

# A Proposal to Repurpose Data as Economic Currency by Delivering a 100% Decentralised Web 3.0 Solution that Gives Data Superior “Valuation” and “Value Store” Properties to “Money”

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## Abstract

Decentr is designed to dramatically improve the security of online data in direct correlation to its generation, reuse and exchange in order to encourage the sharing of open, PSI and proprietary data. Decentr achieves this by creating hyper secure network effects as part of our 100% decentralised “ecosystem”, which decentralises not only *data storage* but also *dataflow*. This is critical in order to maximise the benefits of data generation, exchange and reuse, giving data measurable and hence an exchangeable economic value (non-secure data has limited-to-zero socioeconomic value) as part of our native DeFi features whilst structuring and refining data by default of the valuation process. By doing so, data is automatically assigned the “valuation” and “value store” properties necessary to repurpose data as a legitimate “currency” for an Internet of Value (IoV). This forms the foundational building blocks of a “true” data economy, which underpins Decentr’s open development solution for the building of sustainable, user-centric/consumer-friendly DeFi Dapps.

Decentr achieves this socioeconomic paradigm by decentralising dataflow in the same way blockchain decentralises digital exchanges, replacing money-as-a-medium-of exchange with data-as-a-medium-of-exchange. Our technology and concept fundamentally redefine the relationship between “data” and “economics” by radically repurposing data as both the means and method of transacting online, eliminating the slow and expensive impediment of “fiat-money” for online exchanges. This ensures data never has to be “bought” or “sold” in the traditional sense, freeing up the exchange of data on a voluntary basis. Instead, on Decentr, data itself is generated, reused and exchanged to generate the value necessary to “buy”/acquire more data, as well as other goods and services. Put simply, Decentr creates a socioeconomic paradigm whereby the more data that is refined and structured through generation, reuse and exchange, the more value that is accrued by the data and the data subject who owns, reuses or exchanges it. This creates a sustainable, secure and immutable “data economy” that underpins Decentr’s 100% secure and decentralised DeFi features, including consumer loans and other fintech and personal finance applications, as well as providing an open foundational, networked DeFi Dapp platform for developers.

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# 1. Excellence

Decentr recognises that a “true” **data economy** – one that supports **100% decentralised**, next-generation DeFi Dapps and our native DeFi features – is not viable without a decentralised digital single market – one that is **harmonised** on a global (and not *only* EU) scale. This **global digital single market** must support user-centric fintech features and financial services that are **accessible to everyone**, including loans and banking facilities for the unbanked and undocumented. The **fundamental problem** as regards a new data sharing paradigm to support this goal – a goal underscored by EU and international directives and the needs of individuals, global business and industry – is that no one has yet developed **any realistic approach** to achieve either a “true” data economy or a local or global digital single market. No one – from start-ups to SMEs and large-scale enterprises, legacy tech companies and governments – has even developed a **standardised definition of or approach to** a “true” data economy – let alone developed standardised technology to deliver on its promise.

Decentr is designed to **lay the foundations** for a “true” data economy by creating the **technical, contractual, and compliance** basis for a **global digital single market**, underpinned by our open foundational “decentralised fintech” (dFintech) technology. These aims ensure Decentr addresses **key areas** of industry and governmental concern as regards the emergence of a “true” data economy and the financial and other services that it will support. The EU, for example, has been slow to embrace the development of a **data economy**: as part of a **radical reappraisal** that Decentr undertook into how data is **obtained, stored and exchanged** online we are addressing the “*lack of trusted and secure platforms and privacy-aware analytics methods for secure sharing of personal data and proprietary/commercial/industrial data*”<sup>1</sup> cited by the EU. This reappraisal is critical in order that we continue to develop an approach to data **reuse and exchange** that **assigns socioeconomic value** to data *and hence socioeconomic value* to the *activities* of data subjects (users) *themselves*, favouring egalitarian **wealth creation for every global citizen, business, government, not-for-profit, etc**: this radically-new socioeconomic paradigm forms the **basis** of a **sustainable, secure and immutable** data economy and hence supports the development of sustainable consumer financial products, including DeFi Dapps and our native DeFi features.

Decentr achieves this socioeconomic paradigm by **fundamentally redefining** the relationship between “**data**” and “**economics**”: our technology achieves this by radically **repurposing data** (in true **Internet of Value [IoV]**<sup>2</sup> fashion) as *both* the *means and method* of transacting online, *eliminating* the slow and expensive impediment of “fiat-money” for online exchanges. This ensures data never has to be “**bought**” or “**sold**” in the traditional sense, **freeing up** the exchange of data on a **voluntary basis**. Instead, on Decentr, data *itself* is reused and exchanged to **generate the wealth** necessary to acquire/“purchase” **more data**, as well as **other goods and services**. As our R&D for Decentr has demonstrated, the **only workable approach** to creating a “true” data economy is the elimination of the **time- and resource- intensive** pursuit of a third-party **medium of exchange** (i.e., “*money*”) to “buy” data **in favour of** proactive, socially beneficial **data-generation-as-value-creation**.

## 1.01 Secure Data Storage and Sharing: The Key to a “True” Data Economy

The key analogous precondition to freeing up data reuse and exchange is dramatically enhanced data security: Decentr’s open source **data storage and sharing** solution, a radically-new type of **decentralised platform**, is addressing data security for individuals and industry in line with all relevant EU and international legislation, directives and guidelines. Our technology addresses the findings of the **2017/2018** consultation on the review of **Directive 2003/98/EC on the reuse of PSI (PSI Directive)** that requires development of radically-new **ICT and other technology** solutions and protocols to urgently **overcome** serious data sharing **limitations** with existing platforms, while conforming to the EU’s Open Research **Data Policy** and **Digital Single Market strategy**, encouraging **Public Sector Information (PSI)** and private data sharing as part of a foundational building block for a “true” data economy.

To achieve this, while dramatically improving security, the pilot programme-ready prototype that this project will deliver **fundamentally re-purposes** existing data and data usage by aligning our platform’s **method of**

<sup>1</sup> Ec.Europa.Eu ICT-13-2018-2019 - Funding & tenders - Europa EU

<sup>2</sup> The “Internet of Value” (IOV) refers to an internet whereby the exchange of information *and* value occur at the same speed.

**data storage** with the **method of data exchange**. This realignment is a **critical foundational building block** for a true data economy, largely because it **simultaneously improves** data security: our **Research & Development (R&D)** for Decentr has revealed that this misalignment underscores the **fundamental** data storage and sharing problem that needs to be addressed to **unlock data** for public and commercial reuse, hence giving data much greater value. The fundamental problem is that **security of current data storage solutions** is *directly compromised* by current **data sharing methods** (and vice versa). In other words, the **more secure** the data storage solution on current platforms the **harder it becomes** to integrate data with other applications, whereas the **more efficient** the data sharing method the **harder it is** to secure the data being shared *as well as* being harder to secure the **ID and other sensitive details** of the sharer. We term this unworkable disparity the “**data storage/sharing paradox**”.

## 1.02 Overcoming the Data Storage/Sharing Paradox

This **seemingly insurmountable** paradox is the *direct cause of* the **lack of secure platforms** and privacy-aware analytics methods for all forms of data, degrading the quality of data and hence its value. Decentr comprehensively addresses this paradox, drastically improving **secure and immutable**, decentralised data storage by aligning the **method of data storage** with the **method of data exchange**; i.e., on Decentr **data storage** is **decentralised** (as with any blockchain data storage solutions) but on Decentr the **method of exchanging** data between **data users and data distributors** is *also decentralised*: this changes the way data is **perceived and used** through the 100% decentralisation of *all* data across *all* Decentr **storage, reuse and exchange** applications. This has **dramatic security implications** for users: on Decentr, **each dimension** – data storage and data sharing – **redoubles** the security and veracity of the other through *increased* data storage, reuse and exchange. This is due to the employ across our multidimensional platform of overlapping, **multi-layered decentralised security protocols**, including our industry-leading AI security protocols, all of which combined solve **the data storage/sharing paradox** as the **foundational building block** for a data economy.

## 1.03 Revolutionising Industry: Data as the Means and Method of Value Transfer

The **solution to this paradox** has been recognised by our **business and industry partners** as being critical to the rapid digitisation of industry due to the open nature of our technology meaning industry digitisation will be *simultaneous* with consumer uptake, creating hitherto unheard of **network effects**; this is due to the fact this simultaneous uptake fulfils the **primary criterion** of a sustainable data economy: i.e., on Decentr the activities of data subjects/data suppliers become **indistinguishable as part of** this new economy; they become the *same person*; creating **socioeconomic equality** and wealth creation opportunities for every citizen and business.

