dialogue to implementation, supporting collaboration across key digital transformation domains such as Artificial Intelligence (AI), Cloud Computing, Cybersecurity, and Virtual Research Environments (VREs).

Rather than relying on ad hoc exchanges, the programme introduces a structured cooperation process, combining networking, joint planning, and implementation-oriented activities. This includes:

- Development of action plans and service portfolios between twinned institutions;
- Organisation of bilateral meetings and targeted matchmaking events;
- Engagement in thematic collaboration activities (e.g. HPC, bioeconomy, industrial AI);
- Identification and development of joint project opportunities, including access to international funding programmes.

Participating institutions are selected on the basis of strategic and thematic complementarities, with a focus on innovation hubs, research centres, and organisations supporting digital transformation and SME innovation.

The first round of the programme connected multiple EU–LAC pairs, including collaborations between France–Brazil, Spain–Costa Rica, and Germany–Brazil, among others. These pairings have progressed through structured engagement processes, combining online networking, dedicated workshops, and follow-up activities.

Initial results show that the programme contributes to:

- Strengthening institutional linkages and mutual understanding across ecosystems;
- Advancing from initial exchanges towards structured collaboration formats, including joint action plans and project pipelines;
- Identifying concrete cooperation opportunities, such as shared infrastructures, joint research proposals, and SME-oriented services;
- Highlighting systemic challenges, particularly related to funding alignment, stakeholder engagement, and long-term sustainability.

A key milestone was the Final Twinning Event held in Porto Alegre Brazil, in March 2026, where participating pairs presented results and lessons learned, confirming the importance of structured methodologies, thematic focus, and complementary expertise as critical factors for effective EU–LAC cooperation.

Success Cases

The SPIDER Twinning Programme has demonstrated its value as a structured mechanism to operationalise EU–LAC digital cooperation by connecting innovation hubs, research centres, and digital innovation ecosystems. Through targeted pairings, the programme has enabled the development of action plans, service catalogues, and concrete collaboration pathways, moving beyond networking towards structured cooperation.

Success Case 1: eDIH Paris-Saclay and PCT Guamá

The collaboration between **eDIH Paris-Saclay** and **PCT Guamá** illustrates the potential of twinning to foster initial alignment between innovation ecosystems.

Key outcomes include:

- Exchange of knowledge and practices related to innovation ecosystem management and digital transformation;
- Organisation of joint meetings and reciprocal visits to explore collaboration opportunities;
- Identification of priority cooperation areas, particularly in research-driven domains and regional value chains;
- Recognition of key challenges, including funding constraints and institutional alignment.

This case highlights the importance of structured follow-up mechanisms and funding alignment to translate initial exchanges into sustained cooperation.

Success Case 2: CENAT (Costa Rica) and T4E EDIH (Extremadura, Spain)

The collaboration between **CENAT** and **T4E EDIH** demonstrates how twinning can evolve into structured cooperation through joint activities and project development.

Key outcomes include:

- Development of a joint service portfolio and action plan, supported by continuous bilateral engagement;
- Organisation of targeted matchmaking events (HPC and bioeconomy), engaging universities, research centres, and public actors;
- Identification of concrete collaboration opportunities, including shared use of high-performance computing infrastructures;
- Advancement towards joint research proposals, including Horizon Europe participation.

Success Case 3: CERTI (Brazil) and EDIH Rheinland (Germany)

This case highlights the programme's ability to generate pipeline-ready collaborations, connecting research infrastructures with innovation ecosystems.

The twinning between **CERTI** and **EDIH Rheinland** illustrates a strong, technically grounded collaboration in industrial AI and digital manufacturing.

Key outcomes include:

- Identification of **complementary expertise** in industrial AI, decision support systems, and data governance;
- Development of a **joint initiative (PADEPI)** focused on AI-based decision support for industrial production;
- Definition of **follow-up actions**, including joint workshops, funding alignment efforts, and future project development;
- Recognition of key challenges, particularly related to funding alignment and the need for structured cooperation roadmaps.

This case demonstrates the potential for long-term, application-oriented partnerships based on complementary capabilities.

Beyond individual pairings, the Twinning Programme provides operational and evidence-based inputs to SPIDER, reinforcing the project's objective of bridging digital policy dialogue and practical implementation.

In particular, the programme contributes by:

- Testing structured co-creation mechanisms, including joint action plans, matchmaking processes, and early-stage project development;
- Demonstrating the role of thematic focus and complementary expertise in enabling effective and balanced EU–LAC cooperation;
- Identifying systemic barriers to implementation, notably in relation to funding alignment, stakeholder engagement, and continuity beyond project cycles;
- Generating practical cooperation pathways, such as joint R&D initiatives, shared use of infrastructures, and SME-oriented innovation services.

These experiences confirm a central finding of this deliverable: effective EU–LAC digital cooperation depends on the transition from ad hoc exchanges to structured, implementation-oriented collaboration frameworks, supported by clear value propositions, governance mechanisms, and sustainable funding approaches.

The Twinning Programme acts as an important bridge between experimentation and policy-oriented dialogue. Its results feed directly into other SPIDER components, particularly the Digital Dialogues Implementation Forum (DIF) and the Community of Practice (CoP), where operational insights are translated into broader reflections on governance, cooperation models, and long-term sustainability.

4.5. EU-LAC Digital Dialogues Implementation Forum (DIF)

The EU–LAC Digital Dialogues Implementation Forum (DIF) constitutes a central institutional mechanism within the SPIDER project, established to translate high-level digital cooperation dialogues into practical and sustainable implementation pathways. Anchored in the project's strategic framework, the DIF provides a dynamic, multi-stakeholder platform for structured coordination, inclusive governance, and long-term alignment across Europe and Latin America and the Caribbean (LAC).

The DIF operates with the objective of bridging the persistent gap between policy discourse and institutional action by facilitating engagement across policy, research, civil society, and technical communities. It plays a pivotal role in SPIDER's approach to embedding human-centred, inclusive, and operationally feasible models of digital transformation.

Structured around 2 Thematic Working Groups (WGs), Group 1 focused on Human-Centric Digital Transformation and Group 2 on Diversity, Equality, and Inclusion, the DIF held four plenary sessions bringing together key actors from National Research and Education Networks (NRENs), research-performing organisations (RPOs), civil society networks, and policy institutions. These sessions have focused on thematic areas including:

1. Human-centred digital transformation
2. Diversity, equity, and inclusion (DEI)
3. Gender equality and digital participation
4. Artificial intelligence governance
5. Data sovereignty and regulation

The WGs have gone beyond exploratory discussions, producing early-stage instruments such as indicator proposals, cooperation models, and preliminary frameworks for institutional coordination. Across all themes, participants have emphasized the importance of participatory methods, inclusivity, and responsiveness to regional asymmetries.

The DIF, including its Working Groups and related dialogue processes, has demonstrated its added value through the following contributions:

- Contributing to the translation of policy commitments into more operational considerations for cooperation;
- Highlighting key challenges in regulatory alignment, particularly in fast-evolving areas such as AI and data governance;
- Informing the development of monitoring approaches, including discussions on indicators related to inclusivity, trust, and governance;
- Supporting the exploration of cooperation modalities and mechanisms within the EU–LAC digital ecosystem;
- Facilitating knowledge exchange and collective learning through multi-stakeholder dialogue.

4.5.1. Community of Practice

The **SPIDER Community of Practice (CoP)**, led by RedCONARE, aims to scale up the experience on the use of BELLA across LAC and Europe. Implemented as a participatory and horizontal mechanism for peer exchange, collaborative design, and ongoing stakeholder dialogue. Drawing on methodologies such as Miro-based co-creation, thematic workshops, and reflection loops, the CoP has supported:

- Structured feedback to working documents and instruments;
- Capacity-building and thematic deep dives on inclusion, digital rights, and governance;
- A balancing of regional representation, particularly strengthening the voice of underrepresented LAC institutions;
- Cross-WG coherence through shared insights and design templates.

The CoP adopts an agile, modular logic, whereby outputs progressively feed into SPIDER's broader policy and implementation strategies. CoP is envisioned as a semi-autonomous knowledge network over time, capable of sustaining EU–LAC digital cooperation beyond the SPIDER project lifecycle.

Strategic Role Within SPIDER

The DIF reinforces SPIDER's ambition to move from dialogue to implementation through institutional innovation. It brings together formal coordination structures with participatory co-creation mechanisms, allowing for iterative and evidence-informed learning cycles. Its flexible, multi-actor structure is especially well suited to address the complexity and fluidity of digital transformation in both regions.

Figure 12. SPIDER DIF: TICAL 2025, San José, Costa Rica. Panel 1

By enabling direct contributions from stakeholders and aligning them with shared policy ambitions, the DIF is helping build a **common governance infrastructure** that can evolve beyond the SPIDER project—facilitating sustained collaboration, monitoring, and strategic foresight in EU–LAC digital partnerships.

Insights from the Working Groups

The four plenary WG sessions produced notable insights:

- **WG1 on Human-Centred Digital Transformation** prioritised embedding trust into technology governance, promoting user agency in AI systems, and developing participatory frameworks for regulatory innovation.
- **WG2 on Diversity, Equality and Inclusion** addressed structural and institutional barriers, proposed tools such as Gender Equality Plans and DEI audits, and mapped SDG linkages (notably SDGs 5, 9, 10, and 17).

These meetings confirmed that inclusive design, collaborative monitoring, and normative coherence are essential to operationalising digital cooperation across regions with diverse institutional capacities and socio-political contexts.

5. Analysis of the results

This section consolidates the findings presented in Section 4 by examining how the different components of the SPIDER project interact within the broader EU–LAC digital cooperation

landscape. Rather than reiterating individual results, this section focuses on identifying underlying patterns, structural tensions, and emerging dynamics across the normative, institutional, and operational dimensions of cooperation.

The evidence reveals a cooperation ecosystem that is conceptually well-defined and increasingly resource-endowed yet still evolving in its capacity to translate strategic alignment into coordinated and sustained action.

5.1. Normative Convergence and Conceptual Maturity

The Concept Note establishes a shared understanding of digital cooperation as a multidimensional and values-based process. The identification of priority technological domains, namely Artificial Intelligence, 5G, Blockchain, Cloud, Cybersecurity, and Virtual Research Environments, reflects a high degree of convergence between the EU and LAC in terms of strategic focus.

At the same time, the introduction of qualitative monitoring approaches signals a shift in how cooperation is conceptualised. Rather than being assessed solely through outputs or quantitative indicators, cooperation is increasingly understood in terms of relational qualities such as trust, institutional alignment, and adaptability.

This evolution suggests that EU–LAC digital cooperation has moved beyond a purely technological framing, incorporating broader considerations related to governance, sovereignty, and human-centred development.

5.2. Operational Gaps in the Cooperation Architecture

Despite this normative convergence, the Mapping of Digital Dialogues and Agreements reveals a persistent gap between strategic intent and operationalisation. While a significant proportion of agreements reference key technological domains, only a limited number include the concrete elements required for implementation, such as funding structures, timelines, or clearly defined responsibilities.

This imbalance highlights a structural characteristic of the current cooperation model: a strong capacity for policy alignment coexisting with fragmented implementation frameworks. Many agreements retain political relevance yet lack the institutional mechanisms needed to sustain coordinated action over time.

At the same time, the analysis points to the presence of underutilised institutional capacities, particularly within National Research and Education Networks (NRENs). They occupy a strategic position at the intersection of infrastructure, research, and policy, but are not always fully integrated into cooperation processes.

5.3. Infrastructure and the Limits of Technical Readiness

The findings of the BELLA Survey (D2.1) introduce a complementary dimension to this analysis, focusing on infrastructure and its use. While high-capacity connectivity is widely recognised as essential, its practical utilisation remains uneven across the ecosystem.

