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# TECHNICAL ANNEX

# Excellence in S&T and Networking

# Main challenge

The Action will establish a cross-border network of professionals from economics, business, computer

and information sciences, mathematics, law, information engineering and statistics, focusing on solving the main hurdles of integrating AI systems into the different functions of finance. The main goal is to develop a collaborative platform that produces AI-driven, robust, explainable and sustainable systems that will support the digital transformation of finance. Currently, there exists a significant gap between the theoretical possibilities of AI-based systems and the actual feasibility of implementing these capabilities in real-world scenarios in finance. While numerous researchers have established the

effectiveness of AI-based systems across diverse predictive tasks [10], there remains a critical need for research focused on identifying and addressing the key barriers hindering their widespread adoption in real-world financial use cases. Addressing these barriers will lead to sustained and expansive impacts in finance, ensuring a green and digital transition. Specifically, through joint international efforts and interdisciplinary expertise, the Action will address hurdles related with the different stages of building and deploying AI-based systems. In order to ensure that all dimensions of data quality are satisfied, the Action will: develop a comprehensive data quality assessment framework, establish a unified data privacy framework for financial applications, and identify effective methods for assessing and mitigating biases in large financial datasets. Looking at the model deployment hurdles, the Action will: prototype and deploy end-to-end generative AI use cases in finance, propose guidelines for sensitive financial data processing by AI models, introduce novel metrics for evaluating the utility of LLMs for financial market prediction, and run an assessment of their suitability for portfolio optimization and risk management. For achieving a suitable level of explainability and trust in deployed AI systems, the Action will: evaluate existing XAI tools, propose novel finance-specific XAI methods, train and test strategies for preventing socially-biased outcomes in AI-based risk management systems, and research real-time solutions for reducing latency in AI explanations. Finally, to ensure a data-driven assessment of sustainability, the Action will: create a real-time, data-driven ESG scoring model integrating sentiment analysis, document methods for effective dissemination (via open-source tools and policy recommendations), and conduct a comparative analysis of data-driven ESG measurement techniques, including the utilization of LLMs for enhanced sustainability assessments and regulatory oversight.

The ultimate goal of the Action is to blend diverse expertise that allows us to optimally use high- dimensional data and state-of-the-art AI systems to push forward the digitalization of the functions of

finance in a sustainable way. Emerging AI technologies, distinct from conventional methods, present clear benefits for the financial sector. The effectiveness of these methods will be measured and contextualised in terms of their practicality and the challenges of real-world implementation. While the focus is on financial applications, the outcomes will be applicable to wider fields, and efforts will be made to share insights across different industry domains.

# Objectives

Research Coordination Objectives.

The scientific progress will be pursued by capitalising on the COST research coordination tools. The

specific objectives in this respect are shown below.

RC1. Unified Data Protection Framework (WG1): Develop a common framework and definitions for data privacy methods, specifically focused on differential privacy and federated learning techniques.

RC2. Data Sourcing Standardization for LLM (WG2): Coordinate the collection and curation of financial datasets, and establish a standard set of performance metrics specifically for Transformer Neural Networks used in portfolio optimization and risk management.

RC3. Harmonized Protocols for XAI (WG3): Develop standardized protocols for experimentation and data collection XAI, focused on non-perturbative XAI methods applicable to financial time-series data.

RC4. Comparative Assessment of ESG Measurement (WG4): Conduct a comparative analysis of data-driven ESG techniques, including the use of LLMs for sentiment and news analysis.

RC5. Shared Resource Portal (All WGs): Establish a centralized digital portal where resources like datasets, software tools, and methodological guidelines can be shared across all WGs to accelerate research in data-driven processes, generative AI, XAI, and sustainable digital finance.

RC6. International Coordination for Fairness Models (WG1): Coordinate with international bodies and standardization agencies, e.g. ISO or IEEE, to establish guidelines that ensure fairness and data

protection in financial algorithms, leveraging differential privacy and federated learning methodologies.

RC7. International Stakeholder Input for Algorithmic Bias Mitigation (WG3): Engage with international policymakers and regulatory bodies, as well as business and consumer organizations (European Microfinance Network, The European Consumers Organisation, BEUC and Eurofinas (European consumer credit industry)), to translate the WG's findings on algorithmic bias mitigation into actionable policies. This will involve organizing international workshops and conferences, and developing harmonized guidelines to ensure fairness and prevent discrimination in financial AI systems.

RC8. Tangible Output for Real-Time ESG Scoring (WG4): Develop a real-time, data-driven ESG scoring model aligned with recent EU policies that leverages sentiment analysis and other language model-based techniques. Share the model as an open-source tool globally, and engage with stakeholders and regulatory bodies internationally to promote standardized ESG assessment practices in finance. Collaborate with international partners to validate and adapt the model for different markets and regulatory environments.

RC9. Comprehensive Dissemination and Public Engagement Strategy (All WGs): Develop and implement a coordinated dissemination strategy to share the Action's research results with the public, industry stakeholders, policymakers, and academic communities. This will involve publishing findings in open-access journals, presenting at international conferences, organizing public workshops and webinars, creating policy briefs, and collaborating with media outlets to promote awareness and understanding of the research outcomes across different countries.