This freeing up of personal and PSI data is primarily made possible due to Decentr’s immutability: by deploying Decentr’s **security algorithms and protocols**, this will create a hyper secure suite of data storage and exchange **tools and features** that (**contrary** to current data storing solutions) *increases* personal and industrial security **in direct correlation with** the amount of data that is re-used and exchanged; i.e., the **more data that is exchanged** on Decentr, the **more secure** the data *and its source ID* becomes. This next-generation immutability, coupled with data as *means and method* of transacting, attracted our **bank/PSP** partners, including the world’s **#2 payments provider**, who confirmed the importance of a **near-instant, decentralised global data solution** in their and analogous industries – not only as regards **ID-verification** but also as way of making **time and cost-effective** cross-border transfers, our bank/PSP partners are committed to the **development and deployment** of our solution in the Spanish/Latin America and Caribbean (LAC) territories in which they operate. Our platform prototype will be pilot programme-ready (M35) for an **international pilot programme** with our bank/PSP partners and their networks, and other stakeholders.

1.1 Objectives

Decentr PROJECT OBJECTIVES	
O1	Develop a pilot programme-ready prototype for our radically-new, decentralised technology (platform + web browser), called Decentr that is compliant with legislative guidelines and directives on the <b>sharing and storage</b> or <b>personal and proprietary</b> data.
O2	Complete Decentr’s <b>native AI</b> (CTE 4), called DecAI, for integration with the Decentr platform. DecAI is a radically-new Deep Learning (DL) Artificial Neural Network (ANN) that is set to offer vast improvements over any existing AI, due to its ability to understand the <b>topological and dynamical</b> principles that underpin our networked platform.
O3	Complete our <b>interdisciplinary</b> socioeconomic and science and humanities (SSH) research (WP1, WP7) in order to ensure – in conjunction with wider <b>dissemination and communications</b> activities – that revised legislation and relevant directives are informed by a sound <b>socioeconomic framework</b> .
O4	Launch pilot programme for Decentr prototype with commercial and other stakeholders.

O1	<p><b>Develop a pilot programme-ready prototype for our radically-new, decentralised technology (platform + web browser), called Decentr that is compliant with legislative guidelines and directives on the sharing and storage or personal and proprietary data.</b></p> <p><b>0.1.1.-</b> Continued interdisciplinary research of Decentr platform compatibility (<b>Core Technology Elements [CTE]</b> 1, 2, 3 and 4; with <b>TRL 5 proof-of-concept [POC]</b>; CTE 1] in back end testing) with existing web browsers, including Chrome and Firefox.</p> <p><b>0.1.2.-</b> Development of Decentr’s radically-new <b>consensus mechanism</b> (M31; CTE 2), which is based on an <b>n-dimensional chain</b>: this consensus mechanism assigns value – both <b>social and economic</b> – to the <b>exchange and reuse</b> of data by engaging users in exchanges based on platform-wide <b>cooperative-game theory</b>. In this way, Decentr encourages the proactive, <b>socially responsible</b> storing and sharing of data in the context of our networked <b>socioeconomic data economy model</b>; a model that allows for data to be <b>bought and sold</b> with other data, which is exchangeable for currency as part of our unique suite of features.</p> <p><b>0.1.3.-</b> Development and testing of Decentr’s <b>Multi-Factor Authentication (MFA)</b> layer (in conjunction with CTE 2 consensus mechanism). This user layer deploys the <b>highest possible privacy settings</b> (using pseudonymisation or full anonymisation for enhanced privacy-aware analytics, where appropriate) with encryption capability, coupled with randomised, AI-enhanced automatic algorithmic ID challenges to create a radically enhanced MFA layer.</p> <p><b>0.1.4.-</b> Development of Decentr’s <b>native currency exchange</b> (M27; CTE 3) to ensure compatibility with platform/economic model. This will ensure our <b>economic model</b>/native exchange allows for <b>individuals and industry</b> to not only <b>maintain control</b> over ownership of their data in line with <b>GDPR</b> compliance but also to realise its inherent <b>economic potential</b> as a <b>digital asset</b>, ushering in a true <b>data economy</b> based on sound socioeconomic, commercial, SSH, legislative and technology principles. Our native token is Securities Exchange Commission (SEC) compliant as a <b>utility token</b> in line with the “Howey Test”<sup>3</sup>.</p>
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O2	<p><b>Complete Decentr’s native AI (CTE 4), called DecAI, for integration with the Decentr platform.</b></p> <p>dAI is a radically-new <b>Deep Learning (DL) Artificial Neural Network (ANN)</b> that is set to offer vast improvements over any existing AI, due to its ability to understand the <b>topological and dynamical</b> principles that underpin our networked platform. In effect, due to Decentr’s decentralised networked creating a <b>causal environment</b>, DecAI is able to <b>understand and learn from</b> the processes of <b>human ideation</b>. This gives our AI unique “insight” into the principles and ideas behind <b>data generation</b>, and hence allows DecAI to offer greater insights into the exchange and reuse of this data, vastly increasing <b>data security</b> (and hence</p>
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<sup>3</sup> Sec.gov. (2019). *SEC.gov / Digital Asset Transactions: When Howey Met Gary (Plastic)*. [online] Available at: <https://www.sec.gov/news/speech/speech-hinman-061418> [Accessed 16 Mar. 2019].



data value) across our network.

**0.2.1.-** Interdisciplinary research of DecAI **Application Programming Interface (API)** compatibility with existing **open data and data marketplaces**. This capability will ensure DecAI is subsequently able to track the exchange and reuse of data across our decentralised network, and in conjunction with our consensus mechanism continue to **track and modify** the inherent value of the **original source data** and the subsequent value given to this data through exchange and reuse.

**0.2.2.-** Develop the DecAI **public interface** (in conjunction with UI/UX), which will allow users, both individual and industry, to access all DecAI’s data sharing insights, as well as interact with our AI to address specific **data sharing** queries users may have. For example, users will be able to ask DecAI to **instantly access** all information on a particular subject – for example, “buy-to-let mortgages” – and not only discover the most suitable mortgage based on user-defined **data points** but also track the **historic data** on the mortgage product(s) (and the recommended company(ies) selling it).

**0.2.3.-** Testing of DecAI **security protocols** to ensure security is dramatically enhanced across three critical domains: ***national, domestic and personal security***. Enhanced security across these multi-domains will be achieved by developing a **single-system AI** that is self-regulating within the context of *human/AI interaction*; as a result, DecAI will act as a **self-updating regulator** within its **own evolving system** (our platform).

03

**Complete our interdisciplinary socioeconomic and science and humanities (SSH) research (WP1, WP7) in order to ensure that legislation and relevant directives are informed by a sound socioeconomic framework.**

**0.3.1.-** Publish and disseminate two complementary in-depth White Papers (as well as periodic reports; WP1, WP6, WP7) – in conjunction with wider dissemination and communications activities – in core areas of 1) **technological development** (*as part of* 0.1.1, 0.2.1.) and 2) **SSH/ethical/legal/compliance implications** of our work, which act as “umbrella” WP tasks (T6.2, T6.3) that will be developed in parallel with technology development.

**0.3.2.-** Promote ongoing research into legal, ethical and social aspects with experts, internal and independent experts. This research will highlight the advantages/features/barriers inherent to this technology to foster large-scale adoption of our technology. This forms part of our SSH/ethics whitepaper (0.3.1), as well as promoting **legacy research** into these and other legal and compliance aspects.

**0.3.3.-** Communicating with **data providers** including our PSP/commercial partners, and other PSI, private and commercial data providers and marketplaces across multiple industries and domains. This is with a view to generating a **critical mass of experts** working in R&D activities related to this technology, as part of our communications and dissemination strategy, while enrolling strategic actors, including SMEs, in technology development, pilot programmes and other **commercially exploitable** applications.

04

**Launch pilot programme for Decentr prototype with commercial and other stakeholders.**

**0.4.1.-** Demonstrate **completed Decentr prototype** to PSP commercial partners (M33), and interested VCs and selected private investors. Respond to any modifications required by stakeholder and other feedback.

**0.4.2.-** Launch pilot programme in conjunction with commercial partners (M35), piloting international **ID verification** for money collection (an urgent problem that our bank/PSP partners **have identified** Decentr will solve for individuals and industry). This is ahead of full-scale piloting of **data-only** currency exchange, which is **critical** as it will demonstrate our concept on a rapidly scalable, commercial scale. Whereby a bank is able to offer **inexpensive transfer services** by using **secure and immutable** client data as both the **means and method of sending transfers**, this will demonstrate the viability of our technology to form a critical **foundation block** of a true data economy.

## 1.2 The Key to a “True” Data Economy

### 1.2.1 Improved Personal and Proprietary Data Security Protocols: The Key to a “True” Data Economy

Decentr creates hyper secure network effects that are critical in order to **maximise the benefits** of data exchange and reuse, giving data measurable and hence a **tradable** value (**non-secure data** has limited-to-zero **socioeconomic** value) whilst **structuring and refining** data by default of the **valuation process**. By doing so, data is automatically assigned the **value store capabilities** necessary to repurpose it as a legitimate “currency” for a “true” IoV, providing the incentive to potentially free up vast amounts of **proprietary, commercial and industrial data** for reuse and exchange. This is consistent with encouraging the sharing and reuse of **closed and personal data** due to **improved security and increased data value** that is assigned to the data exchanged by our consensus mechanism.

