FIN-TECH: A FINancial TECHnology knowledge exchange programme

PROPOSAL TEMPLATE: DRAFT

AGENDA

Overview

- Objective
- Work Programme
- Concept and Methodology

Impact

- Expected Impacts
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Implementation

- Work Plan
- Management structure and procedures
- Consortium as a whole
- Resources to be committed

OVERVIEW

1.1. Objectives

1.2. Work Programme

1.3. Concept and Methodology

1.1. Objectives

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Overview: Objectives - I

- Our goal: to provide a coordinated and integrated solution to enhance the European FinTech ecosystem, developing **a knowledge exchange RegTech programme** in **FinTech risk management**, dynamically updated with state-of-the-art technologies and best practice finance models.

- Our team: **25 partners** (21 Universities and 4 FinTechs), interacting with European Union market regulators and FinTech hubs from 30 different countries.

- Our vision: **help regulators connecting** the "Tech" part, made up of disrupting innovations, in the fields of **big (cloud) data, artificial intelligence and blockchain**; with the "Fin" part, made up of emerging practices, in **peer to peer lending, robo-advice and cryptocurrencies**

Overview: Objectives - II

- Main deliverable: the creation of an integrated European “Knowledge exchange Platform” in which Universities, FinTechs and Regulators interact **at the national, European and international level**,
- At the national level we organise, separately in each of the 28 EU countries and Switzerland, **knowledge exchange sessions including policy impact evaluation,** where Tech experts from the Universities teach risk management methods, and their implementation, to FinTechs, under the regulatory framework provided by the National Authority.
- At the European level, we organise **quarterly brainstorming workshops,** where FinTechs, Regulators and Universities exchange ideas, on new technologies and on novel business models, updating risk management methods and fostering a friendly regulatory environment.
- At the world level, we benchmark the advancements of the project, with the help of a properly chosen independent advisory board, and participating **at international FinTech conferences and meetings,** especially concerning RegTech and risk management

Overview: Objectives - III

- O1. Create a panel of experts in FinTech Risk management, through the daily management and coordination of the project
- O2. Create, through research and research workshops, common standards for risk management in big data analytics applications, specifically in peer to peer lending
- O3. Create, through research and research workshops common standards for risk management in artificial intelligence applications, specifically in asset management
- O4. Create, through research and research workshops, common standards for risk management in blockchain applications, specifically in cryptocurrencies and initial coin offerings
- O5 Develop and update knowledge exchange programmes in the fields defined by O2, O3 and O4, matching the business needs of FinTechs with the available technologies, and with the regulators' aim for a safe financial system
- O6. Develop a European Innovation Hub through the implementation of a technological platform for FinTech risk management
- O7. Disseminate the advancement of the programme, through consultation with the advisory board, and through the participation at focused meetings and conferences in RegTech and FinTech risk management.


Universities and Research Centers
FinTech Hubs and Investors
Market Regulators
KNOWLEDGE EXCHANGE PLATFORM

1.1. Objectives

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Overview: Call requests- I

- The challenge of the work programme is to increase the role Europe play in FinTech so that **EU startups can better scale-up** across Europe and at global level; **facilitating the interactions between innovators, supervisors and regulators** is particularly relevant in this context.
- Our proposal facilitates the interaction between FinTech, universities and regulators, through a common research, training, coding and dissemination activity. Training is **a shared experience**, a “knowledge exchange”.

Overview: Call requests- II

Scope I

Bring together

- The scope of the call is to bring together a group of regulatory or supervisory bodies, and other relevant organisations to investigate new approaches for piloting innovative FinTech solutions, anticipating risks, and facilitating the operations of FinTech firms that want to grow and scale-up across Europe.

Scope II

Build capacity and expertise

- Another scope of the call is to Build capacity and expertise regarding new technologies and models to support early understanding for regulators or supervisors and to offer specific advice to FinTech firms that want to grow and scale-up across Europe

Overview: Call requests- III

Scope III

Cross-border networking

- Another scope is to support the cross-border networking of ecosystems, hubs and accelerators focusing on FinTech, in particular to help startups appraise regulatory issues, to engage with other stakeholders and to identify opportunities.

Scope IV

Evaluate the impact of regulation

- A further scope is to envisage possible actions and technical solutions to evaluate the impact of regulation and facilitate regulatory compliance in financial areas.

Overview: Call requests- IV

Scope V

Reinforce the position of Europe among FinTech

- Another scope is to reinforce the position of Europe amongst leaders in FinTech, encouraging cross border collaboration and practical approaches for FinTech experimentation frameworks; enabling FinTech firms to grow and scale-up across Europe.

Scope VI

Develop common understanding

- A last scope of the call is to develop common understanding, interpretation and expertise regarding technology evolution and FinTech-related regulations and policies and, in particular, of those concerning data.

Overview: Our Programme

Objective 1

- contributes to the development of **a network of European experts in Financial Technology Risk Management,** able to connect the needs of the emerging FinTech companies with the regulatory compliance needed to protect consumers and maintain financial stability

Objective 2, 3, 4

- will be developing **new risk management standards in Financial Technology,** encouraging the development of a research and innovation hub that brings together Universities, Regulators and FinTechs.

Objective 5

- aims at knowledge exchange, according to the high-level standards developed in O2-O4**, between all European national regulators and FinTech companies, guided by leading Universities.**

Objective 6

- aims at **developing a European innovation hub**, which will implement technological platform for FinTech risk management

Objective 7

- ensures that the **results are grown and shared**, between Universities, Regulators and FinTechs, and also with the general public