Capacity-building Objectives

The focus of capacity-building goals, achieved through the facilitation of knowledge exchange and

collaborative research agenda development, will be centred around the following subject areas:

CB1. Joint Research Agenda on Data Protection (D1): Conduct at least three joint workshops between legal experts, data scientists, and policymakers from at least five different countries to develop data privacy guidelines.

CB2: Interdisciplinary Collaboration for Fairness in Financial Algorithms (D2, D9): Bridge the gap between ethics, data science, and finance to facilitate interdisciplinary research aimed at fairness models and algorithmic bias mitigation in financial algorithms, with at least three joint workshops.

CB3. Young Researchers in Federated Learning (D3): Engage at least 20 young researchers and innovators for the report on federated learning techniques and protocols, building their capacity.

CB4. Stakeholder Platform for Generative AI in Finance (D4, D5, D6): Establish a stakeholder platform involving at least 10 financial institutions and regulators from different countries to facilitate the adoption of Generative AI in finance.

CB5. Inclusive XAI Methods (D7, D8): Involve at least 30% participation from under-represented genders and teams from countries/regions with less capacity in the field to contribute to the development of scalable XAI methods and transparent Transformer Neural Networks.

CB6. Sustainability Focus in Digital Finance (D10, D11, D12): Develop a joint research agenda that includes environmental scientists, financial analysts, and data scientists to advance sustainable digital finance, particularly in ESG sentiment analysis and scoring models, with at least five workshops. CB7. Comprehensive Capacity-building Through Overall Action Deliverables (D13-D19): Utilize the online presence, data collection, publication plan, training materials, and gender balance reports, with at least 200 participants accessing training materials, and track engagement metrics.

# State-of-the-art

The Action will develop a research framework that addresses the key challenges associated with integrating advanced digital technologies in the finance sector in a sustainable way. The Action will drive forward the digitalization of finance while ensuring that core European policy objectives, such as consumer and investor protection, fair competition and stability and the sustainability goals of the European Union, continue to be met throughout the digital transformation of the financial sector.

In recent years, we have seen the emergence of new technologies, products and business models at an unprecedented speed, all summarised under the label Digital Finance. The digitalisation of the financial industry holds great promise. It offers the opportunity to make quick and cost-effective payments, enable the development of innovative financial products and services and allow wider access to financial services thus incorporating previously unbanked areas. Put simply, digital technologies are expected to fundamentally transform the financial service industry. Some examples of the practitioners’ perspective in terms of the topic’s relevance come from an extensive analysis done by the World Economic Forum (WEF) in [1], which provides a comprehensive picture of how digital technologies are applied in financial services. The study finds that: ● 77% of practitioners anticipate innovative technologies to possess high or very high overall importance to their businesses in the future ● Approximately 64% of practitioners anticipate employing innovative digital technologies in all of the following categories – generating new revenue potential through new products and processes, process automation, risk management, customer service and client acquisition

● Overwhelmingly, practitioners expect that digital technologies will become a key success factor for specific financial service sectors However, the rapid adoption of these technologies has highlighted significant data protection and fairness issues in finance. For instance, the increasing use of big data analytics and AI has raised concerns about the privacy of sensitive financial information and potential biases in automated decision-making systems. Data breaches, such as the 2019 Capital One hack affecting over 100 million customers, have underscored vulnerabilities in data protection practices. Algorithmic biases in credit scoring systems have led to discriminatory lending practices, disproportionately affecting minority groups. Studies have shown that AI models trained on historical data can perpetuate existing biases, leading to unfair loan denials or unfavorable interest rates for certain demographics. Moreover, inconsistencies in data protection regulations across regions create challenges for multinational financial institutions in maintaining compliance when using data-driven technologies.

Also, the fast adoption of innovative technologies in finance poses challenges and risks, encompassing legal issues like disclosure and oversight of transactions, technology-related concerns such as poor data quality due to data silos and inconsistent data formats, protection and privacy issues arising from large-scale data processing, lack of sufficient explainability in AI algorithms, algorithmic bias, and inconsistency in ESG assessment methodologies.

The European Commission has taken steps in addressing some challenges through GDPR, CSRD, SFDR, the European Commission’s AI strategies [2, 3], The European blockchain strategy [4], the European Strategy for data [5] and the digital finance package [6]. These issues align with the UN Sustainable Development Goals [7] and are increasingly relevant for financial service companies, as per the WEF study in [1]. To this point, this study finds that: ● 91% of the surveyed practitioners consider data quality issues to be a key hurdle to deploying innovative digital technologies like machine learning in practice ● 64% of practitioners consider deficits in trust and user adoption to be another major hindrance of the adoption of digital technologies in finance ● Complex models are often developed and evaluated within closed environments which do not match the conditions of real-world applications ● Firms are particularly wary of the potential for complex models to have biases in decision-making.

Current applications of generative AI in finance include the use of Generative Adversarial Networks for fraud detection by generating synthetic fraudulent transactions to train detection models, and Natural Language Processing techniques for automated report generation and sentiment analysis. However, these applications face pitfalls such as data privacy concerns when handling sensitive financial information, the potential for generative models to produce misleading or biased outputs, and challenges in integrating AI systems with existing legacy infrastructures. Additionally, regulatory compliance remains a significant hurdle due to the lack of clear guidelines on the use of AI in financial services.

With this gap between the theoretical capabilities of technology and its actual implementation in real-world scenarios, the Action will develop a research framework that addresses the key technology-related huddles of implementing state-of-the-art technologies in finance applications and enable the transition to a digital finance ecosystem that is environmentally sustainable, transparent and socially inclusive.