Decentr has demonstrated that assigning **data value** is intrinsic to promoting the **improved security** of data storage and sharing as it underwrites data integrity. Our R&D continues to demonstrate that until our foundational technology – a technology that **encourages and incentivises** wider data sharing in line with **enhanced security** – is deployed, the development of trusted and secure platforms and privacy-aware analytics methods will **continue to fragment**. As a result, secure sharing of personal and proprietary data will continue to become **more fractured**: current systems security protocols, including **HATDex, Ocean Protocol, Essentia.one, pCloud, iCloud, Google Drive, SpiderOak** (and many more similar solutions) function, to a greater or lesser extent, to **isolate users inside data silos and siloed communities**, effectively “walled in” by their **own data**. This is due to data-walling being the **default security protocol** employed by current platforms to “protect” user data: this approach (which is the only approach currently being pursued by any tech company, developer or ICT/Big Data company) to securing closed and proprietary data actually works **against the principles** of a true data economy, and is hence the primary issue Decentr addresses.

#### 1.2.2 A Decentralised Data Economy: Implementing our Radically-New Technological Paradigm

Our platform is a game-changing type of **hyper secure** post-blockchain application that creates an immutable and secure, integrated **data storage and sharing** solution for individuals and industry. Decentr achieves this by implementing a system of **layered security protocols** based on a radically-new software architecture that combines **Elliptic Curve Cryptography (ECC)**<sup>4</sup> and **Sobol sequencing** with a **n-dimensional chain** as part of our AI-enhanced, platform-wide community **consensus mechanism** – a mechanism that assigns mutually agreed value to **data and user security protocol upgrades** (further encouraging enhanced data integrity) by deploying a **Delegated Proof of Stake (DPoS)** protocol. Consequently, our technology actually **increases data security**, both closed and proprietary, the **more a user reuses and exchanges data**, creating an immutable, secure open platform on top of which commercial and non-commercial platforms can build out their data solutions **in conjunction with** the Decentr community.

Solving the **data storage/sharing paradox** is critical to the future of the data economy: without the introduction of Decentr’s solution to **secure data storage** while promoting safe, secure and immutable **data sharing**, data storage and privacy-aware analytics will continue to be retarded by the siloed nature of existing security protocols – protocols that are limited either in **scope, application or replication**, or a combination of all three. Consequently, without our solution, the number of platforms (including data marketplaces, sharing spaces etc) that continue to be built on the current internet in an attempt to catalyse a **safe, secure and immutable** data economy will – and we are *already* seeing this happen – **continue to** unwittingly **accelerate** the **entropic degradation** (and hence value) of the very data they are trying to secure and protect. This is due to increasing **fragmentation** of the wider internet greatly worsening **data sharing** and analogous **security** and other problems due to hyper centralisation of the large tech companies.

Even the **International Data Corporation (IDC)**, which is a provider of market intelligence, advisory services, and events for the information technology, telecommunications, and consumer technology markets

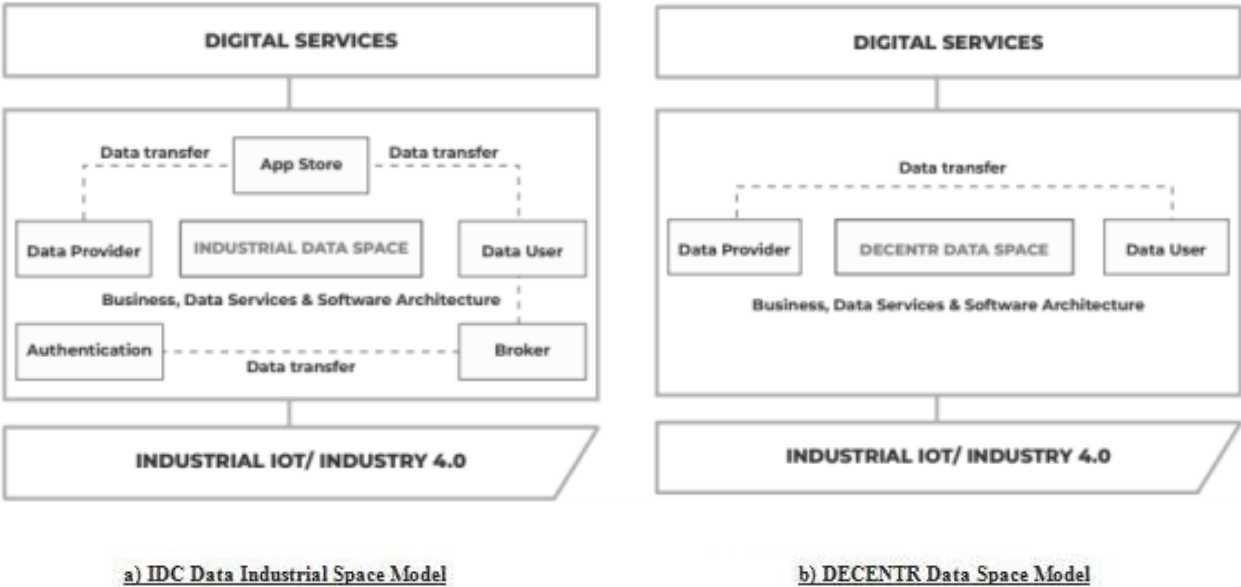
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<sup>4</sup> K. Koyama, U. Maurer, T. Okamoto, and S. Vanstone, “New Public-Key Schemes Based on Elliptic Curves over the Ring  $\mathbb{Z}_n$ ”, *Advances in Cryptology - CRYPTO '91*, Lecture Notes in Computer Science, Springer-Verlag, vol. 576, Aug 1991, pp. 252-266.

cannot see past current approaches to the implementation of a “true” data economy, limiting their scope to the creation of more “markets”. The IDC’s model of an **Industrial Data Space (IDS)**, which is analogous to B2B/B2C data spaces, is compromised by too many **incompatible layers** to ever be stable, scalable, sustainable and secure: these layer include **Data Providers**, **Data Users**, i.e., all data space participants receiving and using the data generated by data, **Data Brokers**, acting as physical and virtual mediators between data providers and data users, **App Store Operators** and a **Certification Authority** (see Figure 1). This means the reuse of **potentially valuable** data in conjunction with the digitisation of EU industry as part of a **digital single market** will with current approaches continue to be severely hampered due to diminished network effects, whilst the continued development of **Knowledge-Based Capital (KBC)** as a valuable resource for SMEs and multinationals – especially in many OECD economies – will be greatly restricted by the same limitations.

**Fig. 1 Comparison of IDC/Decentr Model of an Industrial Data Space**

The Decentr Data Space Model (illustration b) is the same for individuals and industry: this removes the need for Data brokers, App store operators and a Certification authority, leaving only Data providers and Data users (who will increasingly play dual roles as both) to reuse and exchange data via the immutable, decentralised Decentr network.





### 1.2.3 Trading and Valuing Data: Why the Data Economy Revolution has not Happened Yet

The reason the data revolution has not happened yet is **twofold**: data (being mostly in an unrefined and unstructured form) is **hard to trade** and even **harder to value**; until these two issues are reconciled in the way Decentr proposes, in order to make them more secure and easier to **reuse and exchange**, a true data economy will continue to remain out of reach. The potential is there: the data economy in the EU alone is estimated to have had a value of almost **US \$400 billion** in 2016 and is projected to more than double by 2020 reaching **US \$939<sup>5</sup> billion**. Globally, it is estimated that better access to data can help unlock at least **US \$3-5 trillion** in global economic value<sup>6</sup>, which represents an increase of **2-5%** of the gross world product. Yet, despite this, the EU has been “*slow to embrace [the data economy’s] development*”<sup>7</sup> – underscoring what the true potential might be.

### 1.2.4 Why the Data Storage/Sharing Paradox is Hindering the Explosion of a “True” Data Economy

The problem with the creation of a “data economy” is partly one of definitions: current data exchange platforms, including *open* (such as social media platforms), *open public* (such as Gov.uk and similar EU initiatives amongst Member states that comply with **Directive 2013/37/EU** to make information available for reuse) and *paid private/public* (such as **LexisNexis** and **Datastreamx**) offer little more than **datasets** for public and commercial reuse: this is **not a solution** to a “data economy” as they do not address issues of **security and immutability**. A digitised service that offers the **re-sale** of marketing, statistical and other kinds of data, no matter how comprehensive and well-regulated, does not contain the **elements** of an “economy” in any real sense (any more than does a “dairy products” economy or an “aerospace components” economy): it is simply another type of B2B/B2C service, misnamed and misunderstood. What needs to be apprehended and addressed is that the **exchanging** of datasets – however widespread and accessible – will **not lead to** a true data economy until Decentr deploys the technology to **store data securely** while at the same time encouraging its **exchange and reuse** by dramatically **improving security protocols** in an exponential curve *relative to* the **amount** of data exchanged. Fundamentally, then, our platform is designed to ensure that – as noted in the Topic Description – “*specific attention [is] put on involving SMEs and giving them access to data and technology*” while ensuring that as “*IT standardisation faces new challenges as technologies converge and federated systems arise, creating new gaps in interoperability*” **data storage and sharing and other protocols** across our integrated Dapp solution **comprehensively address** them. This is in conjunction with a **federated systems approach**<sup>8</sup>, which may allow sharing models (uncovered information from data) instead of raw data, benefiting exchange without compromising personal data or other privacy issues.