The observed gap between perceived importance and actual use reflects a set of non-technical constraints, including limited awareness of available capabilities, funding limitations, and uncertainties related to data governance and cross-border collaboration. These observations suggest that the presence of infrastructure alone is insufficient to ensure impact.

Instead, infrastructure operates within a broader ecosystem where governance arrangements, institutional capacities, and user engagement play a decisive role in shaping outcomes.

5.4. Emerging Mechanisms of Coordination and Interaction

The implementation of SPIDER introduces additional elements that help build that broader ecosystem. Initiatives such as the Digital Dialogues Implementation Forum (DIF), the Working Groups, and the Twinning Programme provide structured environments in which cooperation can move beyond formal agreements toward more continuous forms of interaction.

These mechanisms highlight the importance of coordination spaces that enable dialogue, validation, and collective learning among diverse actors. The Twinning Programme in particular illustrates how collaboration becomes more tangible when it is anchored in shared thematic priorities and reciprocal exchange between institutions.

Similarly, the DIF and its associated working groups demonstrate how governance can evolve through iterative processes that integrate multiple perspectives and align cooperation with broader objectives such as the Sustainable Development Goals.

5.5. Systemic Perspective: Fragmentation within a Consolidating Ecosystem

Across all deliverables, a consistent pattern emerges. EU–LAC digital cooperation is supported by a set of robust components: strategic vision, institutional actors, and technical infrastructure. However, these elements are not always fully articulated into a cohesive system.

This results in a form of systemic fragmentation, where individual initiatives demonstrate value, but their combined impact remains below potential due to limited coordination and integration.

At the same time, the foundations for a more integrated cooperation model are already in place, as indicated by the presence of platforms such as SPIDERHUB, infrastructures such as BELLA, and governance spaces such as the DIF. The current stage of development can therefore be understood as a transition from a collection of aligned initiatives toward a more interconnected and system-oriented approach.

6. Analysis of the Current Cooperation Framework

This section builds directly on the evidence and insights previously presented. Section 4 documents the key results generated through the SPIDER project, including the normative foundations of EU–LAC digital cooperation, the mapping of dialogues and agreements, and the assessment of infrastructure through the BELLA survey. Section 5 then analyses these findings, highlighting structural patterns such as the gap between strategic alignment and implementation, the uneven utilisation of infrastructure, and the importance of governance and coordination mechanisms.

Building on this foundation, the present section examines how EU–LAC digital cooperation operates in practice. Rather than introducing new conceptual elements, it focuses on how the dynamics identified earlier are reflected in existing cooperation structures, participation patterns, and implementation processes.

To do so, it combines SPIDER evidence with an additional analytical exercise based on CORDIS data, providing a complementary perspective on how cooperation materialises

within EU-funded research and innovation programmes. While this does not capture the full scope of EU–LAC digital cooperation, it offers a consistent reference point for understanding how participation, leadership, and institutional engagement are structured in practice.

This section connects thus the results and analysis of SPIDER with the operational realities of cooperation. In doing so, it identifies the conditions that shape how cooperation is implemented, how it evolves across different contexts, and how its outcomes are distributed across actors and regions. These insights provide the analytical basis for the collaboration opportunities presented in Section 7 and the guidelines developed in Section 9.

In doing so, it also introduces the role of infrastructure and intermediary actors — particularly BELLA and National Research and Education Networks (NRENs) — as key elements for understanding how cooperation moves from strategic alignment to operational practice.

6.1. Governance Architecture and Implementation Dynamics

The results presented in Section 4 and the analysis developed in Section 5 converge on a common observation: EU–LAC digital cooperation is characterised by strong strategic alignment and an expanding set of policy instruments, but with varying degrees of operational continuity and implementation across initiatives. This section explores how these dynamics are reflected in the current governance architecture of cooperation.

Evidence from the Mapping of Digital Dialogues and Agreements shows that cooperation is supported by a wide range of formal and informal policy instruments. At the same time, the BELLA survey highlights the availability of infrastructure with clear strategic relevance. Finally, , the analysis in Section 5 points to differences in how the political dialogues are activated in practice, particularly in relation to monitoring, coordination, and institutional uptake. These findings suggest that the effectiveness of cooperation depends not only on the presence of frameworks and assets, but on how they are connected and operationalised.

EU–LAC digital cooperation can therefore be understood as a hybrid governance architecture. On one hand, political dialogues and formal agreements provide direction, legitimacy, and access to resources. On the other hand, implementation depends on a broader set of actors and enabling mechanisms, including infrastructures and intermediary organisations that connect policy frameworks with institutional practice.

This multi-layered structure is the approach promoted by SPIDER. We treat strategic alignment, infrastructure and knowledge-sharing as interdependent components of the same system. Cooperation becomes more effective when these elements are articulated in a way that supports continuity and enables different actors to engage in a complementary manner.

In practice, five groups of actors play a central role. Public authorities and regional organisations provide policy direction and regulatory frameworks. Development finance institutions shape the financial conditions that enable infrastructure and innovation. Research and innovation actors — including universities, research organisations, and NRENs — contribute technical expertise and implementation capacity. Infrastructures such as BELLA provide the backbone for connectivity and data exchange. Private sector and civil society actors support uptake, innovation diffusion, and inclusion.

The interaction between these actors is central to how cooperation unfolds. Strategic alignment creates favourable conditions for collaboration. However, translating alignment

into sustained engagement depends on institutional capacity and the ability to connect different layers of the cooperation ecosystem over time.

This interaction between governance, infrastructure, and intermediation is particularly relevant in the digital domain, where the availability of connectivity and the presence of enabling institutions condition how cooperation is carried out in practice.

6.2. Strategic Convergence, Regional Differentiation and, the implementation Gap

The results presented in Section 4 show a strong degree of alignment between the European Union and Latin America and the Caribbean in terms of digital priorities. This convergence is further explored in Section 5, where alignment is identified as one of the key enabling conditions for cooperation. At the same time, the analysis highlights that alignment at the strategic level does not translate into uniform patterns of implementation.

To further examine these dynamics, this section draws on SPIDER findings and complementary sources, including regional policy frameworks, multilateral agendas, and comparative analyses of digital development across EU and LAC countries. These complementary sources provide context for understanding how shared priorities are interpreted and operationalised across different institutional and territorial settings.

On the European side, digital transformation is framed through a relatively coherent policy approach that combines competitiveness, resilience, sustainability, and rights-based governance. In the context of EU–LAC cooperation, this policy approach is reflected in priorities such as technological sovereignty, cybersecurity, digital skills, digital public services, and interoperable data infrastructures.

Across Latin America and the Caribbean, similar priorities are present, particularly in relation to social inclusion, climate action, productive transformation, and institutional strengthening. However, the LAC regional landscape is marked by diversity in economic structures, institutional capacities, and development trajectories. Caribbean countries often prioritise resilience, risk management, and institutional efficiency, while continental Latin America places greater emphasis on productive upgrading, state modernisation, and sustainability.

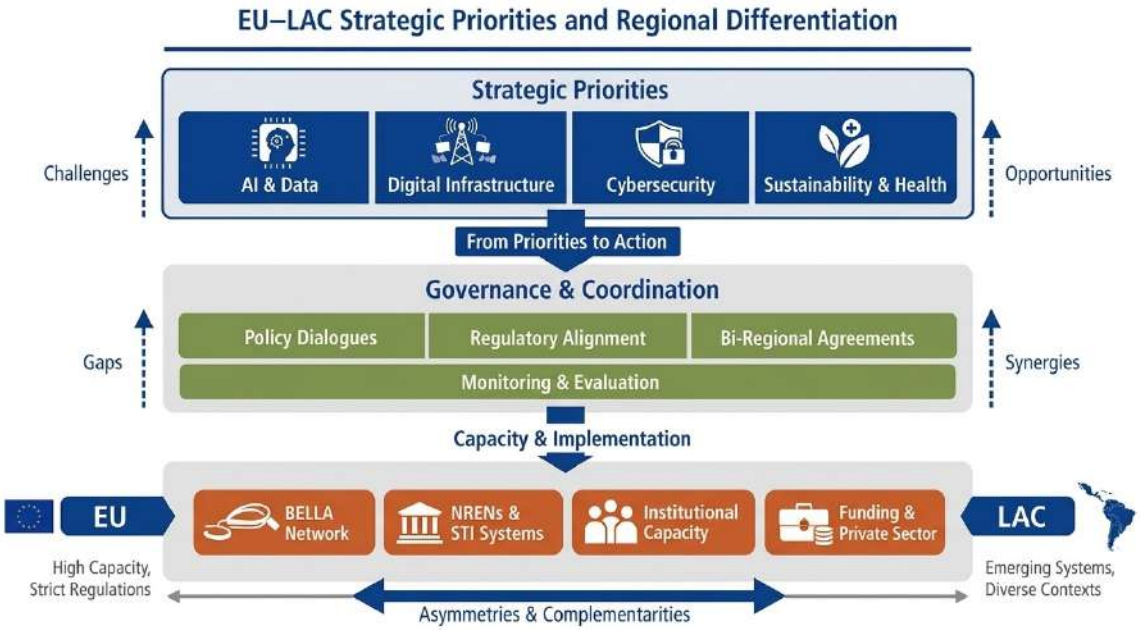

Figure 13. EU–LAC Strategic Priorities and Regional Differentiation

Differences in absorptive capacity further shape how these shared priorities are translated into cooperation. Some countries and institutions are better positioned to engage in advanced innovation ecosystems, regulatory processes, and standard-setting discussions. Other countries focus more on strengthening foundational capacities, including connectivity, digital skills, and institutional frameworks.

From an analytical perspective, this combination of convergence and differentiation helps explain the patterns observed in Section 6.3. While shared priorities provide a common entry point for cooperation, variations in capacity and context influence how participation is structured, how leadership roles are distributed, and how cooperation evolves across different parts of the LAC region.

Rather than limiting cooperation, this diversity shapes its pathways. It creates multiple points of entry and different forms of engagement, which are reflected in the distribution of participation across programmes, institutions, and countries examined in the following section.

At the same time, the extent to which these shared priorities translate into operational cooperation depends on the availability of enabling conditions, including infrastructure, institutional capacity, and mechanisms that facilitate coordination across actors. This reinforces the importance of examining not only alignment at the strategic level, but also how such alignment is supported in practice through implementation of ecosystems.

6.3. Implemented Cooperation in EU-funded Research and Innovation: Evidence from CORDIS

CORDIS provides access to comprehensive information about EU Research & Development projects. The CORDIS[6] analysis examines one specific dimension of implemented EU–LAC cooperation: participation in EU Framework Programme research and innovation projects. An EU–LAC project is defined here as a project that includes at least one EU-27 organisation and at least one organisation from Latin America or the Caribbean (LAC). The analysis uses

[6] https://cordis.europa.eu/es

harmonised CORDIS project and organisation records for **three programmes:** FP7, Horizon 2020, and Horizon Europe.

The unit of analysis varies by indicator and is stated explicitly throughout the section. Project-level indicators are used for programme shares and coordinator location, while organisation-level indicators are used for organisational profiles, organisation–project participations, and economic contribution. Comparisons across programmes should be interpreted cautiously because Horizon Europe remains an incomplete portfolio at the time of analysis. CORDIS therefore provides a robust longitudinal proxy for implemented cooperation in research and innovation, but it does not capture the full range of EU–LAC digital cooperation. It should be read as evidence of implemented cooperation within EU-funded R&I rather than as a complete representation of all cooperation dynamics.

In this sense, CORDIS complements the analysis developed in Sections 6.1 and 6.2 by shifting the focus from governance structures and strategic priorities to observable implementation patterns. CORDIS shows both whether cooperation exists, and how it is structured: who participates, who leads, how participation evolves across programmes, and how far cooperation extends beyond its established institutional and territorial gateways.