The Action will: (i) bolster the EU's digital data market by enhancing data quality, protection and privacy; (ii) establish clear guidelines for integrating generative AI in finance by developing innovative solutions for risk management, market trend prediction, and personalized financial products that consider challenges related to data security, ethical considerations and regulatory compliance; (iii) develop domain-driven XAI solutions by solving some of the key challenges of deploying explainability to ML and DL models applied to financial use cases; and (iv) propose data-driven ESG scoring methods.

The Action’s research framework will lead to better, greener, and more inclusive financial innovations that accelerate the digital and green transition of Europe, in line with Europe’s key strategic priorities such as the development of key digital, enabling and emerging technologie [8], the European Green Deal [9], the Digital Finance Package [6] and the EU AI Approach [3].

We discuss the four key technology-related pillars of the future function of finance, which in turn define the research objectives of the Action:

● Ensuring data protection, privacy and fairness in financial data (WG1). The distinctive feature of the emerging new financial ecosystem is the increasing availability of data. Data is in the centre of the digital transformation and more is to come [5]). Both academia and industry are increasingly faced with data characterised with staggeringly high number of dimensions, high variability and high veracity. Utilising such data is accompanied by many challenges among which: How do we ensure that all dimensions (accuracy, consistency, completeness, currency, volatility and timeliness) of data quality are satisfied to a necessary extent? What are the key challenges and opportunities in developing a unified data privacy framework, including clear definitions and methods, for ensuring the security and compliance of financial applications through the integration of differential privacy and federated learning techniques? What are the most effective methods and techniques for assessing and mitigating biases in large financial datasets to achieve data fairness, and how do these methods impact decision-making processes and outcomes in various finance use cases?

● Develop and deploy end-to-end use cases of generative AI's applications in finance (WG2). Generative AI holds transformative potential for the finance sector, offering capabilities that span from the simulation of intricate financial scenarios and the creation of novel investment strategies, to the generation of synthetic financial data for enhanced analytics. By leveraging these models, financial institutions can potentially devise innovative solutions that enhance risk management and portfolio optimization processes, predict market trends, and offer personalized financial products tailored to individual consumer preferences. However, the journey to integrate generative AI into finance is riddled with challenges [25]: How can sensitive financial data be processed by generative AI models without risking unintentional disclosures? What are the potential applications and limitations of large language models (LLM) in predicting financial market movements, and how can these models be effectively integrated into existing financial forecasting methodologies? How do we assess the suitability and effectiveness of LLM in the specific applications of portfolio optimization and risk management? How can the potential of generative AI be fully harnessed in the finance sector while ensuring no compromises on security, ethics, or regulatory compliance?

● Ensure explainability and fairness of AI-based systems in finance (WG3). To address the “black box” challenge of AI solutions, XAI methods have been developed to explain complex models’ decisions. Current methodologies include feature importance analysis (e.g., SHAP, LIME), sensitivity analysis, local interpretability methods, and model-agnostic approaches [26]. These are used in areas like credit scoring, fraud detection, and algorithmic trading. For example, SHAP values have been used to identify key factors in credit scoring models. However, these models often struggle with the temporal dependencies inherent in financial time series data, leading to less reliable explanations. Additionally, model-agnostic methods may not fully capture complex interactions in high-dimensional financial datasets, reducing their effectiveness. These techniques are not typically designed for financial use cases, limiting their ability to provide robust explanations. Key research questions include: How well do current XAI tools meet the needs of financial stakeholders? How can we develop non-perturbation-based XAI methods that respect time dependencies? How can we prevent socially biased outcomes and ensure real-time explanations? How can XAI enhance ethical AI use and ensure GDPR compliance?

● Streamlining ESG assessment and reporting (WG4). Sustainable finance is critical as climate change and environmental degradation threaten Europe and the world [9]. Moreover, the state of the art of ESG assessment and reporting in finance shows significant gaps in standardization and real-time data integration, indicating a need for more detailed exploration in this area. Currently, ESG assessments in finance rely on frameworks such as the MSCI ESG Ratings and Sustainalytics, which evaluate companies based on a set of predefined criteria. However, these assessments often suffer from a lack of standardization, leading to significant discrepancies in ESG ratings for the same company across different providers. This inconsistency poses challenges for investors seeking to make informed decisions based on ESG factors. Traditional ESG ratings also struggle to capture real-time data, making them less responsive to sudden events. Regulatory efforts like the EU's Sustainable Finance Disclosure Regulation (SFDR) aim to enhance transparency and standardization in ESG reporting, but implementation remains uneven across the industry. As per the European Green Deal strategy, sustainable finance and investment will enable sustainable global development. Key research questions include: How can we develop a real-time, data-driven ESG scoring model using LLM-based sentiment analysis? How can this model be effectively disseminated to enhance sustainability assessments and regulatory oversight? How do different ESG measurement techniques, incorporating sentiment and news analysis, compare in terms of accuracy and reliability for investors?

The Action will ensure that the European finance industry will stay globally competitive, give European

consumers access to innovative financial products, while ensuring consumer protection, financial stability and contribute to ESG and European Green Deal goals.

Overcoming the obstacles associated with AI deployment in finance demands a transdisciplinary, gender-balanced, international research network with a strong focus on young researchers and innovators for several compelling reasons. First, financial systems are globally interconnected, and regional researchers offer valuable insights into local nuances, enhancing the global perspective.