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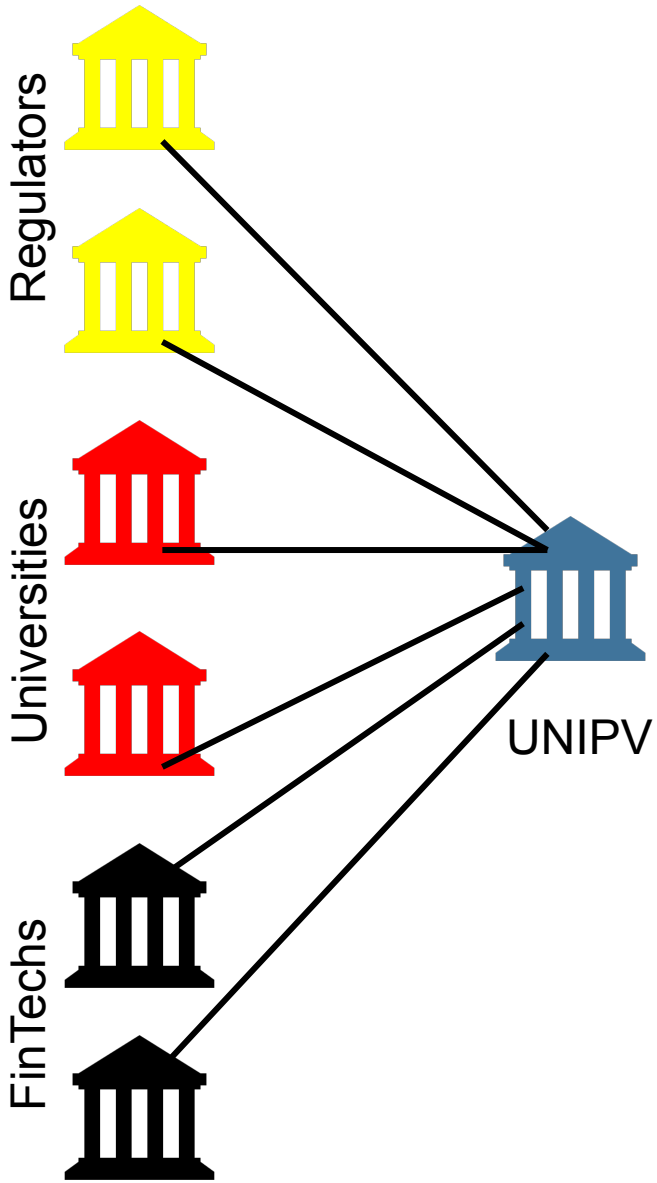


Syllabus

Programme 1: **BIG CLOUD DATA**, with application to peer to peer lending, and corresponding credit and systemic risk management

Programme 2: **ARTIFICIAL INTELLIGENCE**, with application to robo-advice, and corresponding compliance risk and cyber risk management

Programme 3: **BLOCKCHAIN**, with application to cryptocurrencies and initial coin offerings, and corresponding fraud and money laundering risk management

Topic 1: Big Data

Big Data: Technology

- Data science updates the concept of data mining in the light of the availability of "**big data**", that differ from "data" by their automatic generation through social networks, sensors and other data generating tools.

- In this sense, data science can be defined as *'an integrated process that consists of a series of activities that go from the definition of the objectives of the analysis, to the selection and processing of the data to be analysed, to the statistical modelling and summary such data and, finally, to the interpretation and evaluation of the obtained statistical measures'.*

- The difference between big data analytics and Artificial Intelligence is that, in the former case, a "human" intervention is needed; it is a kind of "Augmented Intelligence"

Big Data: Application

- Advancements in big data analytics have been a key force driving the exponential growth of P2P platforms.

- Three main factors can explain the increasing role of P2P platforms in finance:

  - improved quality and speed of service, more inclusion (demand side)
  - use of big data analytics to improve credit scoring
  - regulatory burden on incumbent banks/limited regulation on P2P

Big Data: Risk Management - I

- The growth of P2P platforms does not bring only advantages. It can also pose significant risks to the financial system.

- The potential risks can be grouped into the following categories:
  - underestimation of credit risk
  - challenges in developing an accurate “systemic” risk measurement
  - potential for fraud and money laundering

Big Data: Risk Management- II

- Statistical theory offers a great variety of models for predictive purposes in finance
- When the quantity to be predicted is a default event the most used approaches are based on logistic regression models.
- This directly applies to rating modeling but it can also be applied to similar classification problems in peer- to- peer lending, such as fraud detection and anti-money laundering.

Big Data: Risk Management - III

The two main issues that arise in employing logistic regression for financial predictions are:

1. the event to be predicted may be rare, so there is not enough information for efficient statistical estimates;
2. the event to be predicted is multivariate, and there are strong dependences among the individual default variables.

Big Data: Risk Management - IV

- These limitations represent indeed one area where data science and, in particular network models, can be very helpful.
- Lauritzen (1996) contains a very clear and summarized description of multivariate graphical models and probabilistic expert systems, employed in the '90s to model dependencies between random variables, by means of a unifying and powerful concept of a mapping between probabilistic conditional independences, missing edges in a graphical representation, and suitable model parametrisations.

Big Data: Risk Management- V

- Network analysis has become increasingly recognized as a powerful methodology for investigating and modeling financial interactions between economic agents;