While CORDIS provides insight into formal participation in EU-funded research and innovation programmes, it captures only part of the broader cooperation landscape. Other enabling elements—such as connectivity infrastructures and institutional intermediaries—also shape how participation is initiated, sustained, and expanded beyond individual projects.

6.3.1. Modest Growth from a Low Base

EU–LAC participation is persistent across the three programmes, but it remains limited in scale. Across FP7, Horizon 2020, and Horizon Europe, the share of funded projects involving at least one LAC organisation rises from 1.23% to 1.39% and then to 1.76% of the total programme portfolio. This pattern indicates gradual expansion from a low participation base rather than broad-based integration.

A cautious interpretation therefore points to incremental growth within a still narrow participation base. Even under Horizon Europe, fewer than two out of every one hundred funded projects include a LAC partner. While strategic attention to EU–LAC cooperation has increased, this has translated only partially into expanded participation within implementation mechanisms. Because Horizon Europe is still ongoing, relative shares are more informative than absolute counts at this stage.

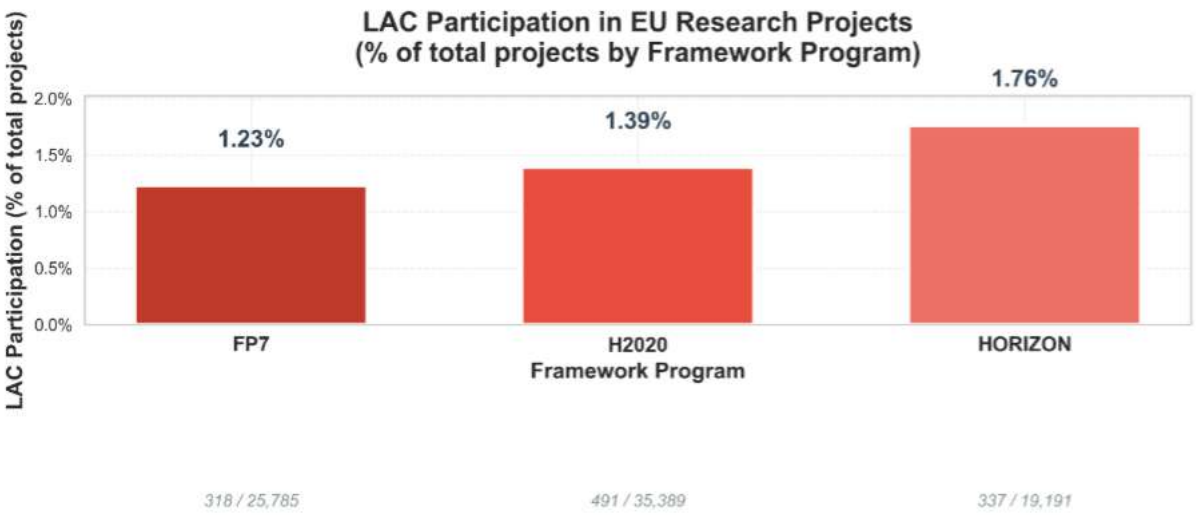

Figure 14. LAC participation in EU Research Projects

These findings suggest that, beyond programme-level openness, additional enabling conditions may influence how participation expands, including access to networks, institutional support structures, and the availability of shared infrastructures.

6.3.2. Participation Patterns in Project Coordination

The distinction among participation patterns in project coordination is relevant because coordination involves key functions such as agenda-setting, consortium formation, administrative responsibility, and the accumulation of managerial experience. The observed pattern therefore reflects a distribution of roles in which participation is more widespread than coordination across regions.

Financial data follow a similar pattern, although interpretation should remain cautious. European participants receive higher average and median economic contributions per organisation. Higher retribution is consistent with a system in which coordination, repeated participation, and administrative experience are more concentrated on the European side. While the data do not establish causal relationships, they suggest that organisational roles and resource allocation tend to evolve together over time.

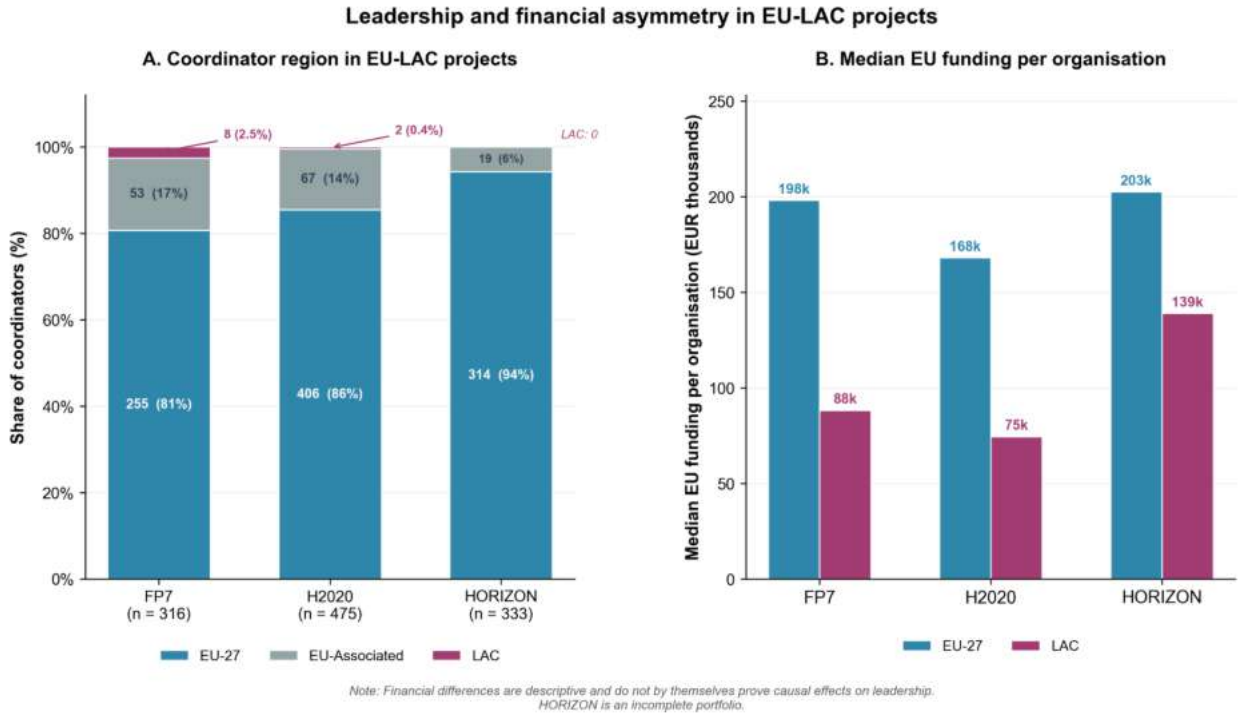

Figure 15. Leadership and financial asymmetry in EU-LAC projects

These patterns also point to the importance of institutional environments that support coordination capacity, including access to networks, administrative support, and trusted infrastructures that facilitate sustained collaboration.

6.3.3. Institutional Composition of Participation

Participation patterns also point to differences in institutional composition. On the European side, involvement is relatively diversified, with participation distributed across universities, research-performing organisations, private sector actors, and, to a lesser extent, public bodies. By contrast, participation on the LAC side appears more concentrated in higher education institutions, with lower representation of private sector organisations and public agencies.

This pattern is consistent with the SPIDER analysis' broader observations . The mapping of cooperation instruments highlights a strong presence of academic and research-oriented collaboration. However, engagement from other parts of the innovation ecosystem — particularly private firms and public sector actors — appears less systematically embedded. Similarly, insights from the Twinning activities suggest that cooperation often builds on already existing academic networks, which tend to act as primary entry points into bi-regional collaboration.

These differences in institutional composition indicate that participation is uneven both in scale and in structure. The types of organisations involved influence how cooperation is organised, the channels through which actors enter projects, and the extent to which different parts of the innovation ecosystem are connected within EU–LAC initiatives.

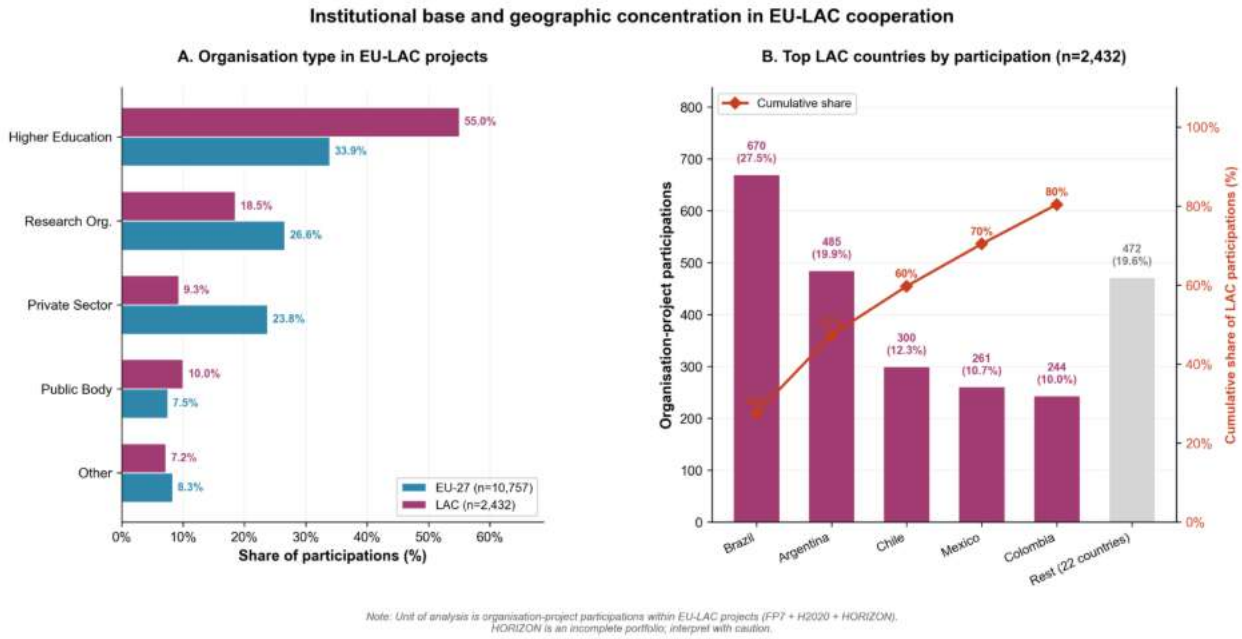

Figure 16. Institutional base and geographic concentration in EU-LAC cooperation

This institutional base and geographic concentration also suggests that participation channels may be more strongly connected to academic networks than to broader innovation ecosystems, highlighting the relevance of intermediary structures capable of extending participation beyond established institutional pathways.

6.3.4. Geographic Concentration and Diffusion Patterns

At the country level, participation also exhibits a high degree of concentration. EU–LAC cooperation is not evenly distributed across the region; it is anchored in a relatively small group of LAC countries. Brazil is most prominent Together with Argentina, Chile, Mexico, and Colombia, they make up the majority of LAC organisation–project participations. Beyond this group, participation declines significantly, with Caribbean representation remaining particularly limited.

This uneven distribution results in a cooperation pattern that is more intensive than extensive: repeated collaboration among a limited set of countries rather than broad regional inclusion. While such concentration can support the formation of strong collaboration clusters, it also implies that experience, learning processes, and access to networks are not evenly distributed across the wider LAC ecosystem.

Overall, the evidence suggests that EU–LAC cooperation in research and innovation is present but remains structured through relatively narrow participation pathways:

- Growth is observable, but gradual;
- participation is sustained, but uneven;
- and engagement is often concentrated within a limited set of countries and institutional types.