Second, addressing these challenges requires a blend of expertise from business, computer science, economics, law, information engineering and mathematics. With a transdisciplinary approach all aspects of the problem are thoroughly explored and integrated into potential solutions. Third, financial data varies by region, and international collaboration helps unify diverse datasets, address privacy concerns, and set common standards. Fourth, financial regulations vary across countries, and ethical considerations are essential. An international research network can facilitate the exchange of regulatory insights and ethical best practices, ensuring that AI systems are compliant with international standards. Lastly, collaboration on an international scale accelerates the development of AI solutions for finance.

# Rationale for choosing networking to address the main challenge

The proposed Action distinctively positions itself within a number of prior and ongoing European and international projects and initiatives. To highlight its added value, we systematically contrast it with previous efforts across multiple platforms:

Marie Skłodowska-Curie Actions (MSCA):

TraDE-OPT, REBOOT.AI, BigDataFinance, DEDS, BehindAI, and AIFocus have made valuable contributions in specialized areas such as big data analytics, regulatory sandboxes for AI, and the impact of AI on firm strategy. However, these Actions focus on segmented expertise, lacking a holistic

framework that combines these elements. Our Action integrates these specialized insights into a multidisciplinary dialogue. Also, the most recent MSCA Doctoral Network on Digital Finance does not

address the core aspects we want to work on.

COST Actions:

While COST CA19130 Fintech and AI in Finance and COST CA21163 HiTEc have initiated discussions on fintech and econometrics, they have not sufficiently explored the intersectionality between technological, regulatory, and ethical dimensions in finance. Our Action fills this gap by synergizing these aspects.

Horizon 2020 and Horizon Europe:

Projects like TANGO, FAME, AI for Alpha, HACID, FINTECH, SINGULARITY, Great.Power.Finance, and FINE offer essential technological advancements and insights. Yet, they often fail to comprehensively address the coordination between technology, ethics, and regulations. Our Action aims to meld these disparate threads into a unified framework.

EU Initiatives and Collaborations:

European Blockchain Partnership (EBP), European Fintech Association, the European Green Deal, the European Digital Finance Package, the European Data Governance Act, AI4EU, the EU Sustainable Finance policy, the EU AI Act and ELISE have made strides in their respective domains. However, these platforms typically focus on specific facets of finance or technology. Our Action expands on this by offering an integrative strategy that aligns with EU priorities, thereby ensuring Europe's competitive position on the global stage.

Key Differentiators and added value

● Interdisciplinary Convergence in WG1 to WG4: Across all our work packages, our platform uniquely brings together professionals from computer science, finance, sociology, and regulatory bodies.

This integrative approach allows us to tackle issues such as data privacy (WG1), generative AI (WG2), explainable AI and bias (WG3), and sustainability (WG4).

● Holistic Approach to Regulatory Compliance in WG3 and WG4: Unlike prior initiatives that either focus on technological feasibility or regulatory challenges, our Action harmonizes these by incorporating ethical and regulatory considerations, particularly in WG3 and WG4.

● Future-proofing the Financial Sector in WG2: While previous efforts like AI for Alpha and TANGO have addressed some aspects of market adaptability, our WG2 aims to comprehensively understand how AI models can adapt to evolving market conditions.

Operationalizing Ethical Governance in WG3: We move beyond theoretical discussions of ethical considerations to actualize them, especially in WG3 where we tackle explainable AI and algorithmic bias, ensuring these methods align with societal norms and values.

● Inclusivity of Stakeholder Perspectives in WG1 and WG4: WG1 focuses on user trust and experience, and WG4 addresses sustainability across sectors. This ensures a more democratic approach to finance, incorporating a broad range of stakeholder perspectives.

● Global Competitive Positioning in WG1 to WG4: In line with EU policy agendas, our Action's objectives strategically align Europe's financial technologies with global competitive requirements.

This is particularly emphasized in our cross-WG challenges on interdisciplinary approaches, enabling collaboration, and navigating regulatory landscapes.

It becomes evident that our Action provides a comprehensive, multidisciplinary, and future-oriented roadmap for advancements in the field of finance and technology. It not only builds upon but significantly extends the existing body of work, targeting a balanced, actionable, and forward-looking approach to complex challenges in the financial sector.

Our team brings together a wide array of scientific disciplines including economics, business, computer and information sciences, mathematics, law, information engineering and statistics, in a balanced composition as needed for this Action: About 50% from economics and business and more than 30% from technical, quantitative disciplines (23% computer sciences, 9% mathematics, 5% information engineering),4% law, complemented by 9% of additional disciplines.

Interdisciplinary Synergy: Our interdisciplinary approach ensures that every aspect, from data-driven processes and AI model development to ethical and sustainable technology deployment, is underpinned by authoritative knowledge and innovative thinking.

Practical and Theoretical Knowledge: The combination of both academic researchers and industry professionals ensures a balanced blend of theoretical insight and practical know-how. Our academic experts bring forth the latest research and theoretical frameworks, while our industry, government and international organisation professionals provide real-world application insights, thereby ensuring that developed solutions are both innovative and applicable. Regulatory insights: With specialists experienced in the financial regulatory landscapes across Europe, our network is acutely aware of the varied and often complex regulatory environments in different countries. This expertise is crucial to develop and implement financial technologies that are not only innovative, but also compliant with regional and international standards.