<sup>5</sup> Digital Single Market - European Commission. (2019). *Final results of the European Data Market study measuring the size and trends of the EU data economy - Digital Single Market - European Commission*. [online] Available at: <https://ec.europa.eu/digital-single-market/en/news/final-results-european-data-market-study-measuring-size-and-trends-eu-data-economy> [Accessed 16 Mar. 2020].

<sup>6</sup> McKinsey & Company. (2019). *Open data: Unlocking innovation and performance with liquid information*. [online] Available at: <https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/open-data-unlocking-innovation-and-performance-with-liquid-information> [Accessed 22Feb. 2019].

<sup>7</sup> Mayerbrown.com. (2019). *A New Data Deal for Europe | Mayer Brown*. [online] Available at: <https://www.mayerbrown.com/Files/News/825879d1-6355-4235-ae2d-f2fe9144a335/Presentation/NewsAttachment/912cb16d-f749-4de1-bd5c-f57f5887b1c4/The-European-Files-Building-the-european-data-economy-Sept-2017-Issue-48.pdf> [https://ec.europa.eu/commission/priorities/digital-single-market\\_en](https://ec.europa.eu/commission/priorities/digital-single-market_en) [Accessed 16 Mar. 2019].

<sup>8</sup> Mengusoglu, E., Pickering, B. (ACM 2007). Automated management and service provisioning model for distributed devices. In: *Proceedings of the 2007 workshop on Automating service quality*: Held at the International Conference on Automated Software Engineering (ASE). pp. 38–41.

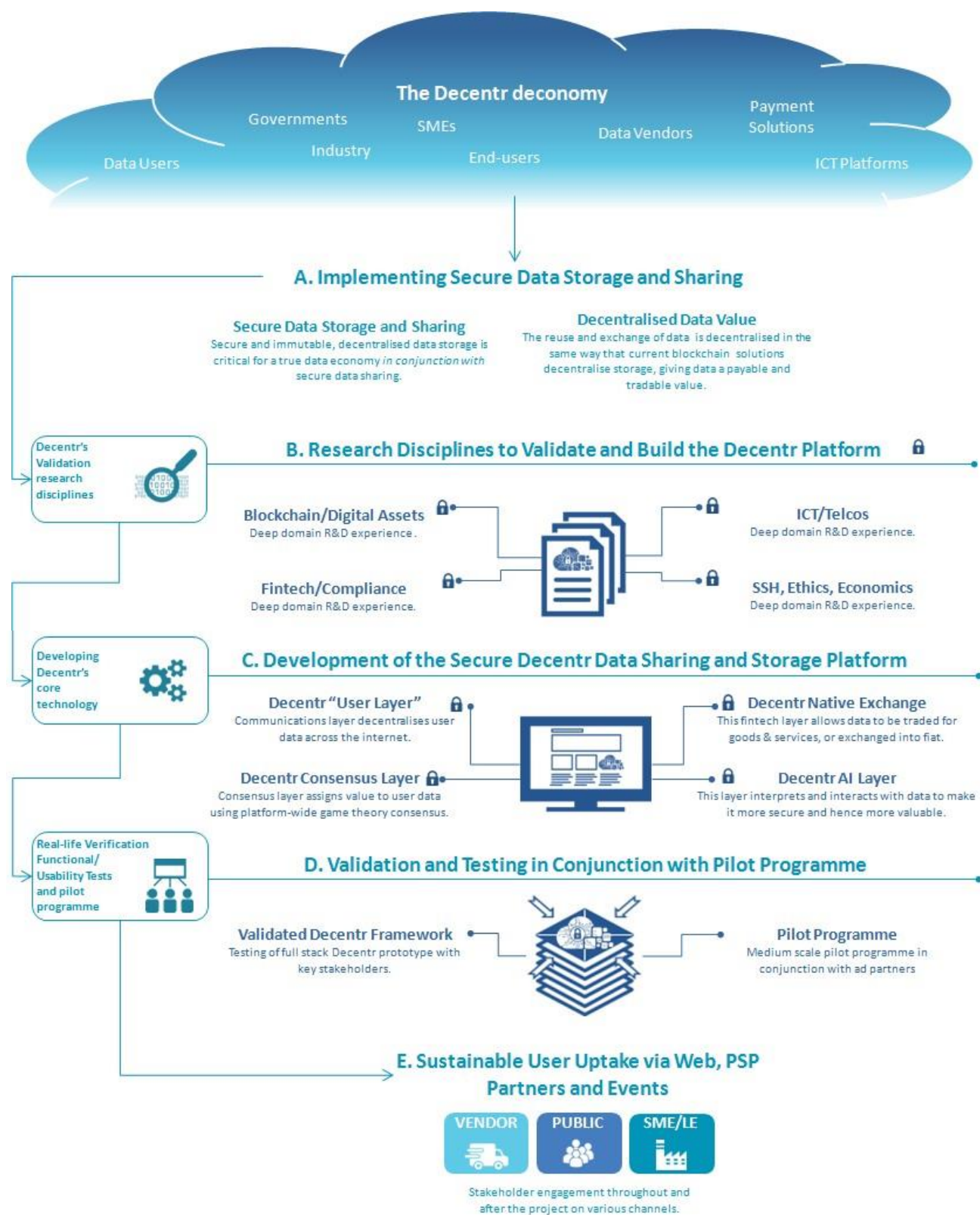


Fig. 2 Decentr Project Concept

## 1.3 Concept and Methodology

### (a) Concept

#### 1.3.1 Decentralising data exchange and storage to create data value for individuals and industry

##### 1.3.1(a) Core design features

Decentr aims to release the full potential of a true data economy by building a secure, open platform that decentralises current centralised **data exchange** systems in the same way **blockchain solutions** decentralise **digital trades**, solving the **data storage/sharing paradox**. This will allow data to be **securely stored, reused and exchanged** as part of a true data economy. By way of clarification of our use of the term “decentralisation”, we are using it in the classical sense of a **decentralised** system being a subset of a larger **distributed** system (Figure 3); i.e., the method of data exchange is decentralised as part of a wider distributed network (by way of analogy with the distribution of Ethereum, for example, being decentralised whereas payments made in Ethereum [ETH] are part of a larger distributed network). In order to understand how we achieve this decentralised and distributed **dataflow**, it is necessary to **reappraise the hype** surrounding the most common form of “decentralised” technology – blockchain – and understand its limitations and strengths as applied to data storage and sharing solutions.

The **technological paradigm** of blockchain was introduced to deliver on the promise of a data economy by creating the framework for a “true” IoV; however, in its current incarnations it is proving to be neither **technically nor conceptually** up to the task in the way that was hoped. Decentr takes a radically-new approach to decentralisation. Our platform will solve the two primary issues as regards large-scale scalability:

- 1) *Mainstream adoption*, and;
- 2) *Transactions Per Second (TPS)*.

As a result, Decentr not only functions as open software on which individuals and industry can build integrated data storage and sharing solutions but also, critically, our technology *simultaneously* functions as a **decentralised “user layer”** for the current internet. This user layer will ensure Decentr is agent-centric, fun and safe while actually **improving on** existing internet usability. In a similar way that Windows and web browsers function as a “user layer” for HTML internet to **contextualize and retrieve information resources** and display them on a user’s device, Decentr is designed to contextualise the data stored on our foundational decentralised technology by decentralising its access, reuse and exchange. This will encourage the reuse of open, personal and proprietary data in line with enhanced data security protocols, including industry-leading privacy-aware analytics methods that give control over personal data to individuals. This will simplify compliance with the **General Data Protection Regulations (GDPR) (EU) 2016/679** for international business while “*establishing trusted networks where data can be transferred, accessed, and used in a secure mode*”<sup>9</sup>. This will be achieved by **overcoming the limitations** with existing, non-secure platforms through the integration of our radically-new, decentralised web browser add-on and internet user layer with the existing centralised internet: in effect, Decentr and the current internet will be complementary facets of a Next-Generation Internet (NGI).