These patterns point to the importance of complementary mechanisms that support broader access, strengthen institutional readiness, and facilitate more distributed participation across the cooperation landscape.

6.4. Three Interpretive Factors Associated with Uneven Participation

The patterns observed in the CORDIS analysis are consistent with broader contextual conditions that shape access and continuity of participation in EU–LAC cooperation. Rather than providing deterministic explanations, these patterns help explain why participation tends to accumulate more strongly in certain countries, institutions, and networks, while remaining more limited or episodic in others.

In this sense, uneven participation should be understood as the outcome of interacting structural, institutional, and operational conditions that influence how cooperation opportunities are sustained over time. These conditions operate alongside the governance dynamics outlined in Section 6.1, the strategic convergence described in Section 6.2, and the participation patterns identified in Section 6.3.

6.4.1. Network Density, External Linkages, and Access to Cooperation Opportunities

The density of pre-existing external linkages plays a relevant role in shaping participation. Countries and institutions with stronger economic, diplomatic or institutional connections to the European Union are often better positioned to identify opportunities and sustain collaborative engagement over time.

This connection however does not imply that external exposure automatically translates into research cooperation. However, denser networks may reduce some of the practical barriers associated with entering international consortia, including partner identification and coordination across institutions. Repeated interaction within established networks can also support continuity, allowing institutions to participate more regularly and to move more easily between successive projects.

At the same time, participation patterns cannot be explained by scale alone. Some countries and institutions demonstrate levels of engagement that exceed what might be expected based on their economic size or aggregate research capacity. This suggests that network embeddedness and institutional connectivity operate alongside structural conditions, shaping the ability of actors to convert available opportunities into effective participation.

6.4.2. Funding Conditions, Administrative Burden, and Entry Barriers

A second set of factors are the financial and administrative conditions under which participation becomes feasible. Changes in funding frameworks, particularly the transition from FP7 to Horizon 2020, altered eligibility conditions for several upper-middle-income countries in Latin America and the Caribbean. The new eligibility conditions increased the relevance of co-funding arrangements and strategic positioning within consortia.

While these changes did not prevent participation, they may have raised the threshold for entry and continuity, especially for institutions with more limited access to complementary funding or weaker administrative support structures. Participation in international programmes often involves significant upfront investment in proposal preparation, partnership development, and compliance with administrative requirements.

This interpretation aligns with broader evidence discussed in the report regarding barriers to international cooperation. Factors such as networking costs, administrative complexity, differences in proposal practices, perceived competitiveness gaps, and misalignment between programme requirements and local institutional contexts may all influence how organisations move from initial interest to successful participation (Formoso et al., 2025).

Uneven participation can therefore be understood both in terms of scientific capability or thematic alignment, and as a function of how demanding international funding environments may be for institutions operating under different conditions.

6.4.3. Research Capacity, Institutional Readiness, and Cumulative Participation

A third factor concerns the relationship between domestic research capacity and institutional readiness. Scientific capability, innovation effort, and academic production create important background conditions for participation, but they do not automatically translate into stronger or more sustained involvement in international cooperation.

Their effect is mediated by whether institutions possess the operational capacities required to engage effectively in complex collaboration environments. These include the ability to identify relevant calls, build and maintain partnerships, prepare competitive proposals, manage projects, and re-enter future consortia with accumulated experience.

In this context, absorptive capacity can be understood as a multidimensional condition. It encompasses not only technical and scientific capability, but also administrative support, proposal development expertise, network access, trusted digital infrastructures, and institutional continuity. It may also include the presence of intermediary organisations that facilitate engagement and reduce coordination complexity.

Where these conditions are more developed, participation tends to become cumulative, enabling institutions to build experience, expand networks, and gradually assume more central roles within cooperation processes. Where they are less developed, participation is more likely to remain episodic, peripheral, or dependent on a limited number of established entry points.

Taken together, these three factors [6.4.1, 6.4.2 & 6.4.3] highlight that participation in EU–LAC cooperation is shaped by more than programme design or thematic alignment alone. This finding reflects a combination of network positioning and institutional conditions to navigate complex cooperation environments. In this context, the extent to which cooperation becomes sustained and inclusive depends on how these elements interact in practice. These findings, in turn, draw attention to the importance of the broader implementation ecosystem—particularly of infrastructure and intermediary actors—in enabling institutions to engage more effectively in transregional collaboration.

6.5. Infrastructure, Enabling Actors, and the Role of NRENs

Building on the governance dynamics outlined in Section 6.1, the strategic convergence described in Section 6.2, the participation patterns observed in EU-funded cooperation (Section 6.3), and the contextual factors shaping uneven participation (Section 6.4), one element is relevant for understanding how cooperation is realised in practice: the interaction between infrastructure, enabling actors, and user uptake.

Within this context, the BELLA infrastructure represents a foundational component of EU–LAC digital cooperation. As the first direct submarine cable connecting Europe and Latin America, it provides the high-capacity, low-latency backbone required for data-intensive research, distributed infrastructures, and sustained cross-border collaboration. In this sense, BELLA expands the secure technical conditions under which cooperation can take place, enabling new forms of scientific exchange and digital interaction.

Evidence from the SPIDER infrastructure survey indicates that institutions with access to BELLA report improvements in collaborative research performance, access to remote computing resources, and the development of digital education environments. More than

62% of surveyed institutions consider BELLA critical for enabling virtual research environments and cross-border collaboration, particularly in areas such as artificial intelligence and cloud-based services.

At the same time, both survey findings and network-level observations suggest that this potential is not yet fully reflected in usage patterns. While the perceived importance of high-speed connectivity is consistently high, barriers such as awareness, institutional integration, technical capacity, and funding conditions continue to influence how the infrastructure is used in practice, particularly across parts of Latin America and the Caribbean.

Traffic data from RedCLARA's monitoring systems (Grafana) provides additional insight into these dynamics. Although stable connectivity is observed across the network, overall traffic levels remain modest relative to installed capacity. This indicates that infrastructure availability, while necessary, is not sufficient to ensure widespread or sustained use. Rather, effective utilisation depends on how connectivity is embedded within institutional workflows, research practices, and service delivery models.

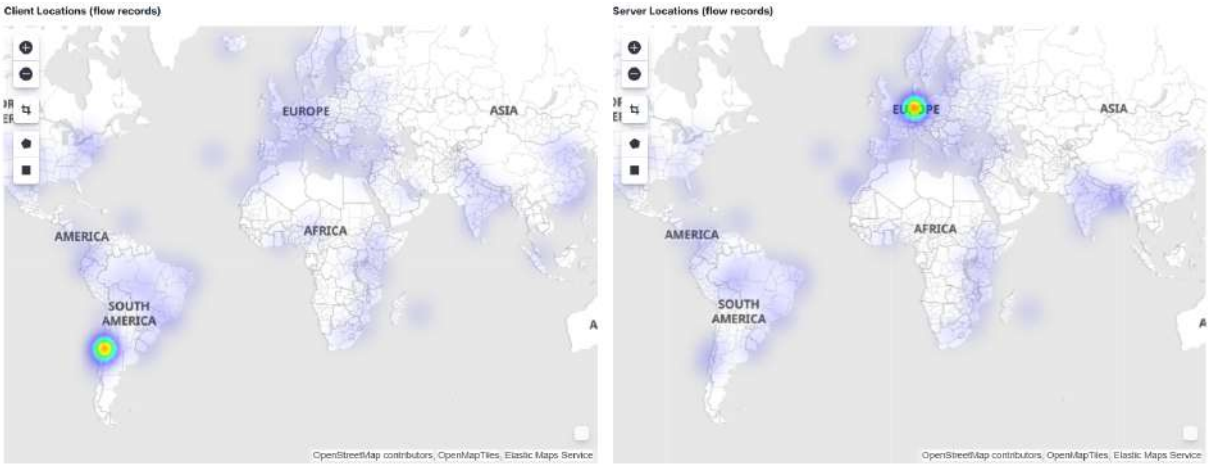

Figure 17. BELLA traffic patterns across LAC countries. Source: Red Clara's Grafana system)

This pattern is consistent with the broader findings of this section: **strategic assets and policy alignment do not automatically translate into operational uptake**. Their impact depends on the presence of enabling actors and structures capable of connecting infrastructure with institutions, users, and concrete collaboration processes.

In this context, National Research and Education Networks (NRENs) play a central and distinctive role. NRENs are not only providers of connectivity, but also key enabling actors within national research, education, and innovation ecosystems. They support high-capacity and trusted digital environments that enable scientific collaboration and cross-border data exchange.

Within the EU–LAC cooperation landscape, NRENs can be understood as the interface between regional infrastructure such as BELLA and national science, technology, and innovation systems. While BELLA provides the backbone for intercontinental connectivity, NRENs operate at the institutional level, facilitating access, integration, and effective use by universities, research centres, and other public and private actors.

Evidence from the SPIDER Mapping Report shows that NRENs are consistently present across multiple cooperation cases. Their role extends beyond infrastructure provision to include enabling interoperability, supporting collaborative platforms, facilitating open science environments, and contributing to the continuity of regional and international partnerships.

From a systemic perspective, their contribution can be understood in terms of how they enhance the functioning of national science, technology, and innovation systems. By supporting the circulation of knowledge, enabling shared infrastructures, and connecting institutions to global research networks, NRENs contribute to amplifying research outcomes and strengthening international visibility.

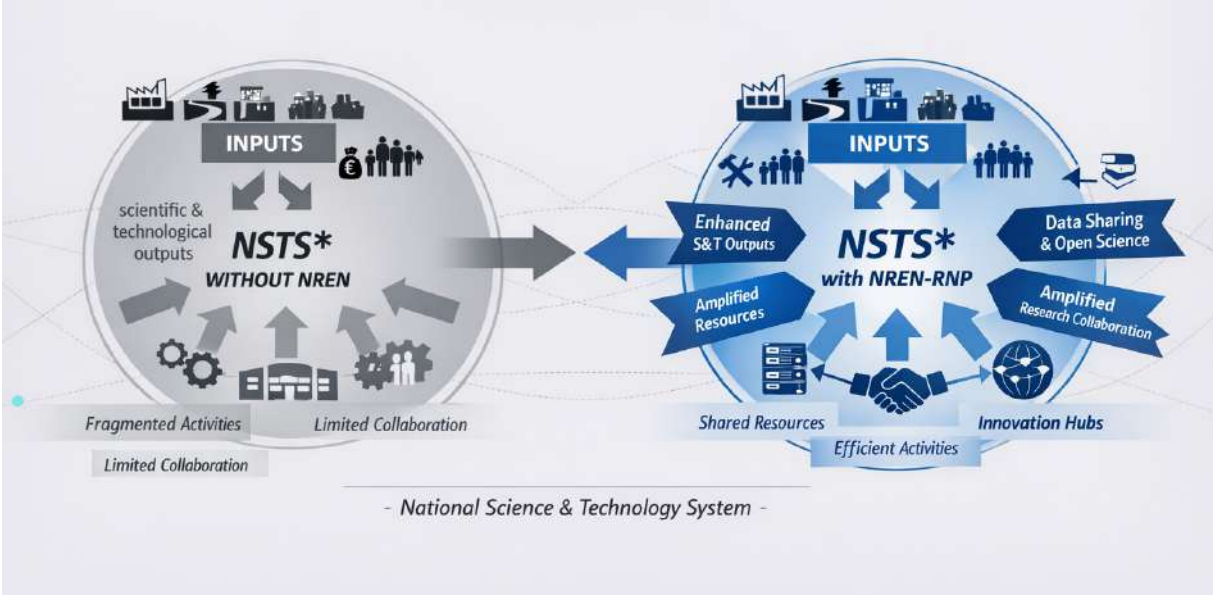

Figure 18. Conceptual role of NRENs within National Science, Technology and Innovation Systems

This positioning also relates directly to the participation patterns observed in Section 6.3 and the interpretive factors discussed in Section 6.4. NRENs can help reduce some of the structural frictions associated with uneven participation, namely limited access to networks, high coordination costs, and gaps in institutional readiness. By providing shared services, trusted environments, and technical support, they contribute to facilitating access and continuity in international cooperation processes.