Technological Proficiency: Inclusion of experts in AI and FinTech provides a solid foundation to explore, develop, and validate cutting-edge technologies that align with the evolving needs of the financial industry, ensuring that our solutions are not just current but also future-ready.

Sustainability Insight: Engaging with specialists in sustainability, especially within the financial sector, ensures that our network can innovatively combine financial technologies with sustainability goals, creating solutions that are both economically and environmentally viable.

Data Privacy Expertise: With authorities in data privacy and protection, our network will create solutions that are not only efficient and innovative but also stringently adhere to data protection laws, safeguarding user information and building user trust.

Geographical and Cultural Awareness: Having experts from different geographical and cultural backgrounds ensures a wide perspective, enabling the development of solutions that are mindful of cultural, social, and regional nuances, thereby ensuring wider applicability and acceptability of the devised technologies and strategies.

Economic and Financial Insight: Experts in economics and finance within our network ensure a thorough understanding of market dynamics, providing crucial insights into creating technologies and strategies that are not only innovative but also economically viable and market-ready.

Furthermore, we have variation across socio-economic factors:

● Regulatory Divergence: Our experts are from countries that have different financial rules, helping us build technologies that work across various legal frameworks, especially considering the different ways countries implement rules like the GDPR, AI regulations and Fintech sandboxes.

● Economic Variation: Our network has participants from all sorts of economies, from big financial hubs like Frankfurt and London to growing markets in Eastern Europe, ensuring our solutions work everywhere and can scale according to different economic contexts.

● Technology Adoption: Our network includes countries at different stages of adopting FinTech, like tech-forward Sweden, Netherlands and others that are just starting their digital finance journey, helping us understand and plan for varied tech landscapes.

Cultural and Social Differences: We have professionals and academics from areas with diverse attitudes toward finance and data privacy, ensuring our solutions are sensitive to different cultural norms and can be adopted widely.

● Environmental Priorities: Our countries have different approaches and progress levels toward sustainability in finance, ensuring our solutions are comprehensive and mindful of varied green finance initiatives and policies.

With our COST members, our network strategically encompasses seasoned fintech innovators from nations with rigorous data protection regulations, data scientists experienced in dealing with multiple economic climates, and AI specialists who have formulated models adaptable to multiple financial scenarios; synergistically, collaborations with NNC provide insights from emerging markets, while our affiliations with IPC ensure that the developed technologies are globally relevant and adaptable, and engagement with Specific Organisations like international fintech forums and regulatory bodies strengthen our initiative with a global, industry-relevant, and regulatory-compliant perspective, thereby increasing our capacity to enhance financial technologies. To ensure effective coordination of such a diverse team, we will establish structured management and communication strategies. A dedicated coordination committee comprising representatives from each discipline and geographical region will oversee the collaboration process, with strict adherence to the COST Inclusiveness Strategy principles. They will facilitate regular communication, set collaborative goals, and ensure that all members are aligned with the project's objectives. We will employ project management tools and platforms to track progress, share resources, and maintain transparent communication channels. We will organize interdisciplinary workshops and team-building activities to motivate participants, create mutual understanding, and promote a safe and inclusive environment.

# Critical mass of the network

Text

# Impact

# Impact related to objectives

The Action is expected to generate a substantial impact aligned with its core objectives. First, it aims to **create high-quality new knowledge** by publishing at least 20 peer-reviewed articles within the first two years in top-tier journals such as the *Journal of Finance* and the *Journal of Financial Innovation*. The relevance and scientific excellence of these outputs will be tracked through the Field-Weighted Citation Index, ensuring continued scholarly influence in the field of Sustainable Digital Finance.

Second, the Action will **strengthen human capital in research and innovation** by engaging over 100 researchers in targeted training, mobility, and access to advanced infrastructures. A key goal is to enhance working conditions and career prospects for at least 50 researchers, with a particular focus on expanding European leadership in the digital finance domain.

Third, the Action promotes the **diffusion of knowledge and open science**, committing to make 100% of its results—including datasets, publications, and software—available via open platforms such as arXiv, OSF, GitHub, Zenodo, EOSC, and Open Research Europe. At least 30% of COST Members are expected to initiate new interdisciplinary and intersectoral collaborations, amplifying the reach and impact of the network across Europe and beyond.

# Involvement of stakeholders

The Action has gathered a very substantial critical mass of business enterprises, governmental organisations, not-for-profit organisations, international organisations and European RTD organisations.

About 2/3 of participants are from academia, and a very substantial 1/3 are from industry and non- academia. Those are

● Financial Institutions: This encompasses a wide range of entities such as banks, insurance companies, credit unions, microfinance institutions, fintech startups, and investment firms, all integral to the evolving financial technologies landscape.

● Regulatory and Compliance Entities: Bodies ensuring that financial technologies adhere to legal and ethical guidelines.

● Technology Providers and Developers: Innovate data-driven solutions and AI technologies.

● Sustainability Organizations: Advocates for environmentally responsible practices.

● Consumer and Business Advocacy Groups: Organizations protecting consumer interests.

● Global Partners: This includes entities from Non-COST countries and Third States (IPC), particularly focusing on key players from countries like the USA, China, and the UAE, enriching our understanding and ensuring a global perspective.