The **key difference** between Decentr and current web browsers is that on Decentr, all user activity is immutably recorded, and this data is assigned a **fluctuating value**. This value is arrived at by **community consensus** (which is based on cooperative-game theory), whilst all **exchanged data**, public, private and open, is distributed in a decentralised manner, also **accruing value** through reuse. Decentralised data sharing **exponentially increases** the *value* of this data while exponentially increasing data and user *security* due to Decentr’s security protocols being based on integrated topological protocols that enhance security by **masking user details** behind interlinked Decentr cloud (dCloud) network data. Decentr **further enhances** the online browsing experience by providing a convenient “one-stop shop” suite of features, including online transactions, an **immutable and secure**, digital ID and wallet and decentralised communications, data sharing and social media services. Individual users engage with each other, businesses and the wider internet by signing up to Decentr to search and browse the web with our add-on, which is similar to “wallet browsers” including **MetaMask**, **Toshi** and **Cipher** in that it allows web browsers, including **Chrome** and **Firefox**, to communicate with our platform. A user’s ID is informed by the **information/activity recorded** as data and can be used for ease of identification/transacting, with all data stored for later retrieval, reuse and

<sup>9</sup> Veronesi, L. and Cattaneo, G. (2017) European Data Market SMART 2017/0063, Industrial Data Platforms – Key Enablers of Industry Digitization, *D 3.10 Quarterly Stories – Story 10*, Luxembourg: IDC.

exchange in any manner a user chooses.

No single App or Dapp (or patented technology) offers these combined services with **safe, secure and immutable, decentralised** internet browsing capability. This **decentralised capability** is critical due to the primary source of data degradation being the **friction created** by the hypercentralised control of data that is exercised by the large, incumbent **technology and data** firms. Considering that centralised systems account for *all* online communications and data sharing platforms this means that individuals and industry can currently **only access** and build *centralised* data sharing “solutions” – which are actually **contributory “problems”** as they data-wall in users – with no alternative of any kind (and none in development or even suggested).

### 1.3.1(b) User Interface Design/User Experience Design (UI/UX)

The integration of world-class UI/UX into Decentr **from the outset** is critical to the **user experience (UX)** and hence rapid user uptake: this adheres to **Steve Job’s famous maxim** of “*starting with the customer and working your way back to the technology*”: UI/UX are both elements that are **crucial to a product** and work closely together to further enhance the user experience. While UX can be considered as a conglomeration of tasks focused on the optimisation of a product for **effective and enjoyable use**, UI is its complement; the look and feel, the **presentation and interactivity** of a product.

With this in mind, our UI/UX partner, the **UK’s #1** design agency, is an industry leader in **both fields**: this combination of skills is critical in order to ensure rapid **mainstream uptake** of our product. What places our UI/UX partner at the **forefront of their field** is that their UI/UX designs are guided by the principles of **cognitive science**, taking into account the idiosyncratic nature of human ideation along with the **limitations and biases** that underpin human decision-making. This UI/UX cognitive science bias is critical to Decentr, due to the fact the **core design architecture** of our platform, including our **communications layer** (CTE 1), **consensus mechanism** (CTE 2) and **AI** (CTE 4) are also based on **psychosocial and cognitive science** principles, whereby these apply to **human communications and interaction**, and the wider **human/AI interpretations** of these actions. Our UI/UX partner’s involvement with every aspect of the design of our desktop and mobile user interfaces will thus ensure a fully intuitive experience across the Decentr network that users will immediately **take for granted** as the **default 21<sup>st</sup> Century, human-centric** internet user experience.

## 1.3.2. Decentr: From Idea to Application

### 1.3.2(a) R&D Assumptions Underpinning Decentr

The Decentr project is based on the **core assumption** that it is possible to design, build and deploy a **genuinely decentralised** communications layer that can decentralise the **storage, exchange and reuse of data** in a way that **exponentially increases** the security of this data. Decentr further assumes that the opt-in exchange and reuse of this decentralised data is **networked** amongst targeted users in such a way that our radically-new **consensus mechanism** can assign a **socioeconomic** value to these exchanges while further enhancing security. One further assumption has to be made for this project to be viable: it has to be assumed that this data is also networked in such a way that an AI can “understand” through the **topological and dynamical** principles created by decentralised data reuse and exchange the processes of **human ideation**. In this way, our AI, called DecAI, is – in conjunction with human users – set to learn the **intellectual processes** of human thought creation. DecAI is able to utilise these processes to track and model potential malicious actors and malware, and flag these to human users. As a result, these AI- monitored **security protocols** are in line with – not only **legislative and regulatory** best practices – but also human **ethical and moral** principles. DecAI will by default adopt these principles due to the **democratically aligned** nature of human-generated data (that our AI is trained on) – data that is exchanged and reused as part of our **causal** data storage and sharing solution.

The Decentr team accepts the above assumptions, on first analysis, more closely resemble **science fiction** than science fact – but this resemblance is **only possible** to assert if these assumptions are seen in the context of the **severe limitations** imposed on data **exchange and reuse** by current technology and research approaches and practices. All current approaches are **non-causal** and hence contain **severely restrictive, in-built network limitations** – restrictions that are actually *designed* to be that way, and further designed to become increasingly **more restrictive** the more a user uses them: this is with a view to – ostensibly, anyway – “*improving*” security. Also accepted, there **has never been** any technology or approach – developed or even suggested – to create a “decentralised” communications layer; the parameters for such technology are wholly unknown due to the lack of **interdisciplinary insight** into the underlying **conceptual, technology, psychosocial, economic** and other R&D challenges. Consequently, to fully appreciate why the above



assumptions are not only **urgent and necessary** to deploy but are within the **scope of this project**, it is necessary to appreciate that we have undertaken the core research and developed a **TRL 5 POC** (in back end testing) of our CTE 1 – this CTE proves *in practice* the viability of the core **decentralised communications** technology. In short, a true decentralised user layer for the current internet is not only *viable* and desirable – as evidenced by the intense commercial interest in our solution – but we have *built one*. This significantly impacts **risk mitigation**, as all other required technologies are adapted from **existing paradigms**, which is why, fully funded, we can complete a **pilot programme**-ready platform in 34 months from inception of program [*with 10 months remaining as of V2.1 April 2020*].

**1.3.2(b) Our TRL 5 Technology: Fulfilling the Assumptions Underpinning the Decentr Project**

Functioning as a user layer for a blockchain-based NGI, our TRL 5 technology is capable of decentralising **dataflow**, including the exchange and reuse of **all online data, including information, digital transactions, communications and social engagement** across our platform. This is in contrast to all current “decentralised” communications platforms that are only capable of decentralising the *storage, updating and access of information*. Because of the **centralised limitations** of internet data storing and sharing platforms, all attempts to “decentralise” communications using current blockchain solutions are compromised by the same, seemingly insurmountable paradox: “decentralised” social media/communications platforms demonstrate the **data storage/sharing paradox in practice**. Where a centralised communications platform – relevant examples being **Obsidian, Diaspora and Akasha** – is built on top of blockchain, security inevitably **increases in direct correlation with decreased** network effects, due to the data storage/sharing paradox. This is literally the *opposite* of an effective data sharing solution – and part of the fundamental problem that Decentr aims to solve to make a true data economy viable.

**1.3.3 AI Enhanced Data Exchange and Reuse and Security and Privacy Protocols**

**1.3.3(a) DecAI: AI-Enhanced Data Generation, Reuse and Exchange**

AI is critical in order to fulfil our overarching vision of an internet based on the principles of **immutably safe and secure data storage and sharing**: it is our goal for individuals and industry along with government and regulatory bodies to work in **lockstep** on the rapid deployment of data storage and sharing technology and digitisation protocols. This is with a view to improving everything from **secure payments and services** for individuals and industry to **socioeconomic cohesion** as part of giving every citizen greater **control over personal data** and data sharing at every EU level: individual, community, local, state and regional. Many issues contributing to societal cohesion, born as they are in many cases of **socioeconomic inequality**, will be ameliorated by our technology due to two important factors:

**1.0.- The fair and equitable**, decentralised storage and sharing of data that our breakthrough technology promotes will be available to **every user**, in conjunction with;

**2.0.- The value** – both social and economic – Decentr’s consensus mechanism assigns to this storage and sharing of data will also be accessible to every user and across **all socioeconomic spectrums**, public, private and charitable, as well as across multiple industry horizontals and verticals.

However, the projected exponential nature of the data stored and shared on Decentr means that inferring meaning, or “value”, from exponentially increasing data generation will require greater than human intelligence. Human- and machine-generated **data** is experiencing an overall **10x** faster growth rate than traditional business data, and machine data is **increasing** even more rapidly at **50x** the growth rate. There are many sources that predict **exponential data** growth by as early as Q4 2020<sup>10</sup>. (This underscores the **urgency** of Decentr: our beta can be ready in as little as 9-12 months to catch the lead edge of this exponential curve.) No human can ever **keep pace with** an exponential data growth rate – let alone process the data generated: to achieve this will take a **radically-new type of AI**, one that can on some level “understand” to processes of human data generation in order to effectively contextualise this data and draw **human-centric insights** that are of benefit to users. Our R&D has demonstrated that the **dynamical and topological** nature of user interactions recorded on Decentr, which is a multi-dimensional network that operates on the **principles of causation**, can be “understood” and **interacted** with by our AI. This means DecAI can radically enhance the value of data generation, identifying for users, both individual and institutional, which information achieves maximal overall engagement (and hence socioeconomic) value.