At the same time, NRENs' capacity to perform this role is not uniform across contexts. Differences in funding, governance structures, and levels of institutional integration affect their ability to provide advanced services and extend coverage. In some cases, these differences influence the extent to which infrastructure availability translates into widespread institutional use and sustained collaboration.

Taken together, BELLA and NRENs illustrate how infrastructure and enabling actors interact within the current EU–LAC cooperation framework. While infrastructure expands what is technically possible, enabling actors shape how that potential is operationalised in practice. Their combined role provides an important bridge between the structural conditions analysed in this section and the collaboration pathways and operational approaches developed in the following sections.

6.6. Strengthen Governance, Visibility, and Sustainability of EU–LAC Digital Cooperation

A central lesson emerging from the SPIDER evidence base is that the effectiveness of EU–LAC digital cooperation depends not only on infrastructure or policy alignment, but on the presence of robust governance frameworks, sustained visibility efforts, and long-term institutional commitment. Across DIF discussions and survey findings, a recurring

challenge is the fragmentation of initiatives, limited coordination among stakeholders, and insufficient mechanisms to ensure continuity beyond individual projects or political cycles.

In governance, cooperation requires clearer coordination structures that align regional, national, and institutional actors. The absence of common frameworks and monitoring mechanisms has limited the translation of dialogue into sustained action. Strengthening governance implies developing shared standards, enhancing interoperability of regulatory approaches, and reinforcing multilevel coordination mechanisms that reduce duplication and enable cumulative impact. At the same time, long-term agreements and adherence to international frameworks are essential to ensure continuity despite political changes and institutional turnover.

Visibility and awareness emerge as equally critical dimensions. Evidence from both the BELLA survey and DIF discussions shows that even when infrastructure and cooperation opportunities exist, engagement remains constrained by limited awareness among potential users and stakeholders. Enhancing visibility requires targeted communication strategies, stakeholder mapping, and the development of platforms that connect capabilities with concrete use cases. In this sense, initiatives such as matchmaking tools, micro-projects, and demonstrators can play a key role in translating abstract cooperation opportunities into tangible and replicable outcomes.

Finally, sustainability must be embedded as a core design principle of EU–LAC digital cooperation. This includes not only financial sustainability, through diversified funding mechanisms and long-term investment strategies, but also institutional sustainability, ensuring that cooperation frameworks are resilient over time. Strengthening the role of enabling actors—particularly NRENs—as stable anchors within the ecosystem contributes to this objective, as they provide continuity, technical reliability, and trusted environments for collaboration. Ultimately, sustainable cooperation depends on aligning governance, infrastructure, and stakeholder engagement within a coherent and adaptive framework capable of evolving alongside technological and geopolitical changes.

7. OPPORTUNITIES FOR COLLABORATION IN DIGITAL TRANSFORMATION

Building on the results presented in Section 4 and the analytical interpretation provided in Section 5, this section identifies structured opportunities for strengthening EU–LAC cooperation in digital transformation. While the preceding sections establish what SPIDER's work packages have produced and what these results imply, the present section focuses on where cooperation can realistically expand and consolidate, given the institutional capacities, thematic convergences and infrastructure conditions already observed.

This section also serves a bridging function within the document's overall logic. It translates empirical evidence into forward-looking cooperation opportunities that, in the next section (Current Cooperation Framework), can be positioned within the broader set of forces, actors and interaction dynamics shaping EU–LAC digital cooperation. In turn, this narrative sequence supports the later formulation of guidelines by clarifying what types of cooperation pathways are most plausible, where they are already emerging, and what conditions enable them.

Opportunities are organised across four complementary dimensions—best practices, instruments, relevant actors and synergies—providing a practical map of leverage points for stakeholders seeking to operationalise digital cooperation.

Across EU–LAC dialogues and implementation-oriented experiences, several recurring patterns can be observed as enabling conditions for effective cooperation.

First, cooperation initiatives tend to be more resilient when political alignment is accompanied by technical anchoring and institutional ownership. Where dialogue outcomes are linked to concrete cooperation channels—such as capacity-building programmes, infrastructure access, or institutional coordination mechanisms—collaboration is more likely to progress beyond initial commitments.

Second, cooperation grounded in shared infrastructure ecosystems demonstrates stronger operational feasibility. Leveraging existing networks and connectivity platforms reduces transaction costs and accelerates implementation, particularly when institutional roles are clear and technical coordination is supported by established intermediaries.

Third, co-creation and peer-learning formats contribute to more adaptive and context-sensitive cooperation. Living labs, communities of practice and twinning-style exchanges offer practical settings where partners can test approaches, align expectations and consolidate trust—an element repeatedly recognised as central to sustained bi-regional engagement.

Finally, best practices increasingly incorporate iterative monitoring and reflective review cycles. Rather than treating evaluation as an end-stage activity, these approaches position monitoring as a tool for learning and adjustment, supporting continuity across institutional and political cycles. These practices provide a set of transferable cooperation features that can be adapted across thematic areas and institutional contexts.

7.1. Instruments

The EU–LAC cooperation ecosystem already contains a diversified set of instruments that can be mobilised to strengthen digital collaboration. The opportunity lies less in creating new instruments than in improving their strategic alignment and interoperability.

Cooperation instruments include structured policy dialogues, memoranda of understanding, joint research and innovation calls, capacity-building schemes, infrastructure-sharing arrangements and implementation-oriented platforms such as twinning initiatives and thematic working groups. Additionally, digital intelligence tools—such as SPIDERHUB—introduce new possibilities for dynamic monitoring and evidence-informed coordination.

A key opportunity emerges in combining these tools modularly. Policy dialogues can be connected to pilot implementation tracks; infrastructure access can be paired with institutional capacity-building; and monitoring mechanisms can be embedded into cooperation instruments from the outset to support traceability and learning. Such articulation enables cooperation pathways that are incremental, implementable and sustainable.

7.2. Relevant Actors

EU–LAC cooperation in digital transformation is shaped by a multi-actor landscape in which political, technical, academic and societal capacities interact.

Government ministries and regional institutions provide mandate and strategic direction. Research-performing organisations, universities and innovation agencies contribute scientific capability and applied innovation. National Research and Education Networks serve as technical integrators and trusted intermediaries, enabling infrastructure access and cross-border collaboration. The private sector can support scalability and innovation

uptake, while civil society organisations contribute legitimacy, inclusion and contextual grounding.

The opportunity lies in **strengthening coordination** across these actors, particularly by ensuring that technical implementers and knowledge institutions are engaged early in cooperation design, and that inclusion-oriented actors have structured participation beyond consultative roles. Forums such as the DIF demonstrate potential to support this articulation by offering a space where policy priorities, institutional capacity and implementation mechanisms can be aligned.

7.3. Synergies

A central opportunity identified through SPIDER's work are latent synergies across thematic priorities, infrastructure assets and institutional mechanisms.

Thematic convergence across areas such as artificial intelligence, cybersecurity, cloud computing and virtual research environments suggests scope for targeted cooperation tracks that combine governance alignment with practical implementation.

Infrastructure synergies—particularly those involving BELLA and the NREN ecosystem—create favourable conditions for scaling collaborative research, enabling data-intensive cooperation and supporting interoperable service models across regions.

Institutional synergies are also emerging. The combination of dialogue mechanisms, implementation-oriented programmes (such as twinning), and participatory structures (such as communities of practice) provides pathways for building institutional memory and continuity. The integration of SPIDERHUB further enhances this architecture by enabling cooperation to be monitored and analysed as a dynamic ecosystem, rather than as a collection of static agreements.

Taken together, these synergies indicate that the conditions for strengthened cooperation are already present. The core opportunity moving forward lies in structuring and connecting these elements more coherently, so that cooperation can evolve from episodic engagement to sustained, evidence-informed collaboration.

8. LESSONS FOR DIGITAL COOPERATION

The implementation of SPIDER, examined through the results (Section 4), the analytical interpretation of those results (Section 5), the current cooperation dynamics (Section 6) and the identified opportunities (Section 7), allows for the distillation of a set of structural lessons for EU–LAC digital cooperation. These lessons do not introduce new concepts; rather, they synthesise recurring patterns observed across strategic vision, policy mapping, infrastructure assessment, institutional experimentation and digital intelligence deployment. Together, they provide the conceptual and operational foundation for strengthening future cooperation within the objectives of SPIDER.

A first structural lesson is that digital cooperation requires institutional anchoring beyond political commitment. Thematic convergence between the EU and LAC is evident in artificial intelligence, cybersecurity, cloud computing and digital infrastructure. The mapping exercise revealed, however, that strategic alignment alone does not ensure continuity. Sustainable cooperation emerges when dialogue outcomes are embedded in structured coordination mechanisms, designated institutional roles and iterative follow-up processes. Cooperation must therefore move from declarative alignment to operational architecture.

Second, infrastructure is a strategic enabler, but not an automatic driver of collaboration. The BELLA assessment confirmed the existence of a robust intercontinental connectivity

backbone with transformative potential. However, it also highlighted awareness gaps, uneven institutional integration and governance ambiguities. Infrastructure becomes impactful only when aligned with policy frameworks, user communities and capacity-building efforts. Connectivity must therefore be coupled with governance and institutional readiness.

Third, digital cooperation functions most effectively as a multi-actor ecosystem. Across the DIF, Twinning Programme and Communities of Practice, it became evident that governments, research-performing organisations, NRENs, innovation hubs, private-sector actors and civil society each contribute complementary capacities. Structured co-creation formats reduce asymmetries, strengthen trust and enable contextual adaptation. Cooperation is most resilient when it is ecosystemic rather than transactional.

Fourth, monitoring frameworks must capture relational and qualitative dimensions. Traditional quantitative metrics alone proved insufficient to assess cooperation quality, inclusiveness and institutional alignment. SPIDER's qualitative indicator framework and the development of SPIDERHUB demonstrated how digital intelligence tools can enhance transparency, traceability and adaptive learning. Monitoring, when embedded from the outset, becomes a governance instrument rather than a retrospective assessment tool.

Fifth, scalability depends on structured synergies. The project revealed that many cooperation elements—dialogues, infrastructure assets, funding instruments and institutional networks—already exist but often operate in parallel. Greater articulation between these components enables continuity and amplifies impact. Linking policy dialogues with implementation tracks, infrastructure access with capacity-building, and monitoring systems with governance mechanisms strengthens coherence across cooperation layers.

Finally, reciprocity-based institutional exchange reduces structural asymmetries and fosters sustainable engagement. The Twinning Programme illustrated that peer-based strengthening, rather than one-directional transfer, generates deeper institutional ownership and longer-term collaboration. Mutual capacity development enhances confidence, adaptability and shared responsibility.

Taken together, these lessons indicate that effective EU–LAC digital cooperation is not constrained by a lack of ambition or thematic alignment. Rather, its sustainability depends on institutional structuring, infrastructure integration, inclusive participation, qualitative monitoring and adaptive governance. These pillars frame the pathway through which cooperation can evolve from episodic engagement to structured, scalable and human-centred collaboration, in line with SPIDER's strategic objectives.