It’s noteworthy that we have successfully onboarded representatives from each of these stakeholder categories, ensuring that a wide spectrum of expertise and perspectives is embedded from the outset.

Stakeholder Involvement Plan:

● Inclusive Initiating Workshop: Establish a foundational understanding, initial stakeholder input, and network cohesiveness by convening a workshop with virtual and in-person participation options to initiate collaborative action. The outcome will be a consolidated document capturing an initial roadmap, main challenges identified, and strategies to address them

● Continuous Collaboration and Communication: Ensure a sustained dialogue and cooperation via a digital platform for continual discussion, knowledge sharing, and collaboration among stakeholders.

● Regular Stakeholder Check-Ins: Ensure consistent feedback and iterative development by implementing bi-annual meetings for updates, inputs, and collaborative efforts.

● Thematic Working Groups: Achieve in-depth progress in specialized areas by focussing on technological development and sustainability, inviting stakeholder participation through open calls.

● Capacity Building and Dissemination: Enhance stakeholder capacity and disseminate insights by conducting workshops and webinars to share findings and build capacity.

● Continuous Feedback and Improvement: Ensure that the Action is consistently refined based on stakeholder feedback by implementing bi-annual surveys and feedback tools, integrating insights into ongoing Action adaptations.

● Policy Dialogue and Aligning Outputs: Ensure findings and outputs align with and influence policy by organizing annual forums with policy-makers, e.g. in Brussels, to ensure findings are policy-relevant and contribute to policy evolution.

● Final Evaluation and Future Planning Workshop: Assess impact and a plan for future sustainability by hosting a workshop to evaluate impacts, understand shortfalls, and plan future trajectories.

# Communication, dissemination and valorisation

In our Action's first MC meeting, a comprehensive science communication plan will be laid out. Science Communication Plan: This plan is grounded on three core principles:

● Transparency: Ensuring all communications are clear, open, and understandable.

● Continuous Outreach: A pledge to maintain persistent engagement with all stakeholders.

● Engagement: Fostering connections across diverse fields, from academia to industry.

Academic Seminars: Every partner institution will host at least one academic seminar annually. Conference Presence: COST members will participate in high-quality international conferences across

Europe, ensuring our research and innovations are showcased on leading platforms. Publications: We will aim for publications in reputable journals with robust impact metrics.

Industry Engagements: Seminars designed for industry experts are planned in hybrid formats. The objective: to captivate a minimum of 100 participants and spur subsequent collaborative projects. Multimedia Outreach: For every Action activity, an informational video will be produced targeting the wider public. Our digital strategy will also encompass the creation of a dedicated website, active social media engagement, and insightful blog posts.

Intellectual Property Management: Our approach here is two-fold:

● Encouraging collaborations and external research initiatives.

● Channelling resources into product evolution and development.

Community Engagement: Twice annually, we will connect with communities, the general public, and end users (Open Lab Days, Open Science Festivals). Our findings and innovations will also be presented to a comprehensive audience, including regulators and policymakers. Additionally, the focus remains on the pragmatic aspect: transitioning from research prototypes to tangible financial tools.

Dissemination Oversight by CG: The CG will act as the custodian of our dissemination activities. Their mandate will encompass ensuring that our output is not just communicated but will follow stringent standards. Resource optimization strategies include synchronizing Working Group discussions with standout conferences like the Computational and Financial Econometrics (CFE) and Computational Statistics (COMPSTAT) conferences. During these conferences, dedicated sessions will be chaired by COST members to amplify our research visibility.

Multi-Channel Engagement: Our strategy is to adopt a multi-channel approach for engagement. This involves: 1. A dedicated website; 2. Active social media channels like Facebook and Twitter; 3. Circulation of newsletters within academic and professional circles; 4. Prioritizing publications in prestigious journals; 5. Both virtual and in-person scientific discourses Outreach: Leveraging the media contacts of select Action members, our outreach initiatives will be amplified to capture a broader public audience.

Exploitation Plan: The Action will generate results that can successfully be exploited academically and

economically. Key elements of this plan include:

● Commercialization: Transitioning research prototypes into market-ready products.

● Collaborations: Engaging with industry leaders for potential partnerships or licensing deals.

● Education: Offering training programs and workshops, catering to both academia and industry.

● Policy Influence: Using our research to inform and shape regulatory frameworks and policies

● Repository Updates: Ensuring that our database remains updated, reflecting the latest findings.

# Implementation

# Action Structure

The Action's major deliverables and timeframe are designed to achieve the research coordination and

capacity-building objectives effectively. The deliverables span a period of 48 months and will make impactful contributions to the areas of data privacy, generative AI, XAI, and sustainable digital finance.

WG1: Data-Driven Processes

D1 (Month 15): Data Privacy Guidelines for Financial Applications: A comprehensive report outlining best practices for data privacy in financial applications.

D2 (M27): Fairness Models for Financial Algorithms: Models and metrics to ensure fairness.

D3 (Month 39): Federated Learning Implementation: A report on the techniques and protocols.

Milestone WG1 (Month 12): Completion of the initial draft of Data Privacy and Fairness Guide

Control points: Finalization and approval of guidelines (M15), Validation of models and metrics (M27)

WG2: Generative AI in Finance

D4 (Month 15): Advanced Portfolio Optimization Models: A document detailing advanced portfolio optimization techniques using Transformer Neural Networks.