<sup>10</sup> Peter J Denning, T. (2019). *Exponential Laws of Computing Growth*. [online] Cacm.acm.org. Available at: <https://cacm.acm.org/magazines/2017/1/211094-exponential-laws-of-computing-growth/fulltext> [Accessed 10 Feb. 2019].



An AI with this level of predictive potential as regards human behaviour is set to place the EU at the forefront of the most **powerful technology** in human history: our AI can utilise this predictive ability to communicate in a human-like way with users, and improve upon data in the form of user-generated content, both **socially and for media, research and other purposes**, as part of the wider Decentr community. This will present almost unimaginable **individual, social and humanitarian** and egalitarian wealth creation benefits. As regards industry and commercial applications, DecAI working with humans shows great promise for improvements in the **efficiency** of industry supply chains and inter-carrier payments for Telcos, as well as **improved compliance and enhanced security** implications across a range of potential applications and industries. Security applications in the areas of enhanced ID verification, KYC, AML, taxation, regulation and compliance and big data contextualisation are also areas we are exploring in conjunction with our AI R&D and commercial partners.

**1.3.3(b) dAI: Enhanced Personal, Domestic and National Cybersecurity**

Cybersecurity and the affects – both positive and negative – that artificial agents, including AI, have on systems, needs to be examined in the context of personal, domestic and national implications. **National security** is an “umbrella” term this document uses to discuss risks that external state and non-state actors pose to a country, whereas the term **domestic security** refers to a range of stability risks that emerge from within the nation state or the broader EU. These are evident where cybersecurity concerns multinational corporations or cross-border Internet-of-Things (IoT) and Smart City networks. **Personal security** concerns the security threats posed to individual devices by malicious actors intent on stealing personal data to influence a user’s browsing habits.

As identified in a 2018 Rand Corporation report, “*The Risks of Artificial Intelligence to Security*”<sup>11</sup>, the application of AI to surveillance or cybersecurity for national security and industrial initiatives opens a new attack vector based on what the report terms a “*data diet vulnerability*”: in other words, as this term suggests, the voracious diet machines have for raw data – in a similar way to raw, unprocessed and unrefined food in a human or animal diet – can also contain dangerous “**contaminants**”. To continue this analogy, in the same way a malicious pathogen virus or bacteria could be introduced into a voracious animal or human eater, adversaries may learn how to **systematically feed** disinformation to AI surveillance and other systems. This would essentially create an unwitting automated double agent capable of national or industrial **eavesdropping or sabotage**, as well as having serious implications for domestic and personal security. The goal with Decentr is, in effect, to ensure our AI is a “discerning consumer” of available data, with self-learning algorithms that allow it to continue to “learn” what **is and is not good** for it to “consume” (and by analogy digest and regurgitate) in order for it to maintain its (and **by association** its host application and human user) digital health.

Cybersecurity has been identified as a particularly fertile area for AI-enabled vulnerabilities<sup>12</sup>. Decentr proposes that the opportunities for **error and attack** within cybersecurity domains need to be minimised at the personal, domestic and national level, or eliminated entirely, in order that such breaches do not occur either **accidentally or for malicious purposes**. However, deploying **additional layers** of artificial agents to correct gaps or deficiencies with existing agents in any AI system in order to automatically correct bad AI outcomes, or by stringing together **multiple AI implementations**, can be difficult. Both approaches are often more difficult than just designing an agent to **automatically recognise** bad outcomes. As the Rand report notes, “*many automated systems are not able to recognise when they are in error states, especially when these error states relate to social norms. In general, an effective automated AI regulator may need to be as complex as the system. And, in theory, such regulators would also require regulation.*”

This highlights the **fundamental developmental** and cybersecurity problem Decentr is overcoming: if – as the Rand report correctly notes – an AI “regulator” is required that is as complex as the system itself then this will necessarily limit the **scope and extent** of that system. To overcome this, we propose that a single-system AI that is self-regulating within the context of *human/AI interaction* will act as a **self-updating regulator within its own evolving system**. We further propose that this AI, once trained in a **structured** environment (our platform) will be able to intuit meaning in an **unstructured** environment (the current internet), allowing us to develop artificial agents that can function across the wider internet to rapidly

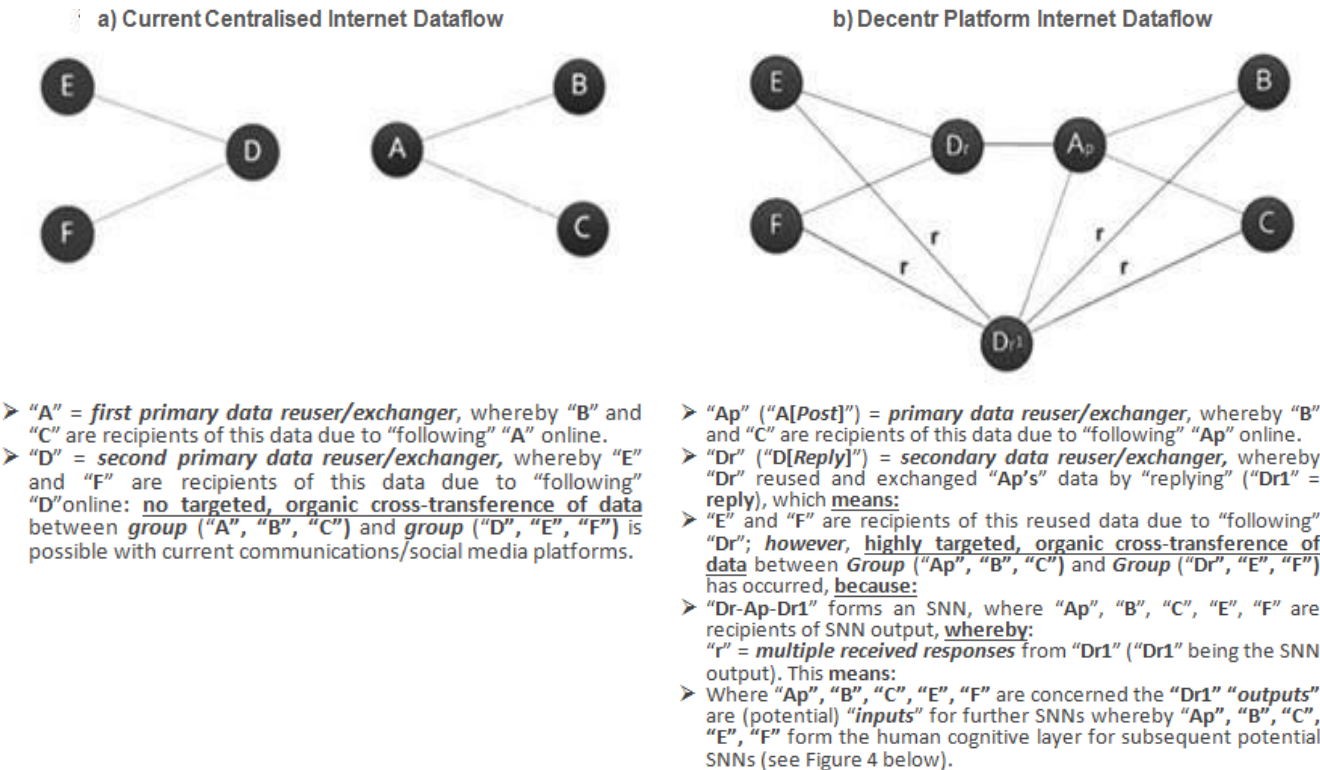
<sup>11</sup> Rand.org. (2019). *The Risks of AI to Security and the Future of Work*. [online] Available at: <https://www.rand.org/pubs/perspectives/PE237.html> [Accessed 16 Mar. 2019].

<sup>12</sup> Boujmil, J., Tagmouti, N. and Raissouni, N. (2017). Role of Management and Policy Issues in Computer Security: Rand Report R-609 within Organization. *Transactions on Machine Learning and Artificial Intelligence*, 5(4).

contextualise fragmented data as part of our platform. DecAI is set to be that AI: our TRL 5 technology creates a new internet user later that decentralises all data **storage and exchange** across our network and increasingly the **wider internet**. By doing so, Decentr creates exponential sets of evolving (as the Rand report terms it) “*social norms*”: these **social norms** are expressed on Decentr in what we call “**Social Neural Networks**” (SNN); i.e., the networks of “conversations” that exponentially “evolve” across our platform due to **decentralised data exchange** across our decentralised user layer (see Figure 4 below).