9. KEY GUIDELINES for Human-Centred and Sustainable EU-LAC Digital Cooperation

This section distils the principal recommendations arising from the co-creation process undertaken by the SPIDER project. These guidelines aim to translate the project's conceptual and empirical findings into actionable principles to support inclusive, effective, and sustainable digital cooperation between the European Union (EU) and Latin America and the Caribbean (LAC).

Each guideline is grounded in the evidence generated through key SPIDER outputs: the Conceptual Framework, the Mapping of Digital Cooperation and the Bella Survey. This guiding instrument has been complemented and reinforced with other results of the cooperation project and with the Sustainable Development Goals (SDGs).

9.1. Guideline 1: Align Digital Cooperation

Description of the Guideline

Digital cooperation between the European Union (EU) and Latin America and the Caribbean (LAC) has reached a decisive moment. The accumulated political dialogue, strategic declarations and thematic convergence should evolve into structured and operational implementation.

Analysis of regional agendas reveals a critical convergence of priorities. The European Union seeks to consolidate an open and competitive model of digital sovereignty, grounded in regulatory capacity, technological leadership, and industrial competitiveness. Meanwhile, the LAC region increasingly positions digital transformation as a lever for productive diversification, institutional strengthening, and inclusive economic growth. This strategic complementarity provides fertile ground for a more structured and mutually beneficial cooperation framework.

This guideline establishes that digital cooperation initiatives should be conceived at the intersection of these two strategic visions. Cooperation should not be limited to technology transfer or isolated projects; rather, it should foster the co-creation of digital value chains, knowledge ecosystems, and shared governance models.

Within this framework, the BELLA infrastructure constitutes a critical enabling asset. Beyond its physical interconnectivity function, BELLA supports the practical deployment of a human-centred digital transformation model. Such a model would safeguard fundamental rights, promote environmental sustainability, and strengthen technological autonomy in both regions.

Aligning cooperation with shared strategic priorities ensures that initiatives are not fragmented or opportunistic but embedded within long-term institutional commitments and measurable development objectives.

Key Actions

1. Prioritise investment in areas of strategic convergence

Human and financial resources should be directed towards domains where European technological capabilities and LAC structural demands intersect. These include, for example:

- High-Performance Computing (HPC), cybersecurity, and ethical AI development, including preparedness for emerging risks such as those associated with quantum computing and future encryption challenges.
- Productivity enhancement for micro, small and medium-sized enterprises (MSMEs),
- Public sector modernisation and digital government,
- Sustainable agriculture and climate-related digital applications.

2. Operationalise shared digital infrastructure

Existing infrastructure should be actively leveraged to support federated and interoperable data spaces between the EU and LAC. Initiatives inspired by distributed infrastructure models, such as ResInfra or SCALAC, demonstrate how geographically dispersed capacities can operate under shared governance and interoperability principles.

Encouraging local and collaborative data processing through HPC and trusted research environments enables both regions to retain the added value of data, enhance digital autonomy, and reduce excessive dependency on external providers. Infrastructure should therefore be understood not merely as connectivity, but as a strategic platform for joint innovation and digital sovereignty.

3. Implementation Instruments

Strategic alignment requires structured tools capable of sustaining coordination over time. The following instruments contribute directly to this objective:

- Data Intelligence (SPIDERHUB Platform): Institutionalise the use of centralised repositories, such as SPIDERHUB,to systematically map existing agreements, ongoing projects and thematic priorities. This approach enhances budget efficiency, strengthens strategic synergies, and ensures that new initiatives build upon previous achievements rather than duplicating efforts.
- Twinning Programme: Adopt structured collaboration frameworks, such as the Twinning Programme (standardised Memoranda of Understanding combined with Action Plans), to connect innovation ecosystems, including Digital Innovation Hubs, across both regions. These frameworks facilitate start-up soft-landing pathways, promote reciprocal knowledge exchange, and accelerate balanced technology transfer.
- Digital Dialogues Implementation Forum (DIF): Sustain multi-actor coordination spaces that enable continuous governance and inclusive participation. By actively engaging civil society, academia, public authorities and the private sector, the DIF helps ensure that digital transformation remains human-centred and socially grounded, rather than driven exclusively by market dynamics or state intervention.

9.2. Guideline 2: Institutionalise Human-Centred Design Principles

Description of the Guideline

This guideline calls for the institutionalisation of human-centred design principles not merely as an ethical imperative, but as a strategic competitive advantage within the broader socio-political process aligned with fundamental rights.

Embedding fairness, transparency and accountability into the architecture of digital systems from the outset is essential to building the public trust required for the responsible and informed adoption of emerging technologies, including artificial intelligence. When digital solutions are designed around people's rights, needs and lived realities, social resistance is reduced, institutional legitimacy is strengthened, and long-term infrastructure investments become more sustainable.

Digital cooperation must go beyond technical interoperability and prioritise equity, accessibility, and ethical standards. Apply ethical-by-design approaches that incorporate privacy, transparency, user agency, and meaningful human oversight, with specific attention to gender, disability, geographical diversity, and the linguistic and cultural contexts in which AI systems operate. Cooperation should encourage multilingual and culturally responsive AI systems, including multimodal applications, that are trained and assessed in ways that reduce bias and reflect the realities of EU–LAC societies.

Key Actions

To ensure that digital cooperation genuinely responds to the structural needs of society, institutions engaged in EU–LAC collaboration should formally embed Ethics-by-Design and Equity-by-Design approaches across all phases of cooperation initiatives.

- Funding conditionality plays a central role in this regard. Digitally funded projects should demonstrate a measurable contribution to reducing structural inequalities and advancing sustainable development objectives. Alignment should be ensured with SDG 9 (Industry, Innovation and Infrastructure), SDG 10 (Reduced Inequalities), and SDG 17 (Partnerships for the Goals). Social impact criteria should form part of eligibility requirements and evaluation processes.

- Guaranteeing agency and sovereignty is equally critical. Digital systems developed within the EU–LAC framework should reinforce the capacity of both individuals and states to exercise meaningful decision-making authority. This entails ensuring effective control over data, transparency in automated decision-making processes, and safeguards against extractive practices that create technological dependency or undermine autonomy. Human-centred cooperation must strengthen digital sovereignty while fully respecting fundamental rights.
- Inclusion must be embedded from the outset. Diversity — including gender, geography, linguistic and cultural contexts, socio-economic background, disability and accessibility considerations — should function as a core design parameter rather than an ex-post adjustment. Proactive mitigation of algorithmic bias and discriminatory outcomes must occur at the earliest stages of system architecture and programming, where foundational design choices are made.

Tools for Implementation

The operationalisation of this guideline can be supported through recognised governance instruments and, where appropriate, mandatory compliance mechanisms.

- Ethical and social impact assessments should be systematically integrated into projects involving artificial intelligence and large-scale data processing. These assessments should not be limited to formal compliance exercises but should function as substantive tools for evaluating societal implications, human rights risks and long-term sustainability. Their use may be linked to funding eligibility and ongoing monitoring.
- Regulatory sandboxes provide an additional mechanism for responsible innovation. By institutionalising controlled experimental environments, policymakers and stakeholders can test regulatory approaches related to AI, data protection and digital governance before full-scale implementation. Such environments enable experimentation while safeguarding rights and reinforcing public trust.
- Robust data ownership protocols and Data Processing Agreements (DPAs) are essential for governing cross-border data flows. Clear definitions of intellectual property, data governance structures and accountability mechanisms help ensure privacy, legal certainty and equitable interregional cooperation.
- Finally, Diversity, Equity and Inclusion (DEI) audits within technological consortia and research partnerships should be encouraged as a preventive governance instrument. Diverse development teams contribute to more robust, inclusive and socially responsive technological outcomes, reducing the risk of embedded bias and strengthening overall system legitimacy.

9.3. Guideline 3: Consolidating the Role of National Research and Education Networks (NRENs) as Strategic Orchestrators of the Digital Ecosystem

Description of the Guideline

This guideline proposes strengthening Research and Education Networks (RENs) and National Research and Education Networks (NRENs) — such as RedCLARA in Latin America and GÉANT in Europe — as orchestrators of the digital ecosystem, building on their technical capacity and their ability to articulate national science, technology and innovation ecosystems.

These networks constitute the historical backbone of science diplomacy and serve as a natural vehicle for connecting actors across the science, technology and innovation ecosystem. Their experience in secure interconnection, coordination and cross-border collaboration positions them as key facilitators of structured and sustainable digital cooperation.

Enhancing this role may contribute to reinforcing national digital capacities and strengthening EU–LAC cooperation in digital transformation.

Key Actions

Public policymakers and international organisations may consider empowering NRENs by repositioning them as strategic actors in the implementation of digital cooperation initiatives. This can be advanced through the following actions:

- Recognition within National Digital Agendas. Promote the recognition of NRENs within National Digital Agendas, not as isolated academic expenditure, but as enabling platforms contributing to data sovereignty, cybersecurity and the development of open science. Such recognition may strengthen their institutional position and align them more clearly with national digital priorities.
- Expansion of the Mandate towards Productive Innovation. Encourage flexible regulatory frameworks that allow NRENs to collaborate more effectively with the private sector, start-ups and Digital Innovation Hubs (DIHs). Reducing academic isolation and fostering interaction with industrial value chains can facilitate technology transfer and support innovation processes within the broader ICT ecosystem.
- Strategic Support in Reducing the Digital Divide. Promote institutional awareness initiatives targeting senior decision-makers — including rectors, ministers and agency directors — to illustrate how NREN value-added services address governance challenges and contribute to improving efficiency and return on investment in digital infrastructure.
- Science Diplomacy and International Cooperation. Leverage the technical capacity and coordinating role of NRENs to strengthen science diplomacy and consolidate international strategic alliances. Their participation can facilitate structured and sustainable cooperation frameworks that support national and bi-regional digital transformation efforts.

Tools for Implementation

The operationalisation of this integrative role may be supported through the following governance and management instruments:

- Sustainable Management Models. Encourage the evolution from traditional service-based management models towards approaches — supported by public commitment — that recognise the articulating role of NRENs within national STI and digital ecosystems. This shift may enhance strategic autonomy, institutional resilience and ecosystem coordination capacity.
- Scaling of Twinning Mechanisms. Build on the SPIDER experience by replicating and strengthening structured Twinning models that connect NRENs with European and Latin American Innovation Hubs. Such mechanisms can support technology transfer plans and the adoption of operational good practices.
- Open Science Catalytic Tools. Promote interoperable data repositories, research data platforms and satellite monitoring systems as instruments that support the resolution of shared structural challenges, such as climate change and productive heterogeneity. These tools may contribute to technological sovereignty and the democratisation of knowledge within national and bi-regional digital strategies.

9.4. Guideline 4: Consolidating Bridges between Political Vision and Operational Execution

Description of the Guideline

This guideline encourages strengthening the connection between political vision and operational execution by institutionalising permanent mechanisms of articulation between policymakers, regulators, digital infrastructure managers and technical implementers.

Establishing structured and continuous coordination frameworks can facilitate the translation of high-level political commitments into practical, scalable solutions. Solutions developed in one region may be integrated and adapted in the other with greater regulatory predictability, strategic coherence and implementation capacity, drawing on enabling infrastructures such as BELLA.

Consolidating these bridges contributes to more effective digital cooperation and enhances the capacity to transform diplomatic dialogue into tangible outcomes.