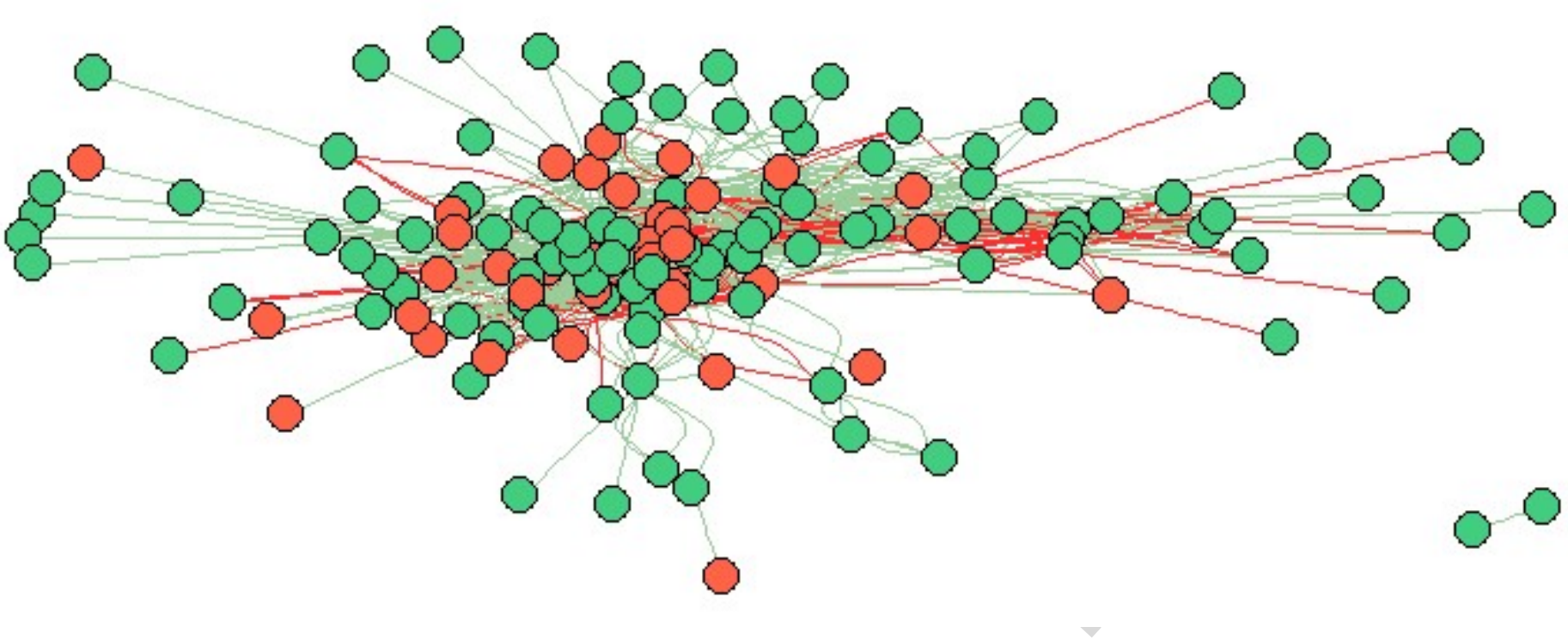
- Network models rely on adjacency matrices, which can be based on graphical correlation networks, thus adding a stochastic component to network models;

- Correlation networks have been recently introduced in finance, as a tool for understanding financial flows in global markets, as they apply to the management of systemic risk.

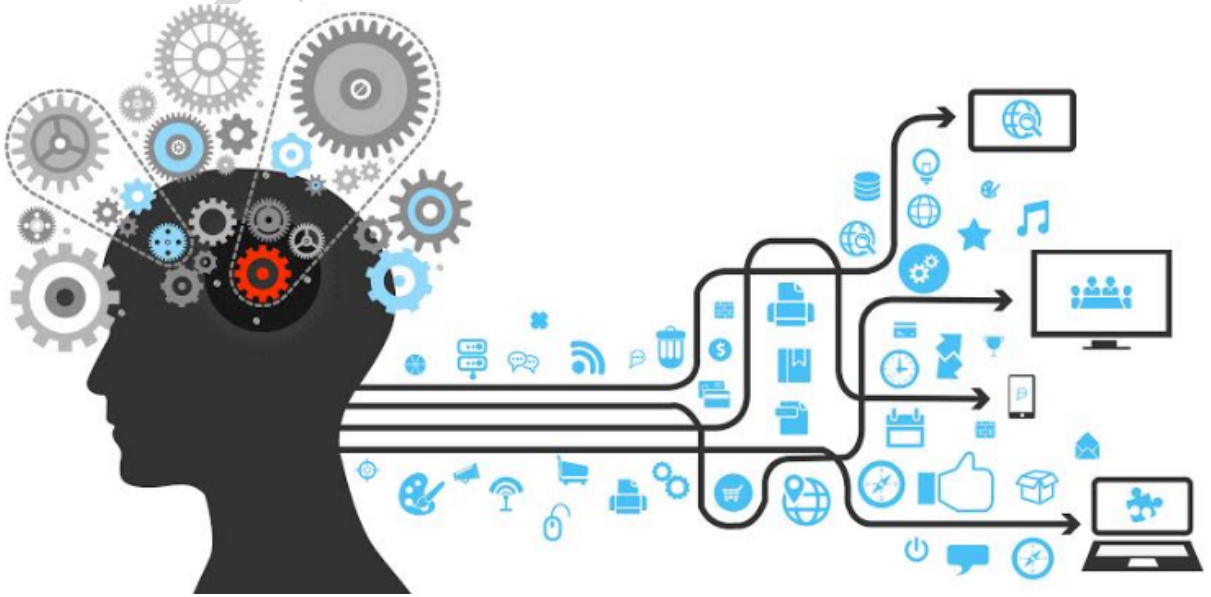
Big Data: Risk Management- VI

- P2P platforms can take advantage of their inherent ability for better data collection on the network to which borrowers belong.
- If statistical units correspond to borrowers, correlation networks can be built on the basis of observed balance sheet variable.
- A network between N borrowers can be represented by adjacency matrix, obtained calculating the correlations between the two series of values of the balance sheet variable observed, respectively, for two borrowers at time t.
- Once the adjacency matrix is derived, summary networks statistics and centrality measures can be estimated and included in a credit scoring model, taking systemic risk into account.

Big Data risk management - example



Topic 2: Artificial Intelligence



AI: Technology

- The Financial Stability Board (FSB) in its two recent reports (FSB 2017a, 2017b) identifies three common drivers of the growth of FinTech:
  - shifting consumer preferences on the demand side;
  - evolving technology on the supply side
  - changing financial regulation
- The first concerns higher customer expectations for convenience, speed, cost and “user-friendliness”, the second concerns advances in technology, mainly related to artificial intelligence applications; and the third regards the increased frequency of changes in regulatory and supervisory requirements.

AI: Application

- In this perspective, automated consultants, **known as robot advisors**, aim to improve financial services.
- This seems plausible, given their greater simplicity of use and transparency. However, these advantages may be offset by the greater risks that are brought on board and, especially, of those linked to a fast, automated service, that may lead investors to underestimate the risk profile of the proposed investment.
- Our viewpoint is positive, as the increased risks connected with the use of robo advisor platforms can be mitigated by an appropriate analysis of the data they generate. This data can be leveraged not only to improve the service, making it more personalised, but also to reduce risks and, in particular, the risks of an incorrect risk profile matching between "expected" and "actual" risk classes.