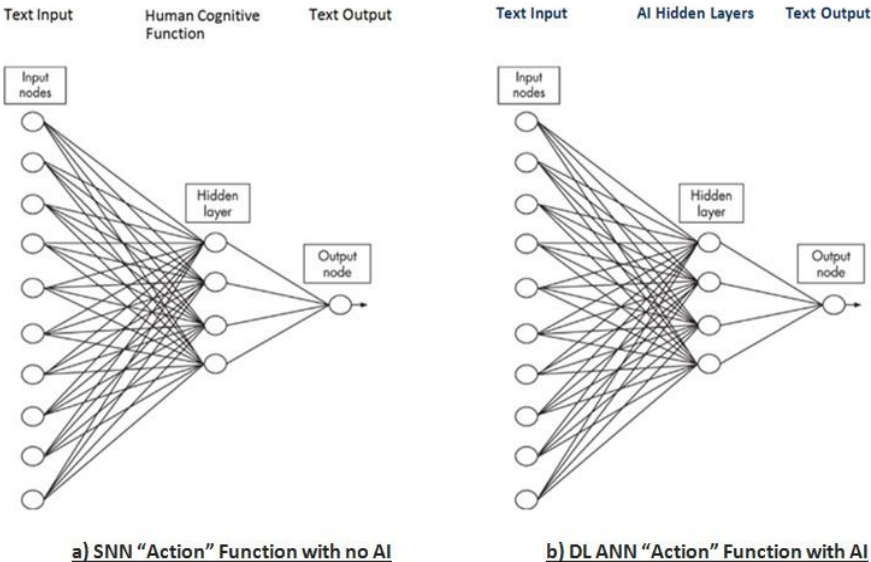
**Fig. 3 Comparative Centralised/Decentralised “User Layer” Network Algorithm**

To clarify our terminology, an “SNN” is named by analogy with a Recurrent Neural Network (RNN) (a type of Artificial Neural Network [ANN]), which is itself analogous to a human Neural Network (NN): an SNN refers to the “input-output” algorithms formed on Decentr as a result of dataflow being decentralised across our network. In such an environment, any “action” (see Figure 4 below) online (and offline where IoT devices are connected), has the potential to create a *follow-on* action, the execution of which describes (where information flow is decentralised) a similar phenomenon to a human NN.



As shown in **Figure 4(a)** and **(b)**, the SNN operates in a similar manner to a DL ANN: in **Figure 5(a)** a human user functions as the “processing layers” (“**Human Cognitive Functioning**”) in the absence of AI, while in **Figure 5(b)** the AI learns from (and ultimately contributes to) the human processing layers, with the AI “understanding” via its hidden layers the relationship between human inputs and outputs.

**Fig.4 Social Neural Network (SNN)**



Critically, SNNs are predictive and predictable; measurable phenomena that is based on the interrelated, democratically aligned, **dynamical and topological** human interactions that DecAI has access to on Decentr. Having reorganised user interaction round this democratic model, successive open artificial agents can be built on DecAI, integrating **specific and general** artificial agents with our broader native AI. This by default creates the necessary and ongoing integrated, (what we term) “**Socio-Security Matrix**” (SSM) required to ensure all AIs behave in accordance with broader evolving human **ethical principles** within a broader evolving human/AI social system. This will ensure the training of an AI (native and non-native) built on our open solution will at every level always be consistent in the job it is tasked to do, and its actions are coherent with the way its human counterparts wish it to do it (and, indeed, how its human counterparts do it *themselves*). DecAI achieves this by integrating a **Deep Learning (DL) RNN AI** (which also operates on an *algorithmic* level like the neural network of the human brain) with Decentr’s causal matrix to analyse across our user layer these evolving SNNs.

Put simply, DecAI can be assigned to general or specific tasks – including **security, regulatory and compliance** – and can carry out these tasks in accordance with “finding” (via hidden layer SNNs) the most “ethical” way to achieve the desired outcome. Moreover, the action *itself* of achieving tasks in an ethical manner represents the “reward” function common to the AIs backward/forward RNN propagation algorithms. In short, “ethical” activity undertaken by our AI – as with the **ideal operative** human ethical state – is a reward unto itself, promoting more of the type of actions that **led to the reward state**: as a result, Decentr is set to not only embody a type of machine “ethics” but machine “curiosity” as well – all necessary components of a “wider” AI (by analogy with current “narrow” AIs) as we move towards a “true” **Artificial general Intelligence (AGI)**.

*b) Research and Development Methodology*

**1.3.4 Inter-Disciplinary Research Considerations**

Due to the nature of our technology and deployment, our proposed collaborations go beyond **current mainstream collaboration** configurations in joint **Science & Technology (S&T)** research. We aim to advance different scientific and technological disciplines together and in **synergy** towards a breakthrough – not only of a technological nature – but also with a view to a paradigm shift in **socioeconomic and psychosocial** thinking at all levels in order that Decentr has maximal positive societal impact. We have in conjunction with our **research partners** developed challenging new cross-cutting economic and psychosocial theories that exploit the inter-disciplinary connections between **economics, psychosocial and machine psychology** studies; especially **sociology, critical theory, post-structuralism** and **process philosophy** that we are applying to Decentr’s development with a view to promoting progressive personal and societal change. This is in conjunction with several key researchers in these fields, as well as several independent researchers in the fields of applied and heterodox economics, social sciences and the psychological sciences. These theories relate to:

**1.0.- “Heterodox” Economics.** The **value of user data** fluctuates on Decentr in a similar way to currency; however, **economic exchanges** on our platform **eschew fiat money** and its digital equivalents in favour of the transfer of “**data value**” *only*. Our radically-new technology offers individuals and industry a hitherto unknown **economic paradigm** on which to base their **personal, social and business** activities: as a **wealth creation** tool, Decentr **complements** the real-world economy by stabilising the fraction reserve banking system: it does this by ensuring economic exchanges are longer a **zero sum game**<sup>1314</sup>.

**2.0.- Psychosocial Theory.** **Psychosocial principles** state that psychological issues and subjective experiences cannot be **deterministically reduced** to the social. Decentr has applied this paradigm to our fundamental architecture: the pursuit of the **realisation of individual potential** (in place of the pursuit of **fiat money as a medium-of-exchange**) that the decentralised exchange and reuse of data on Decentr promotes deterministically relocates **objective and subjective** experiences to the **socioeconomic** in the

<sup>13</sup> Lane, J. (2015). Nations and Global Economic Competition: Variable and Zero Sum Games. *British Journal of Economics, Management & Trade*, 9(2), pp.1-16.

<sup>14</sup> The invocation of a non-zero-sum game is because that on our platform voluntary data trades between individuals imply that both parties subjectively perceive the transaction from the perspective of “receipt” as being of “higher value” than from the perspective of “sending” (due to the socioeconomic value assigned to data reuse and exchange on our platform).

form of data as a mutually agreed “value store”. Put simply, this means that our platform relocates the key driver of a **healthy and competitive** EU society and economy to where it should be: the realisation of the **individual potential and personal achievement** of every online citizen *in place of* the pursuit of fiat money as a **socially malignant** end unto itself.

**3.0.- Machine Psychology.** In order that **value created** by our economic and SSH innovations is exponentially multiplied by human-AI symbiosis, ongoing research into the intersecting disciplines of **Evolutionary Psychology in conjunction with Cognitive Psychology**, are critical, This in the context of **psychosocial principles** that (as noted in the algorithms of our fundamental tech) are an important determinant of the effectiveness of outcomes when deploying our platform and “training” our native AI. This further relates to **Machine Psychology**, which recognises that where complex machines may behave in an irrational or unacceptable manner, mediation with such a machine will **more closely resemble** the principles of classical psychology. Within our system, this principle is critical to **realising value**, as our native (and non-native) AI will need to understand human interrogation at both a formal and informal level to be maximally effective while **deriving maximum value** for and from reused and exchanged data for individuals and industry.

1.3.5 Legacy Research & Development.

EU and global R&D is set to benefit – **not only** from participating in the R&D of our technology (which includes a separate technical and SSH/ethics white paper to be researched by us and our partners and selected independent researchers during the project and delivered by project completion [WP7; M34]), but in the **resulting paradigm** our breakthrough solution creates. One of our primary goals is to ensure that truly **global interdisciplinary collaboration** on major new research projects will be possible as a legacy outcome of our project *due to* the decentralisation of data exchange and reuse being assigned a social and economic value. This **socioeconomic paradigm** will ensure that collaboration *itself* will in part or in full **fund future research**, promising a surge in **technical, philosophical and scientific progress** across many important and emerging disciplines not seen since the scientific revolution and the Enlightenment. We have commitments to these research goals from several major universities and research institutes, in conjunction with our primary bank/PSP partner who is committed to **supporting ongoing research** into Decentr outcomes and paradigms while helping set up new research initiatives in **analogous and emerging** fields.