Key Actions

To maximise the impact of high-level digital diplomacy, multilateral organisations and public authorities are encouraged to promote a model of Permanent Operational Cooperation, integrating technical knowledge into the policy design cycle from its earliest stages. This may be advanced through the following actions:

- Strengthening Operational Coordination Actors. Promote the recognition and capacity-building of key coordinating organisations — such as NRENs, Digital Innovation Hubs and development agencies — that possess the ability to translate diplomatic agreements into technical solutions, business models and scalable territorial services. Reinforcing their role can help ensure that policy commitments are operationally viable and context sensitive.
- Institutionalising Continuous Feedback Mechanisms. Encourage the establishment of permanent feedback processes through which evidence generated during implementation — including infrastructure usage data, pilot project results and performance metrics — is systematically incorporated into policy review and adjustment cycles. Such mechanisms support the development of adaptive regulatory frameworks capable of evolving alongside technological innovation.
- Action-Oriented Targeted Capacity Building. Support practical training programmes focused on the use, application and optimisation of shared digital infrastructure. Strengthening local talent and operational capacities enables territorial actors to transform joint investments into concrete development and innovation opportunities.

Implementation Mechanisms

The operationalisation of this approach may be supported through complementary instruments designed to enhance agility, coordination and evidence-based policy alignment.

- Cascade Funding Mechanisms: Promote agile and smaller-scale funding schemes with simplified procedures that enable local actors, start-ups and micro, small and medium-sized enterprises (MSMEs) to access resources for proof-of-concept development and pilot solutions. These mechanisms can complement large consortia-based programmes and broaden ecosystem participation.
- Strengthening Structured Interregional Cooperation Mechanisms: Consolidate the model of peer-to-peer consortia as a sustained instrument of collaboration, allowing homologous entities from both regions to co-develop processes, transfer technology

and exchange operational best practices. This approach supports mutual learning, sustainable capacity-building and the effective implementation of commitments derived from digital dialogues within a balanced and long-term cooperation framework.

- Shared Experimental Environments (Regulatory Sandboxes): Encourage the development of bi-regional testing environments where innovative solutions can be assessed under agile regulatory supervision. Such sandboxes generate empirical evidence that may inform regulatory harmonisation and policy refinement.
- Multi-Actor Implementation Forums: Promote the institutionalisation of permanent working groups bringing together representatives from government, academia, civil society and industry to co-design and evaluate roadmaps supported by measurable Key Performance Indicators (KPIs). These forums can strengthen accountability, coordination and long-term policy coherence.

9.5. Guideline 5: Systemic Evaluation of Dialogue Outcomes and Agreements through a Structured Framework

Description of the Guideline

The SPIDER project has mapped more than 96 digital dialogues and over 60 multilateral agreements between the European Union and Latin America and the Caribbean, revealing a recurring gap between political commitments and their effective implementation. Traditionally, the evaluation of digital diplomacy has relied on administrative metrics — such as the number of meetings held or budgets executed — without systematically assessing its tangible impact on technological adoption, institutional strengthening or regulatory convergence.

To consolidate a bi-regional cooperation model grounded in evidence, it is advisable to implement a structured monitoring framework. Such a framework must be capable of evaluating the quality of interaction, the sustainability of initiatives and their contribution to the management of digital public goods. For example, beyond recording the occurrence of a dialogue on artificial intelligence, assessment mechanisms could consider whether it led to regulatory harmonisation, joint pilot projects or the adoption of ethical standards aligned with the Sustainable Development Goals (SDGs).

Strengthening impact-oriented evaluation contributes to greater policy coherence, transparency and long-term effectiveness in EU–LAC digital cooperation.

Key Actions

Advancing a comprehensive impact assessment approach may be supported through the following actions:

- Comprehensive Impact Measurement. Encourage a transition from compliance-based reporting towards qualitative indicators that assess structural effects. This may involve evaluating whether a cybersecurity agreement strengthened national capacities, or whether a 5G roadmap facilitated coordinated investments between regions.
- Cooperation Matrices and Operational Roadmaps. Promote the explicit link between political commitments and implementing actors — such as NRENs, ministries and digital innovation hubs — by defining responsibilities, timelines and verifiable indicators. A practical example could involve associating commitments under the EU–LAC Digital Alliance with concrete projects supported by enabling infrastructures such as BELLA.
- Multi-Actor Traceability and Transparency. Support open access to implementation information for academia, the private sector and civil society, thereby strengthening

legitimacy and institutional learning. Platforms such as SPIDERHUB illustrate how diplomatic declarations can be transformed into dynamic monitoring instruments.
- Harmonisation of Measurement Frameworks. Encourage convergence between European instruments — such as the Digital Economy and Society Index (DESI) — and Latin American frameworks — including the Digital Development Observatory of ECLAC and the eLAC goals — in order to facilitate comparability and establish a shared bi-regional evaluation language.

Tools and Implementation Mechanisms

Operationalising this monitoring approach may benefit from concrete institutional and technological instruments.

- Policy Intelligence Platforms. Promote the use of platforms such as SPIDERHUB to structure commitments, actors and implementation progress into interactive dashboards that enhance visibility and accountability.
- Collaborative Evaluation Spaces. Support the continued use of structured forums — such as the Digital Dialogues Implementation Forum (DIF) and its Working Groups — to conduct periodic reviews, assess progress and adjust strategic priorities where necessary.
- Standardised Qualitative Indicators. Encourage the adoption of qualitative indicators — such as those developed in the Concept Note (D1.1) and operationalised through SPIDERHUB — that assess sustainability, institutional ownership and scalability of initiatives derived from digital dialogues and agreements.

9.6. Guideline 6: Institutionalising Inclusive Co-creation and Multi-stakeholder Participation in Digital Governance

Description of the Guideline

Historically, digital policy design has operated under vertical (top-down) models, led primarily by the State and large technology providers. However, evidence gathered through the Digital Dialogues Implementation Forums (DIF) and the Working Groups of the SPIDER project suggests that initiatives disconnected from territorial realities tend to present lower levels of adoption, ownership and long-term sustainability.

Within the EU–LAC partnership, multi-sector participation may be understood as a democratic principle, and a mechanism for operational effectiveness. Institutionalising open innovation models can help ensure that digital solutions respond to concrete structural needs — such as rural connectivity, administrative interoperability or digital literacy — while integrating the cultural, linguistic and territorial diversity of both regions.

This approach reinforces a shared vision of people-centred digital transformation, aligned with the principles discussed within SPIDER and reflected in broader bi-regional frameworks.

Key Actions

Advancing structured co-creation and multi-actor engagement may be supported through the following actions:

- Promoting Co-Creation from the Design Phase. Encourage a shift from ex-post consultation models towards participatory processes from the outset of project design, drawing on the Quadruple Helix model (State, Industry, Academia and Civil Society). For example, universities, start-ups and civil society organisations could

be involved in the technical definition of AI or GovTech initiatives prior to deployment.

- Integrating Inclusion as a Quality Criterion for Investment. Cooperation instruments may incorporate Diversity, Equity and Inclusion (DEI) principles as part of their evaluation criteria, encouraging meaningful participation of local ecosystems and of those groups who will ultimately use the technology. Inclusion may thus be considered an indicator of quality and long-term sustainability.
- Fostering Diverse Leadership within Digital Ecosystems. Beyond user inclusion, initiatives may encourage the participation of women, emerging talent and regional actors in technical and decision-making roles. Strengthening diverse leadership contributes to local capacity-building and to addressing structural gaps, as highlighted in the SPIDER Working Groups on DEI and artificial intelligence.
- Strengthening the Articulating Role of NRENs. National Research and Education Networks may play a relevant role as neutral territorial coordination platforms. They can facilitate collaborative innovation processes and leverage their regional interconnectivity — such as the RedCLARA–GÉANT linkage — to support structured cooperation.

Implementation Mechanisms

The institutionalisation of co-creation may be reinforced through operational instruments that facilitate effective participation and ensure territorial relevance in technological development.

- Innovation Laboratories (Living Labs). One practical approach involves co-financing physical and virtual spaces where communities, researchers, start-ups and public authorities can adapt and test technologies prior to scaling. For example, validating agricultural AI solutions within specific rural territories or adapting digital identity platforms to local regulatory frameworks.
- Bi-Regional Communities of Practice (CoPs). The consolidation of permanent expert networks — such as those fostered through SPIDER — can facilitate methodological exchange, collaborative technology auditing (for example in ethical AI or cybersecurity), and the development of shared standards between the EU and LAC.
- Multi-Actor Consortia within Funding Instruments. Cooperation mechanisms may encourage plural consortia that include territorial actors, innovation hubs and civil society organisations, promoting local ownership and sustainability. This approach is particularly relevant for open GovTech projects or sector-specific digital transformation initiatives.
- Inclusive and Contextualised Technology Design. As a transversal principle, solutions developed within the cooperation framework may incorporate:
    - Culturally sensitive AI systems based on datasets representative of regional languages and realities.
    - Open and interoperable digital infrastructures that facilitate transparency and participation.
    - Accessibility standards (such as WCAG) and mobile optimisation, particularly relevant in contexts marked by connectivity gaps.

The combination of these mechanisms supports the transition from open innovation as a declarative principle to a structured practice that enhances adoption, scalability, and social impact in EU–LAC digital cooperation.

9.7. Guideline 7: Promoting and Democratising the Sustainable Use of Shared Digital Infrastructure (BELLA Network)

Description of the Guideline

Bi-regional connectivity has reached a historic milestone with the deployment of the BELLA submarine cable (Building the Europe Link to Latin America). This high-capacity, secure infrastructure represents a foundational asset for the technological sovereignty of both regions. However, ecosystem analysis reveals a critical optimisation opportunity: while a world-class infrastructure is in place, its adoption beyond a strictly academic niche remains limited, constraining its transformative macroeconomic impact.

Within the framework of the "Twin Transition" (Digital and Green) promoted by the EU and LAC, infrastructures such as BELLA may consolidate their role as indispensable physical enablers of transatlantic data sovereignty, critical information processing for climate resilience, and the development of advanced technological value chains. Moving from connectivity provision towards the creation of innovation ecosystems — ensuring meaningful and impact-oriented connectivity — can maximise return on investment (ROI) while strengthening bi-regional collaboration and competitiveness.

Key Actions

Key organisations within the digital cooperation ecosystem are encouraged to prioritise the effective use of shared infrastructure resources through systematic identification, strategic openness and long-term sustainability considerations. Catalysing the use of BELLA may foster synergistic bi-regional collaboration between public institutions, productive sectors and academia, optimising regional technological capacities for shared development.

- Promoting Access for Relevant Productive-Sector Actors. Encourage the linkage of productive-sector stakeholders through authorised intermediaries — such as Digital Innovation Hubs (DIHs) — enabling entrepreneurship ecosystems, start-ups and micro, small and medium-sized enterprises (MSMEs) to access BELLA's capacity for high-impact pilot development and technology transfer initiatives.
- Aligning Infrastructure with the Green Transition. Promote the alignment of network usage and data-intensive processing with carbon neutrality objectives, including the European Green Deal and regional sustainability frameworks such as SELA and eLAC. Data centres and infrastructure connected through BELLA may be encouraged to operate under high standards of energy efficiency and renewable energy integration.
- Demonstrating Public Value through Strategic Use Cases. Foster the development of tangible "use cases" that demonstrate to decision-makers how BELLA's performance and security capabilities address critical challenges in strategic vertical sectors such as public health, smart agriculture and emergency management. Visibility of applied impact may strengthen political support and accelerate adoption.

Implementation Mechanisms

Operationalising the social and economic value of shared digital infrastructure may be supported through the following mechanisms:

- Technological Matchmaking Platforms. Develop institutional tools capable of directly connecting local industry demand for data processing with the installed capacity available within National Research and Education Networks (NRENs) through BELLA.

Such platforms may facilitate structured collaboration and improve resource utilisation.