AI: Risk Management - I

- We aim to propose statistical measurements models aimed at profile matching between "expected" and "actual" risk classes;
- Robot advisors build personalised portfolios for investors, on the basis of algorithms that take into account investors information relative to age, risk tolerance and aversion, net income, family status. Obtaining this information is a legal requirement (specified by the MIFID directive), and robot advisors employ online questionnaire to obtain it. The analysis of the responses to questionnaires can allow robo-advisors to estimate the "expected" risk class of each investor.

AI: Risk Management - II

- Data analysis algorithms can be implemented not only on the demand side, but also on the supply side. Robot advisors could consider the available financial products, and classify them into homogeneous "actual" risk classes.

- Linking together the "expected" risk classification of an investor with its "actual" classification allows to evaluate whether a robot advisor respects its risk profile, one of the most important requirement of the MIFID II (Market in Financial Instruments Directive) regulation, which becomes, in the context of robot -advisory financial consulting, a verifiable requirement, not only from a theoretical and formal viewpoint but also from an empirical and operational one.

AI: Risk Management - III

Measuring Actual Risk → Unsupervised Cluster Analysis

- Construct homogeneous asset classes.
- Measure of distance → matrix based on partial correlation coefficients, who adjust correlations for the presence of spurious effects
- Advantages: unsupervised, less complex;
- Disadvantages: low predictive accuracy

Predicting Expected Risk Class → Supervised Neural Networks

- Automatize the classification methods, making them able to predict a risk expected (actual) profile of a new investor, on the basis of its personal characteristics or on the structure of the proposed portfolio
- Advantages: high predictive utility
- Disadvantages: more complex, less parsimonious

AI: Risk Management - IV

- We remark that this is a clear example of “RegTech”: the application of Artificial Intelligence methods to the simplification and automatisation of compliance and regulatory requests. If we extend the mentioned approach employing text mining models to read regulatory documents we can propose a general model of RegTech compliance.

- We remark that Robo-advice is probably the FinTech area which may most be impacted by cyber risks. Statistical tools can be employed to measure and, therefore, prevent, cyber risk.

AI: Risk Management - V

- Operational risk has been defined, by the Basel Committee on Banking Supervision, as "the risk of a monetary loss caused by human resources, information technology (IT) systems, by organisation processes or by external events".

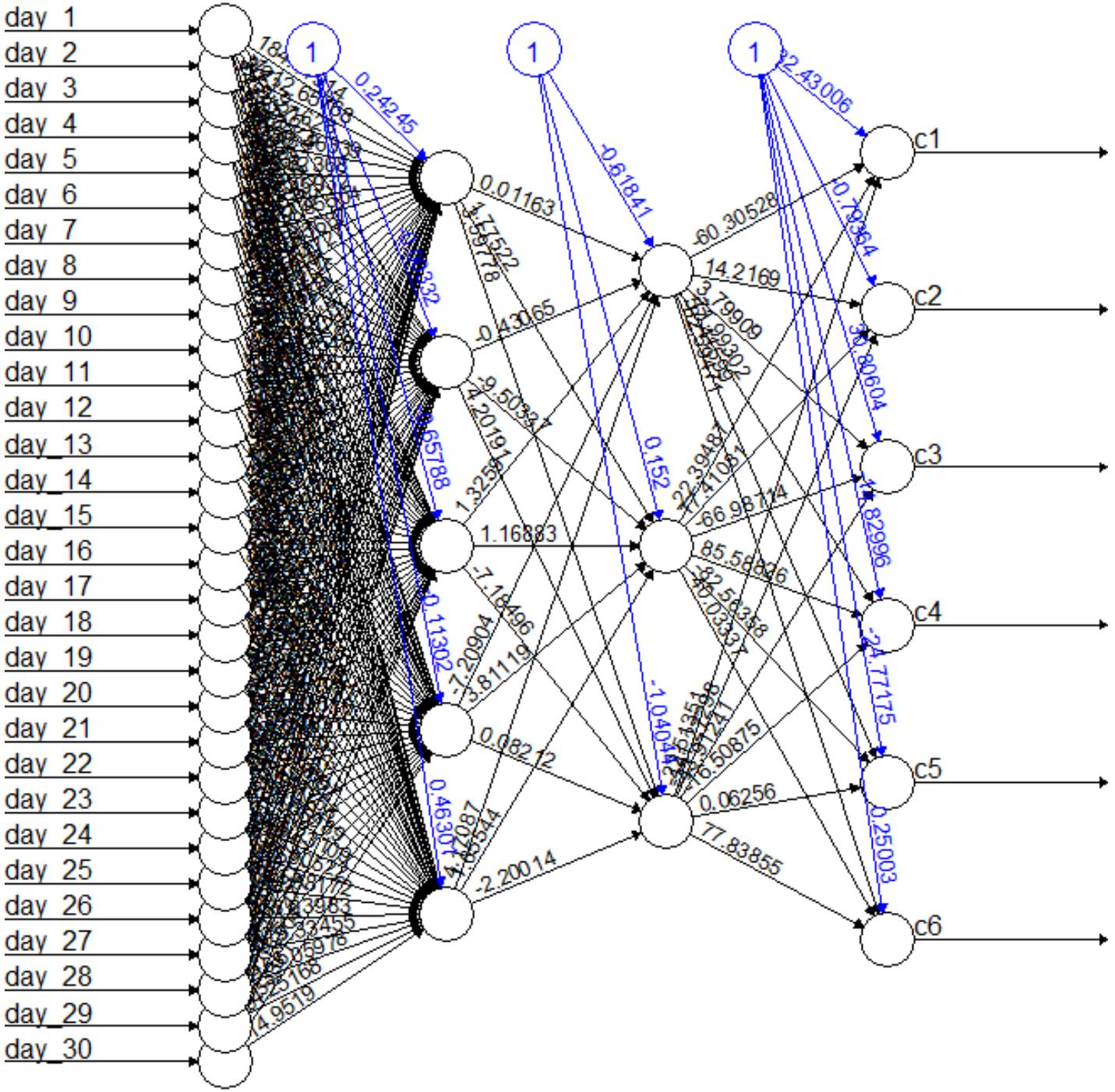
- Among operational risks caused by IT systems, cyber risks are gaining increasing importance, due to technological advancements and to the globalisation of financial activities.