D5 (Month 27): Enhanced Risk Assessment Models: Generative AI Models and algorithms.

D6 (Month 39): Personalized Financial Advice Models: Models that provide tailored financial advice.

Milestone WG2 (Month 24): Delivery of first models in portfolio optimization, risk assessment, and personalized financial advice using Generative AI.

Control points: Testing and refinement of models (M15), Pilot testing with user feedback (M36)

WG3: Explainable AI and Algorithmic Bias in Finance

D7 (M27): Scalable XAI Methods: A report on scalable XAI methods tailored for time-series data.

D8 (Month 39): Transparent Transformer Neural Networks: Documentation and code for transparent

and interpretable Transformer Neural Network architectures.

D9 (Month 46): Algorithmic Bias Mitigation Strategies: A report outlining strategies for measuring and

mitigating algorithmic bias in financial applications.

Milestone WG3 (Month 36): Achievement of key developments in scalable XAI methods, transparent

neural networks, and bias mitigation strategies.

Control points: Evaluation of existing models (M24), Documentation and code finalized (M36)

WG4: Sustainable Digital Finance

D10 (Month 27): ESG Sentiment Analysis: Models and findings on sentiment analysis related to Environmental, Social, and Governance factors.

D11 (M39): News and Reports Analysis: Algorithms for analyzing news for ESG-related information.

D12 (M46): Real-Time ESG Scoring Models: A scoring system for assessing the ESG performance. Milestone WG4 (Month 24): Draft of ESG-related models and tools, including sentiment analysis, news analysis, and real-time ESG scoring.

Control points: Analysis findings compiled (M24), Algorithms validated (M39)

Overall Action Deliverables

D13 (M9): Online Presence and Social Media: A website and LinkedIn, Facebook, Twitter accounts.

D14 (M24, M45): Data Collection: 20 datasets to be used for research, publicly accessible.

D15 (M21, M42): Publication Plan: A green open-access repository for 80 papers, 4 special issues.

D16 (M12): Training Materials: Slides and video material from two PhD training schools per year.

D17 (M9, M39): Research Proposals: Submission of 40 research proposals, national and European.

D18 (M12, M36): Award: An award for the best Young Researcher presentation at the MC meeting.

D19 (M21, M33): Gender Balance Reports: Periodic reports tracking gender balance and inclusivity.

Milestone (Month 24): Establishment and maintenance of online presence, data collection, publications, training materials, research proposals, awards, and gender balance reports.

# Work plan (tasks, activities and timeframe)

DESCRIPTION OF WORKING GROUPS, TASKS AND ACTIVITIES

The work plan is divided into four specialised WGs and 18 tasks, for the 48-month duration, designed

to ensure alignment with the research coordination and capacity-building objectives.

WG1: Data-driven processes

WG1 focuses on safeguarding data privacy, data protection, and ensuring fairness in finance. The

interdisciplinary group lays the foundation for the other WGs and employs advanced methodologies

such as differential privacy and federated learning to develop guidelines for data privacy and fairness.

T1. Develop Comprehensive Data Privacy Guidelines: Create a set of comprehensive data privacy

guidelines tailored to the unique challenges of financial applications

T2. Fairness Models for Financial Algorithms: Develop fairness models and metrics designed for

financial algorithms to mitigate biases and ensure equitable outcomes.

T3. Implementation of Federated Learning: Implement techniques to enable collaborative model

training across distributed financial data sources while preserving data privacy.

WG2: Generative AI in Finance

WG2 is dedicated to enhancing portfolio optimization, risk management, and personalized financial

advice through advanced Generative AI techniques. The group leverages recent Transformer Neural

Networks to improve models for optimal portfolios, assessing risks, and detecting fraudulent activities.

T4. Advanced Portfolio Optimization: Develop advanced portfolio optimization models using

Transformer Neural Networks to improve investment strategies and maximize returns.

T5. Enhanced Risk Assessment: Create advanced risk management models that leverage Generative

AI to identify and assess financial risks in real-time.

T6. Personalized Financial Advice: Develop personalized financial advice models that consider

investor preferences and financial goals, leading to tailored recommendations.

WG3: Explainable AI and Algorithmic Bias in Finance

WG3 will make AI models in finance more transparent and accountable while addressing algorithmic

bias. The group pioneers the development of novel, non-perturbative XAI methods for financial data and Transformer Neural Networks. They also work on mitigation strategies for algorithmic bias.

T7. Scalable XAI Methods: Develop scalable XAI methods tailored for financial time series data,

allowing stakeholders to understand AI-driven decisions.

T8. Transparent Transformer Neural Networks: Create transparent Transformer Neural Networks by

devising interpretable architectures and visualization techniques.

T9. Algorithmic Bias Mitigation Strategies: Design and implement effective strategies for measuring

and mitigating algorithmic bias in financial applications, ensuring fairness.

WG4: Sustainable Digital Finance

WG4 will advance sustainable digital finance through data-driven ESG measurement. The group employs Large Language Models to perform sentiment analysis, analyze news and reports, and develop real-time, data-driven ESG scoring models, contributing to sustainable finance.

T10. ESG Sentiment Analysis: Utilize Large Language Models to perform sentiment analysis on news articles, financial reports, and social media data to improve ESG factors.

T11. News and Reports Analysis: Develop algorithms for comprehensive analysis of news and financial reports to extract relevant ESG-related information.