- Integration with Open Science Clouds. Promote the federation of Latin American data-hosting platforms with the European Open Science Cloud (EOSC). This federation would contribute to the development of a sovereign ecosystem in which researchers and public institutions can manage critical data without dependency on external commercial providers.
- Micro-Projects and Demonstration Pilots. Encourage the deployment of agile funding instruments — such as cascade funding mechanisms — aimed at co-financing small-scale projects that actively utilise BELLA's network capabilities. Such pilots may accelerate adoption while generating short-term evidence of impact.
- Federated Identity Management (e.g., eduGAIN). Promote the institutionalisation of federated credential systems to reduce bureaucratic friction and enable secure, seamless access for authorised users to shared transatlantic resources. This may enhance usability while maintaining robust security standards

9.8. Guideline 8: Mapping and Capitalising on Technological and Commercial Exploitation Opportunities

Description of the Guidelines

Across the SPIDER project, a consistent pattern emerges: cooperation is effective at generating knowledge and piloting solutions, but less so at ensuring their uptake beyond the project lifecycle. Many initiatives produce valuable results, yet these do not always translate into real-world applications, whether in the market or in public services.

This gap is visible in the mapping of agreements, where references to key technologies are common, but concrete pathways for implementation and use are often missing. A similar dynamic appears in the case of the BELLA infrastructure: although its relevance is widely recognised, its capabilities are not always fully understood or used by potential stakeholders.

These findings point to the need for a stronger focus on how cooperation outcomes are actually used. This involves connecting innovation with concrete demand, supporting technology transfer, and ensuring that results can move beyond project environments into sustained application.

Key Actions

- Integrate exploitation pathways into cooperation design: Ensure that initiatives consider from the outset how results can be adopted, scaled, or transferred, addressing the implementation gaps identified in existing agreements.
- Align innovation with real demand: Promote approaches that identify the needs of industry, public administrations, and end-users early in the process, responding to the disconnect between available capacities and their actual use.
- Facilitate technology transfer and adaptation: Support the application of technologies to specific regional contexts, building on experiences such as the Twinning activities, where collaboration was more closely linked to practical use cases.
- Improve visibility of ecosystem capabilities: Strengthen the mapping and communication of available services, infrastructure, and expertise—particularly those linked to BELLA and NRENs—to enable broader uptake.

Implementation Mechanisms

- Digital Innovation Hubs and Twinning-based approaches: Use these structures to bring research outputs closer to local ecosystems, particularly SMEs, through testing, validation, and training activities.
- Matchmaking and intelligence platforms (e.g. SPIDERHUB): Support tools that connect supply (research, infrastructure, expertise) with demand (companies, public sector needs), enabling more targeted collaboration.
- Flexible collaboration and IP frameworks: Facilitate joint development and use of results across regions by reducing administrative and legal barriers to cooperation.

9.9. Guideline 9: Driving Regulatory Convergence and Harmonisation of Digital Standards

Description of the guideline

The SPIDER analysis shows that while EU–LAC cooperation is well aligned at the strategic level, differences in regulatory frameworks continue to limit its practical implementation. Variations in data governance, digital services regulation, and emerging technology standards can create uncertainty, slow down collaboration, and restrict the cross-border use of digital solutions.

At the same time, discussions within the Digital Dialogues Implementation Forum and its working groups highlight a shared commitment to principles such as privacy, security, and human-centric digital governance. This creates a strong basis for convergence, not through full harmonisation, but through the development of interoperable frameworks that allow systems, services, and policies to work together across regions.

Strengthening interoperability is key to enabling cooperation outcomes—whether research results, digital services, or infrastructure-based applications—to move more easily between the EU and LAC contexts.

Key Actions

- Strengthen structured regulatory dialogue: Support continuous exchange between EU and LAC regulatory bodies to align approaches in areas such as artificial intelligence, data governance, and digital services, building on the role of platforms such as the Digital Dialogues Implementation Forum.
- Promote the use of common and open standards: Encourage the adoption of internationally recognised technical standards that facilitate interoperability, reduce dependency on specific providers, and support the integration of infrastructures such as BELLA.
- Advance interoperability of trust frameworks: Support the development of compatible systems for digital identity, electronic signatures, and data protection, enabling secure cross-border interactions for citizens, researchers, and businesses.
- Focus on priority areas of regulatory friction: Pay particular attention to domains where differences have a stronger impact on cooperation, such as AI governance, cross-border data flows, and cybersecurity coordination.

Implementation Mechanisms

- Technical working groups and regulatory dialogues (e.g. DIF): Use existing cooperation spaces to discuss, adapt, and align regulatory approaches, drawing on both EU experience and LAC institutional contexts.

- Regulatory sandboxes and policy labs: Create environments where new regulatory approaches can be tested in practice, allowing for gradual alignment based on evidence and shared learning.
- Capacity building and expert exchange: Support training and exchange programmes for regulators and policymakers to strengthen institutional capacity and facilitate mutual understanding of different regulatory systems.

9.10. Closing Remarks on the Guidelines

The guidelines presented in this document should be understood not as isolated recommendations, but as interconnected elements of a broader approach to strengthening EU–LAC digital cooperation. Each guideline addresses a specific dimension—ranging from governance and infrastructure to regulation, capacity, and innovation—yet their effectiveness depends on how they are implemented in combination.

Taken together, they reflect a shift in perspective: from viewing cooperation as a set of discrete initiatives toward understanding it as a coordinated and evolving system. This implies greater attention to how policies, institutions, and infrastructures interact, as well as to the conditions that enable collaboration to move from alignment to sustained impact.

Figure 20 presents the operational guidelines through three complementary axes: Strategy and Governance, Ecosystem and Infrastructure, and Implementation and Impact. Together, these three axes provide a more accessible reading of the framework without reducing its systemic character. This visual organisation helps to clarify how the guidelines move from strategic alignment and regulatory orientation to the enabling role of infrastructures and ecosystem actors, and finally to the practical conditions required for inclusive and measurable implementation. By grouping the recommendations in this way, the figure makes evident that effective EU–LAC digital cooperation depends not on isolated actions, but on the articulation of governance, capacity, and impact within a coherent operational logic.

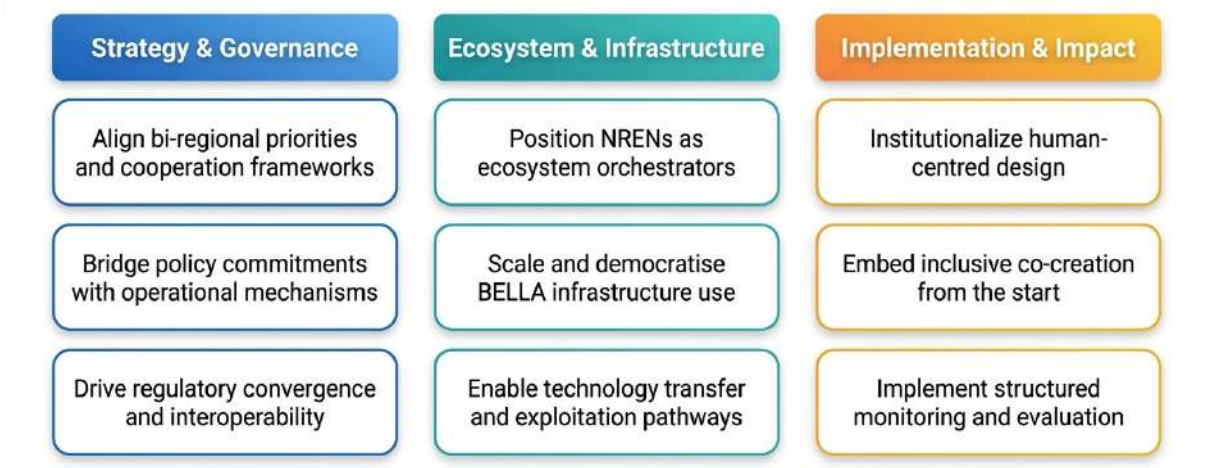

Figure 19. Operational Guidelines

At the same time, the diversity of contexts across the EU and LAC regions means that these guidelines are not intended as fixed models, but as a flexible framework that can be adapted to different institutional realities and strategic priorities. Their value lies in providing orientation while allowing for contextualisation, experimentation, and learning.

The guidelines offer a structured basis for advancing digital cooperation in a way that is more coherent, inclusive, and responsive to emerging challenges. The following section

builds on this foundation by reflecting on their broader implications and the pathways through which they may support the long-term evolution of the EU–LAC digital partnership.

10. CONCLUSIONS

The Guidelines for EU–LAC Digital Cooperation mark an important step in strengthening the digital partnership between the European Union and Latin America and the Caribbean. At a time when both regions share a clear strategic vision, the challenge is no longer defining priorities, but making cooperation work in practice, consistently, effectively, and at scale. The SPIDER process makes clear that the issue is not a lack of initiatives, but the difficulty of connecting what already exists into a system that delivers tangible results.

Across the project, a strong common ground is evident. Both regions approach digital transformation through a values-based lens, shaped by commitments to inclusion, human rights, sustainability, and technological sovereignty. This alignment is visible both in political discourse, and in the convergence around key technological areas such as Artificial Intelligence, 5G, Cloud Computing, Cybersecurity, Blockchain, and Virtual Research Environments. These shared priorities provide a solid basis for collaboration.

Yet alignment alone has not been enough. The analysis of digital dialogues and agreements shows a recurring pattern: many initiatives are well defined at the strategic level, but less developed when it comes to implementation. The missing link is often not ambition, but coordination in terms of clear roles, sustained mechanisms, and the ability to move from agreement to action. The challenge is less about creating new frameworks and more about making existing ones work together.

The experience of the SPIDER project offers useful insight into how cooperation could evolve. The SPIDER project brings together the knowledge platform SPIDERHUB, the connectivity infrastructure BELLA, and the coordination space Digital Dialogues Implementation Forum. In doing so, the project illustrates what a more integrated cooperation architecture might look like. At the same time, it also shows that building such an architecture is an ongoing process, where alignment between components still needs to be strengthened.

The case of the BELLA infrastructure is particularly illustrative. Its strategic importance is widely recognised, yet its use does not fully reflect its potential. This gap points to factors that go beyond technology: awareness, governance, institutional capacity. These factors will ultimately determine how infrastructure is used and by whom. The existing gap highlights a broader point: connectivity creates opportunity, but impact depends on how that opportunity is taken up.

Similar lessons emerge from the cooperation mechanisms developed within the project. Initiatives such as the Twinning Programme and the Digital Dialogues Implementation Forum show that collaboration becomes more meaningful when it is grounded in shared interests and sustained interaction. What makes the difference is not only the existence of partnerships, but the quality and continuity of the relationships that support them.

The EU–LAC digital cooperation appears therefore less as a fixed structure and more as a system in evolution. It is shaped by interactions, by the capacity to adapt, and by the strength of the connections between actors and institutions. The growing use of qualitative monitoring approaches reflects this shift, recognising that cooperation is about measurable outputs, as much as about trust, alignment, and the ability to learn over time.

The guidelines presented in this document are not intended as isolated solutions, but to bring greater coherence to an already rich ecosystem. They reflect a move away from fragmented efforts toward a more connected, adaptive, and collaborative approach to digital cooperation.

Digital cooperation should go beyond technical interoperability and prioritise equity, accessibility, and ethical standards. It should apply ethical-by-design approaches that incorporate privacy, transparency, user agency, and meaningful human oversight, with specific attention to gender, disability, geographical diversity, and the linguistic and cultural contexts in which AI systems operate. Cooperation should encourage multilingual and culturally responsive AI systems, including multimodal applications that are trained and assessed to reduce bias and reflect the realities of EU–LAC societies, while also addressing structural asymmetries in access to infrastructure, data, skills, and resources that may widen the AI divide between regions.

Ultimately, the SPIDER project shows that the foundations for a strong EU–LAC digital partnership are already in place. What lies ahead is the task of making those foundations work together so that cooperation is not only well intentioned, but also effective, inclusive, and lasting.

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