- Cyber risks can be defined as "any risk emerging from the use of information and communication technology (ICT) that compromises the confidentiality, availability, or the integrity of data or services”

AI: Risk Management - VI

- Cyber events are typically rare and not repeatable, being very specific. It is quite natural, therefore, to measure them with a less demanding ordinal approach rather than using quantitative data which are often not available.
- Cyber risk measurement is usually seen as a preventive diagnostics, based on data, expressed in ordinal categories, such as "high", "medium" or "low" risk, rather than in terms of quantitative data
- Hence, what is necessary is a methodology to measure cyber risks that start from ordinal random variables, that represent the levels of severity for different risk events, in different business lines. A cybersecurity risk index can then be calculated so to prioritise intervention in process controls.

AI Risk Measurement - example



Topic 3: Blockchain

Blockchain: Technology - I

- The possibilities of the „Blockchain“ (BC) based technologies are well known and receive so much positive feedback to the point, that some may call it a hype.
- BC creates "pro" and "con" groups, that accelerate the creation of a mythos character and obstruct the view on facts. It is important to separate between the concept behind this new matter and its actual implementation, to prevent myths to be created and facts to be ignored.
- We consider financial applications of BC, with the goal of ensuring investor protection and financial stability, while taking full advantage of the new technological developments.
- We consider both public and private DLTs

Blockchain: Technology - II

- The BC is a sustainable list of datasets called blocks, which are concatenated using cryptographic techniques.
- Each block contains a cryptographically secure hash consisting of data from the previous block.
- All participants, the nodes on the network of a distributed system, are peers with equal standing (Peer-To-Peer). Some or all of the nodes in the network maintain copies of the database.
- For the database to be trusted – all listen to the same message - it must be identical across the peers. Agreement on the state of the database is called consensus.

Blockchain: Application - I

- The concept of supplementary (Delmolino et al., 2016), alternative (Ametrano, 2016) or even digital currencies (Chaum, 1983) is not new, but the concept of an open-source currency without a central point of trust, such as a central distribution agency or state lead control is revolutionizing (King & Nadal, 2012).
- A CC is commonly defined as a digital asset designed to work as a medium of exchange using cryptography to secure transactions and value changes, to control the creation of additional value units, and to verify the transfer of assets.
- Plenty of different versions of CCs exist to choose from. BTC is the first example of a digital asset which has no backing or intrinsic value (Nakamoto, 2008), and since then many more sophisticated systems, like Ethereum (ETH) have been created.

Blockchain: Risk management I

- We consider the main financial application of BC, Crypto Currencies
- The project will deal with risk management in cryptocurrency markets around some main themes:
  - cryptocurrencies and their implications for market risk and systemic risk
  - cyber crime and, in particular, money laundering risk
  - initial coin offerings (ICOs) and fraud detection