T12. Real-time ESG Scoring Models: Build dynamic ESG scoring models that provide ongoing assessment and scoring of ESG performance for financial products and companies.

Overall Action Tasks:

T13. Cross-WG Collaboration: Foster collaboration and knowledge exchange among all WGs to ensure interdisciplinary insights using tools such as Git, Jira and Slack channels.

T14. Dissemination and Impact: Implement a comprehensive dissemination strategy to share research outcomes, engage with stakeholders, and maximize the impact of the Action.

T15. Ethical and Regulatory Compliance: Ensure all ethical guidelines and regulatory rules, in relation to data privacy, algorithmic fairness, and financial industry standards.

T16. Science Communication Plan: Develop and implement a science communication plan to disseminate the Action findings to both the scientific community and the general public.

T17. Quarterly CG meetings;

T18. Annual MC meetings

# Deliverables

The Overall Action Deliverables reflect the project’s commitment to visibility, open science, training, inclusivity, and long-term impact. These cross-cutting outputs are designed to support and amplify the scientific activities of all Working Groups. From the creation of a strong digital presence and open-access resources, to structured data collection, publication strategies, and support for early-career researchers, these deliverables aim to ensure a dynamic, inclusive, and sustainable research ecosystem. A key milestone at Month 24 will assess the coordinated progress of these foundational elements.

Overall Action Deliverables

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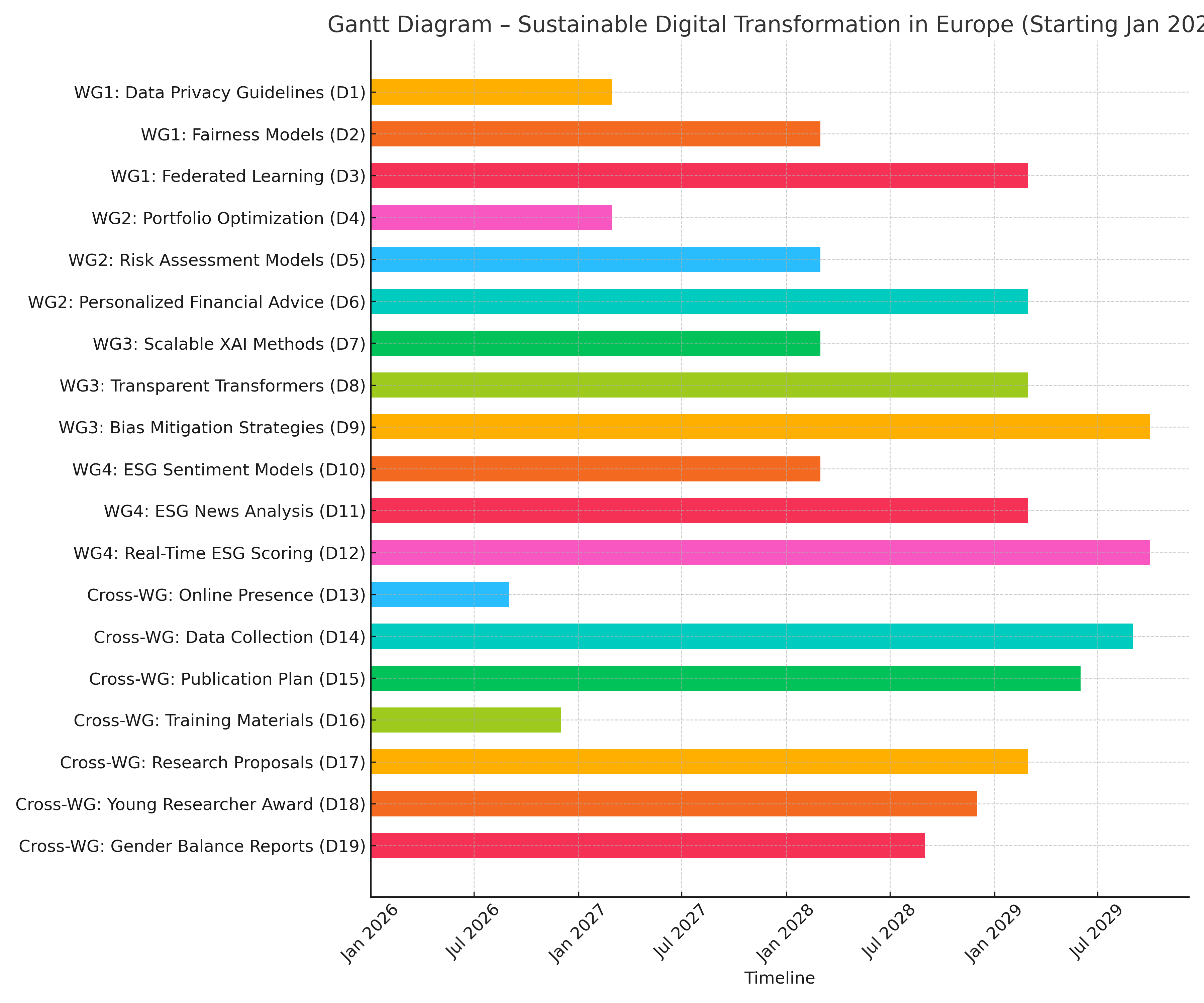
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Milestone (Month 24): Establishment and maintenance of online presence, data collection, publications, training materials, research proposals, awards, and gender balance reports.

1. **Gantt chart**



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