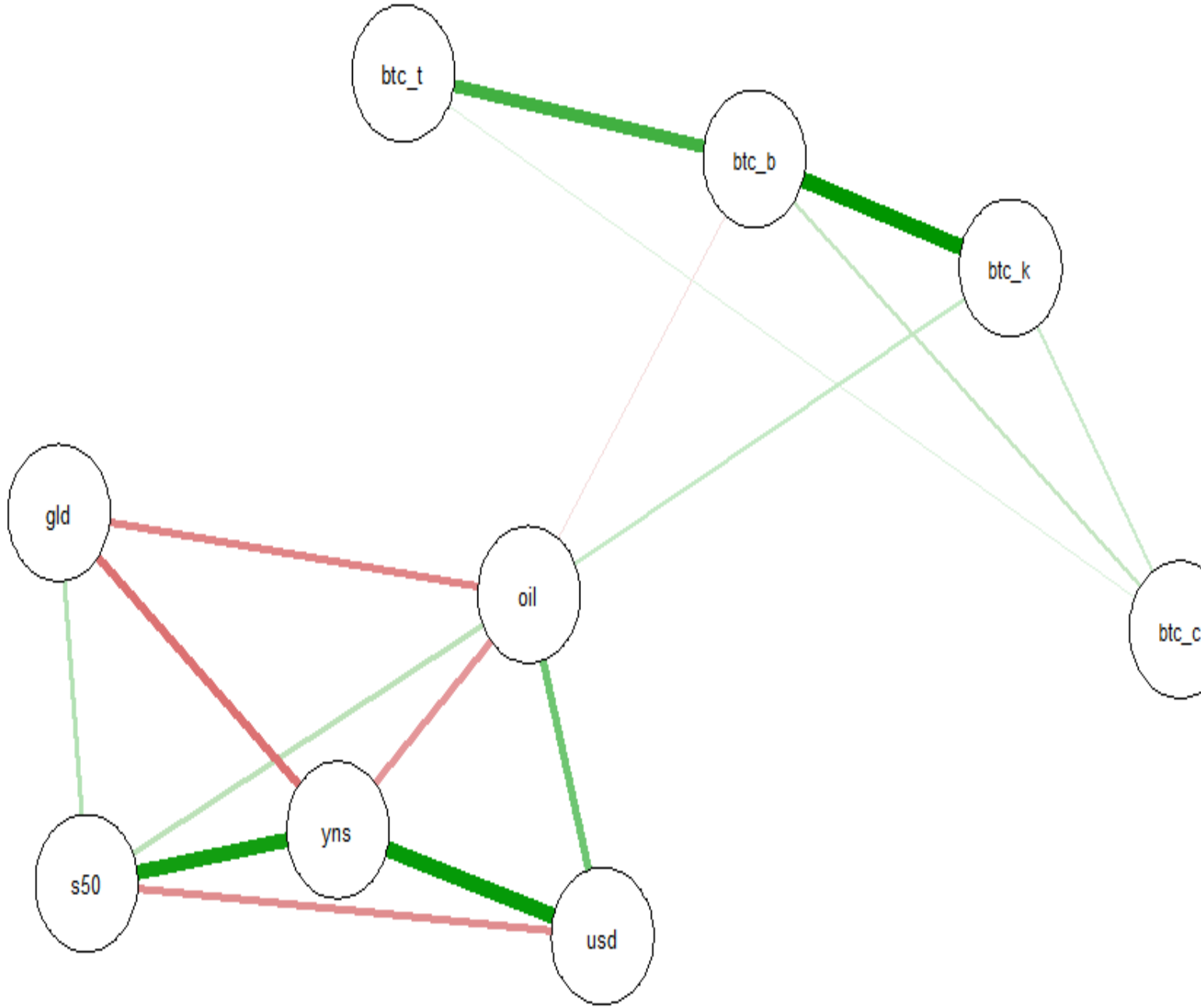
Blockchain: Risk Measurement – II

- A highly perceived risk, in dealing with cryptocurrencies, is money laundering.
- Money laundering embraces all those operations to disguise the illicit origin of capital and to give them a semblance of legitimacy, to facilitate the subsequent reinvestment in the lawful economy.
- Each financial intermediary, including FinTechs, should be aware of the risks undertaken, in order to avoid involvement in criminal activities.
- For this purpose we propose to introduce a notion of risk of money laundering, the measurement of which will allow to control it.

Blockchain: Risk Measurement – III

- To predict money laundering behaviour, statistical models, based on blockchain transactional data and network science models can be used. They depend on the available data (difference between payment tokens and security tokens)
- Another method that can be applied in the bitcoin context is network cluster analysis. This allows us to exploit network topology for the purpose of identifying communities of users based on their transactions. Specifically, a network cluster analysis algorithm that takes as inputs the set of users ("nodes" in network terminology) and the trades between users ("edges" or "links" in network terminology) (Foley et al., 2018).
- Another model, that can be used for the purpose of identifying the main determinants of successful (fraudulent) ICOs is text mining. By collecting data on the ICO itself (existence of a white paper etc.) and from discussions on Telegram chats relating the value and prospects of the underlying project we can build, train and test models to discriminate and classify ICOs by their probability of success (fraud).

Blockchain: Risk Measurement – Application



IMPACT

2.1. Expected Impact

2.2. Measures to maximize impact

2.3. Communication

2.1. Expected Impact

IMPACT

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Expected Impacts: Contributions - I

Research	FinTech	RegTech
• Network-based scoring; • Machine learning for risk profile matching; • Network-based community and price detection	• Efficient lending; • Efficient asset allocation; • Reliable crypto currencies	• Predictive credit risk models; • Reduced compliance and cyber risk; • Stability in crypto markets

Expected Impacts: Contributions -II

- The EU FinTech Training Platform project addresses a context with many facets and players of different nature active in different areas. It must be based on the existing EU regulation; in this sense several documents have been recently issued by the EC, by the ESAs: EBA, ESMA,EIOPA; by the ECB, and by supranational regulators such as FSB, BIS, IOSCO.
- We will also consider specific national regulations, in the EU and in “FinTech advanced” countries: Switzerland, United Kingdom, United States, Australia, Hong Kong, Singapore,..
- We will also try to capture “expected” regulation, specifically through the members of our advisory board, which will be chosen from international regulatory bodies and related industries.

2.1. Expected Impact

IMPACT

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Measures to maximise impact: Dissemination activities - I

- The project is committed to make its published outputs freely available. This will include research, knowledge exchange and dissemination.
- Concerning research, the project results will be written up in the form of technical reports / working papers to be made available under public repositories. We will also consider publishing the papers in high quality scientific journals.
- Concerning knowledge exchange, we will develop a common syllabus, which aims to constitute a “standard” for FinTech risk management.
- Concerning dissemination, we will organize international research conferences in RegTech and FinTech risk management, as well key industry related conferences in the FinTech sector, through the partnering FinTech hubs

Measures to maximise impact: Dissemination activities - II

- The project will organise **eight one-day workshops** in order to organise full interaction between Universities, Regulators and FinTechs, and to involve the FinTech sector community at large. This to raise awareness about the project objectives, to better understand the needs of the industry across the sector, but also widen the potential user evaluation base.
- Towards the end of the project we will leverage events such as the Digital Finance Europe conference (first edition in Brussels in 2018 organised jointly by B-Hive and the European Banking Federation (EBF)) to disseminate and demonstrate the results achieved by FIN-TECH.

MONTH	ACTIVITY	TARGET
M1	Create website and initial publicity material	General public
By M3, and then every quarter	Workshops	Universities, Regulators and FinTechs
By M3	Start knowledge exchange programmes	University, Regulators and FinTechs
M3-M24	Dissemination of results through scientific publications and presentation at conferences/events	Scientific community, Regulators community, FinTech community at large.
M24	Final Conference, with summary of results	General public

IMPACT

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Communication - I

INTERNAL

→ Clear, timely and inclusive communication within the project partner consortium required to ensure the smooth running of the project and the facilitation of project activities.

EXTERNAL

→ The external audience will include FinTechs, Regulators, Policy makers, as well as the wider public. A formal communication requirement which is included as key task in the project's plan is the formal reporting to the European Commission.

IMPLEMENTATION

3.1. Work Packages and Deliverables

3.2. Management structure and procedures

3.3. Consortium as a whole

3.4. Resources to be committed

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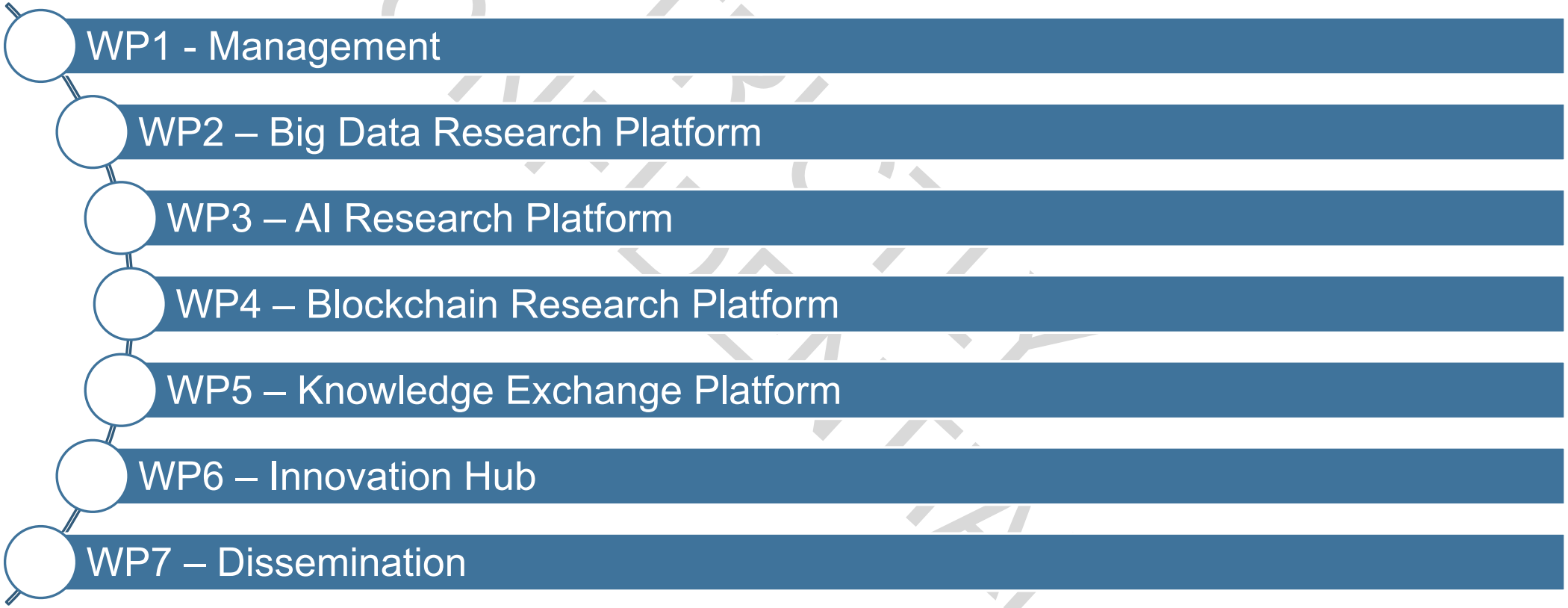
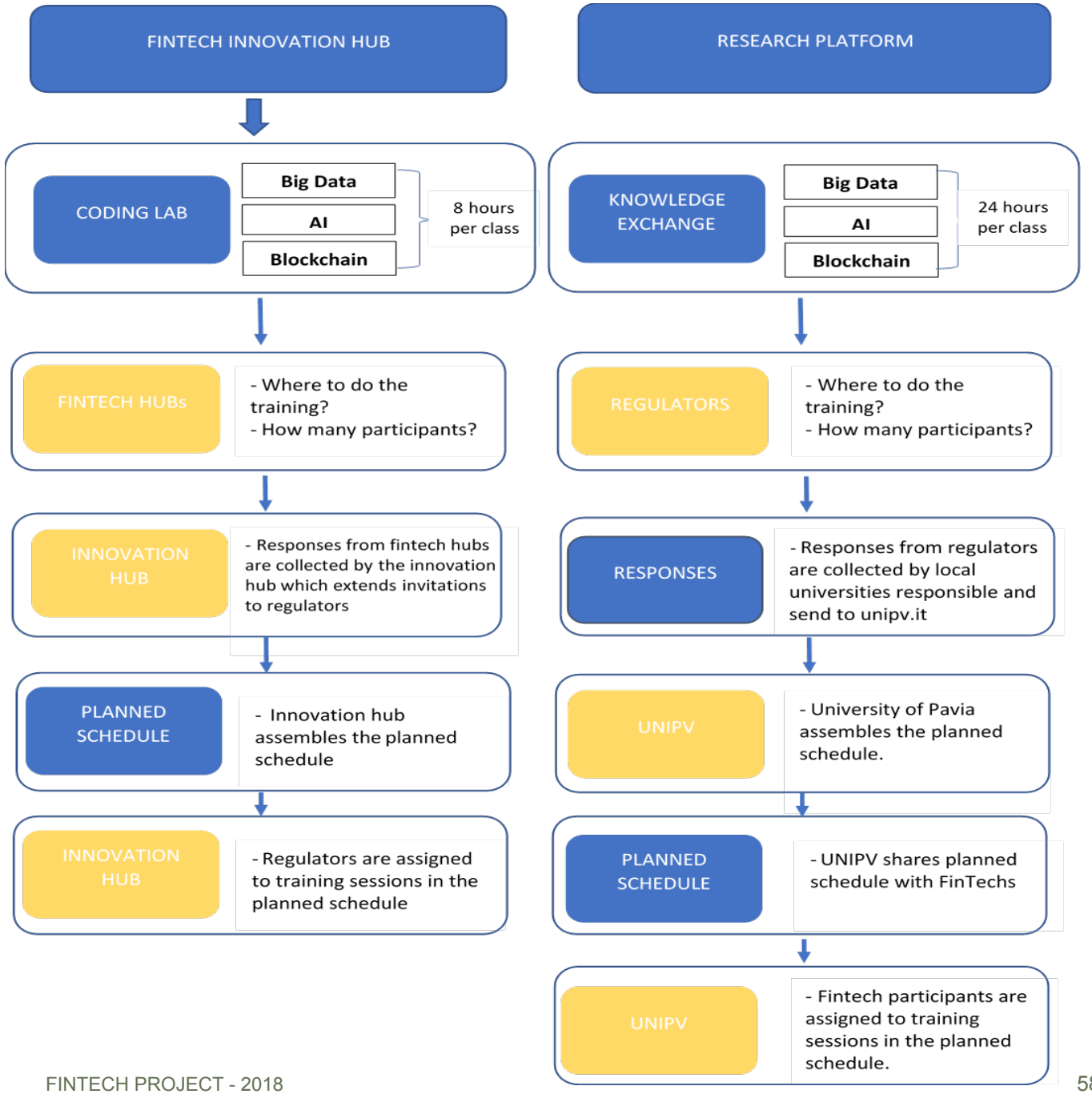
Work Packages and Deliverables – I



Work Packages and Deliverables – II



WP2 – Big Data Research Platform

Date	Topics	Methods
Block 1	Statistical learning	Logistic regression, generalized linear models, predictive accuracy
Block 2	Machine learning	Tree models, Neural networks, Ensemble methods
Block 3	Network science	Systemic risk models
Block 4	Peer to peer lending I	Credit risk and fraud detection models in peer to peer lending
Block 5	Peer to peer lending II	Systemic risk in peer to peer lending
Block 6	Policy impact	Brainstorming to evaluate impact of financial regulation on P2P

WP3 – AI Research Platform

Date	Topics	Methods
Block 1	Statistical learning	Supervised and unsupervised learning
Block 2	Machine learning	Documents and bag of words. Text mining and sentiment analysis.
Block 3	Reg Tech	Automated compliance: text analysis of regulatory documents.
Block 4	Robo Advice	Questionnaire based risk propensity. Asset allocation and compliance risk
Block 5	Cyber risk	Cyber risk measurement
Block 6	Policy impact	Brainstorming to evaluate impact of financial regulation on robo-advisory

WP4 – Blockchain Research Platform

Date	Topics	Methods
Lecture 1	Blockchain models - I	Cryptography, distributed consensus, mining and proof of work
Lecture 2	Blockchain models – II	Blockchain networks, Bitcoin and Ethereum.
Lecture 3	Initial coin offerings	Smart contracts, ICOs and regulation.
Lecture 4	Crypto markets	Exchanges, wallets. Price contagion. Crypto indexes
Lecture 5	Cyber crime detection	Network community detection. Money laundering risk measurement.
Lecture 6	Policy impact	Brainstorming to evaluate impact of financial regulation on cryptocurrencies

3.1. Work Packages and Deliverables

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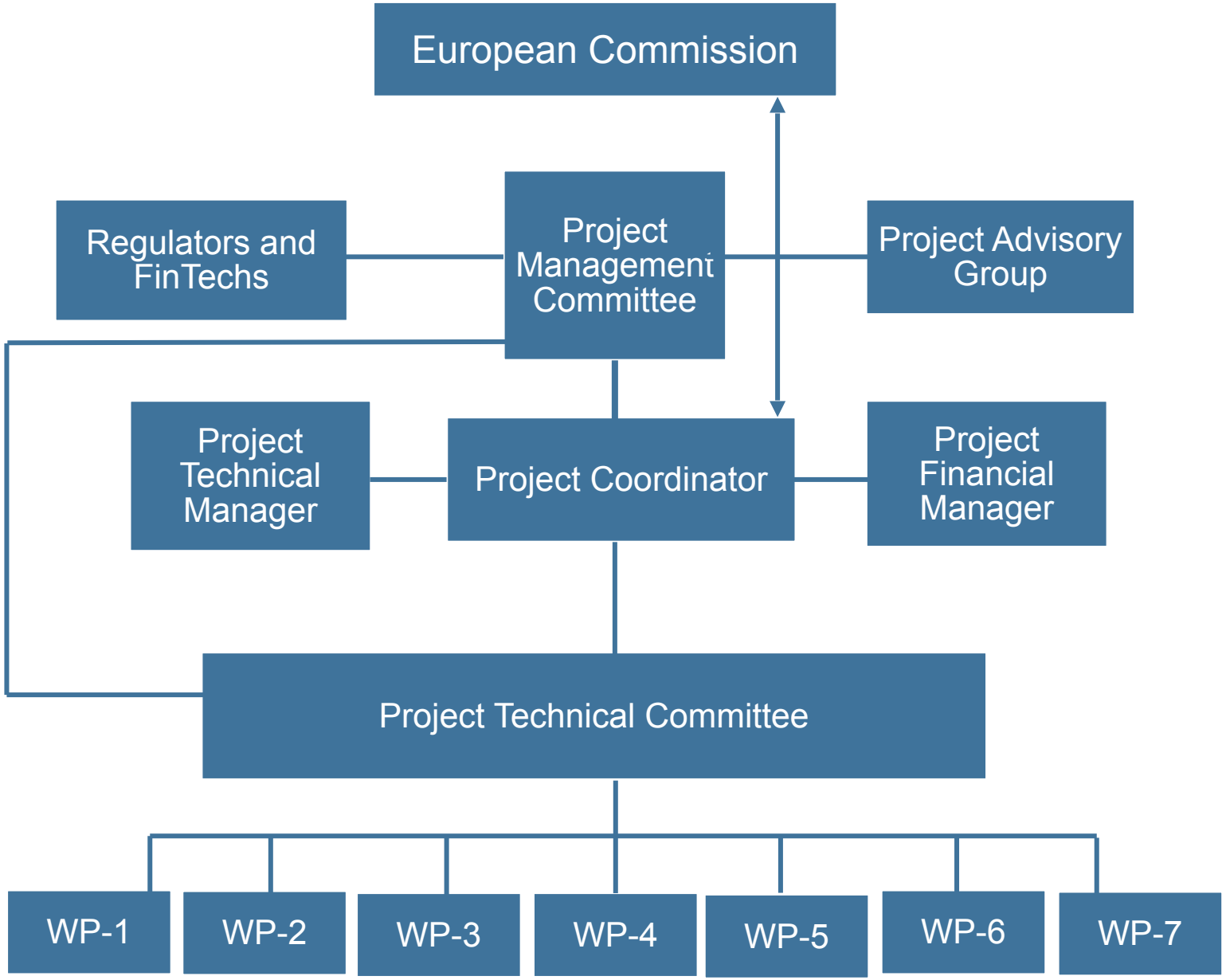
Management Structure and Procedures - I

- The management structures and procedures that will be used in the FIN-TECH project will be based on the experiences of the involved partners.
- UNIPV as Coordinator is responsible for project management, and for the coordination of Universities, their activities with Regulators and their interactions with FinTechs.
- The consortium has already thought of the necessary legal framework for the project (NDA and Consortium Agreement), so we believe that if the project gets selected, these issues will not delay the starting of the project as we expect the Consortium Agreement to be fully negotiated and signed before the grant agreement is signed.

Management Structure and Procedures – II



Management Structure and Procedures – III

3.1. Work Packages and Deliverables

3.2. Management structure and procedures

IMPLEMENTATION

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PARTNERS

FinTech

REGULATORS