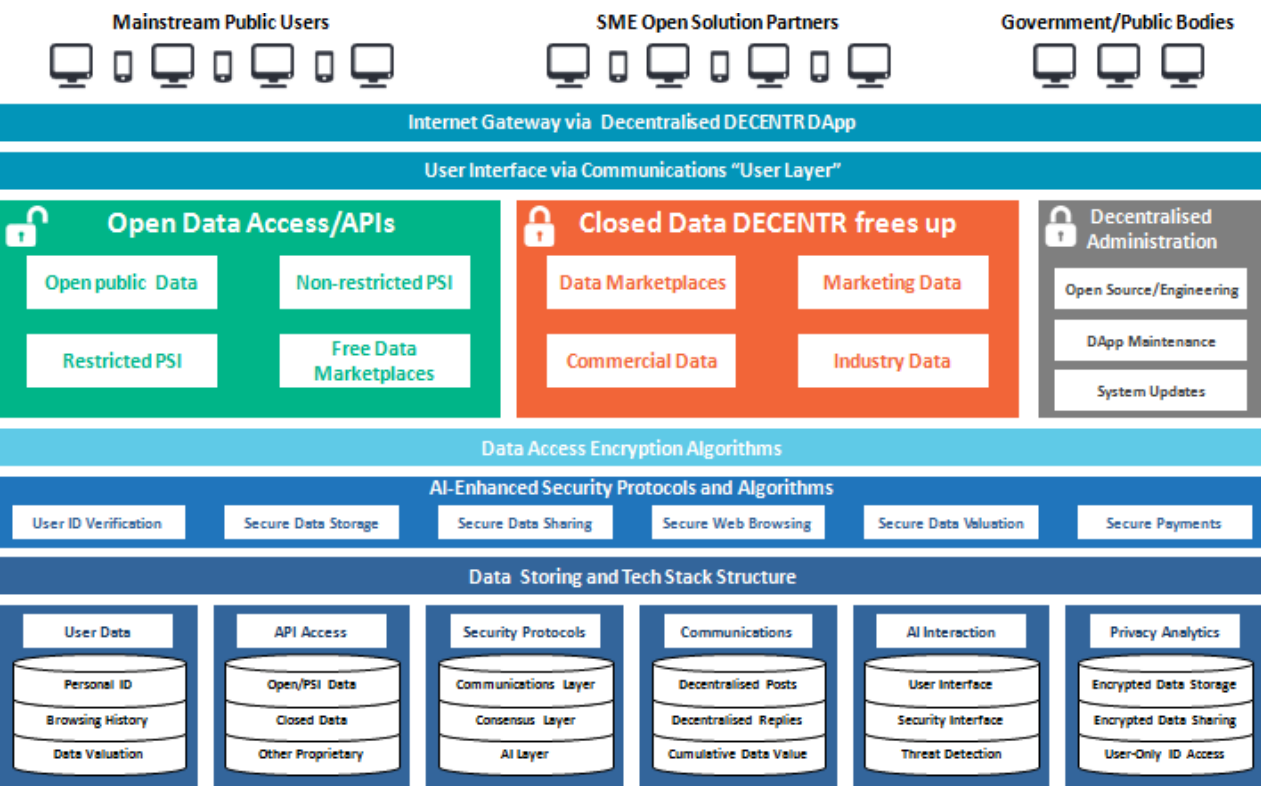


Fig 5 Technical Architecture of the Decentr Portal



1.3.6 Decentr Gender Analysis and Policy

Decentr’s research, technology development and evaluations include a consideration of sex and gender equality (beyond the traditional concepts of male and female) in line with sex and gender theories and issues. Of particular importance is the need to pay attention to sex and gender with regard to user requirements (WP2, WP3, WP4, WP5, WP6, WP7) and social and political considerations (WP1, WP7). Decentr is committed to promoting equal employment opportunities and will establish a programme to make the H2020 gender and equality policy fully effective in line with the EU **Non-discrimination and equal opportunities: A renewed commitment (COM(2008) 420 final), Council Directive 2000/78/EC** establishing a general framework for equal treatment in employment and occupation and Proposal for a **Council Directive on implementing the principle of equal treatment between persons irrespective of religion or belief, disability, age or sexual orientation (COM(2008) 426 final)**. With this in mind, Decentr has a strong female representation among the executive members, including the overall Project Coordinator team having female members. Decentr is committed to promoting equal employment opportunities and aims to establish a program of action to make the H2020 gender and equality policy fully effective. It will establish a system for monitoring gender equality in mobility schemes such as equality of access and participation, which causes subsequent impact on professional careers. Possible actions against institutions that are not respecting the principles concerning equal opportunities will also be foreseen in line with **Council Framework Decision 2008/913/JHA** on combating certain forms and expressions of racism and xenophobia by means of criminal law. Decentr will encourage balanced recruitment of female and male researchers, as well as of family-friendly policies, such as flexible working arrangements.

Decentr is aware that there are gendered differences in data exchange and reuse, especially concerning communications and social media usage; specifically, “while women are mainly driven by relational uses, such as maintaining close ties and getting access to social information on close and distant networks, men base their continuance intentions on their ability to gain information of a general nature”<sup>15</sup>. This translates to the space that the project will work in; for example, by classifying the veracity of data generation, exchange and reuse across social media network content in real-time. This is an important issue that all members will pay attention to in an on-going basis. Decentr’s research, technology development and evaluations include a consideration of sex and gender equality (please note that this is beyond the traditional concepts of male and female). Of particular importance is the need to pay attention to sex and gender with regard to user requirements (all WPs). Particular attention will be paid to whether different sexes/genders use data differently across networks, for different purposes, and whether they have different degrees of inherent or learned “trust”. In this regard, we will pay attention to whether and to what degree gender impact promotes or militates against users engaging with Decentr in line with the company’s commitment to supporting **Council Directive 2004/113/EC** implementing the principle of equal treatment between men and women in the access to and supply of goods and services. These matters will be considered through a ongoing empirical, S&T and R&D review and also during gathering user feedback and requirements.

Consequently, adherence to sex/gender specifications will be built into our use case and scenario definition. In addition to considering sex and gender in the mentioned tasks and in architecture development, Decentr includes a privacy impact assessment and also will undertake a review of social and political considerations of the output. These activities will be undertaken while bearing in mind sex and gender theories and issues. The focus on understanding the usage and needs of different genders is particularly important to Decentr as part of our commitment to a fairer, more just and equitable society.

1.3.7 Links with other Projects and Institutions

There are links to existing strategies, studies and research projects, which will be considered as regards feeding into the current project. The Decentr team integrates experience and knowledge from previous research and development endeavours in their respective domain into Decentr. In addition, engagement of further organisations coordinating and participating in previously EC-funded projects, which are related to Decentr have been secured through their involvement in the Decentr Expert and Advisory Board (EAB) through a Letter of Support. The Consortium has identified the following internal and external projects that are intended to be incorporated into Decentr development and implementation:

<sup>15</sup> Krasnova, H., Veltri, N., Eling, N. and Buxmann, P. (2017). Why men and women continue to use social networking sites: The role of gender differences. *The Journal of Strategic Information Systems*, 26(4), pp.261-284.



**Table 1: Research and Development Projects Linked to Decentr**

Projects	Description
<b>SOBIGDATA</b> <i>Proactively building on social “Big Data”</i> H2020 DS, 2016-2018	SoBigData is creating the Social Mining & Big Data Ecosystem: a research infrastructure (RI) providing an integrated ecosystem for ethic-sensitive scientific discoveries and advanced applications of social data mining on the various dimensions of social life, as recorded by “Big Data”. Building on several established national infrastructures, SoBigData will open up new research avenues in multiple research fields, including mathematics, ICT, and human, social and economic sciences, by enabling easy comparison, re-use and integration of state-of-the-art big social data, methods, and services, into new research that is transferrable to Decentr.
<b>OPERANDO</b> <i>Online Privacy Enforcement, Rights Assurance and Optimization</i> H2020, 2015-2019	The OPERANDO project will integrate and extend the state of the art to create a platform that will be used by independent Privacy Service Providers (PSPs) to provide comprehensive user privacy enforcement in the form of a dedicated online service, called “Privacy Authority”. The OPERANDO platform will support flexible and viable business models, including targeting of individual market segments such as public administration, social networks and Internet of Things.
<b>BILLON</b> <i>FinTech blockchain solution revolutionises direct payments.</i> H2020, 2017-2019	Billon is a distributed ledger technology for creating free current accounts enabling making ultra-low cost payments with real currencies (EUR, GBP, PLN) in a regulated manner. The disruptiveness of Billon arises from: (1) distributed architecture developed on blockchain by our specialists, (2) compliance with the EU regulations upon the agreements with banks and ongoing FCA Regulatory Sandbox in the UK, technology and compliance that is critical to Decentr native payments solution.
<b>SSIX</b> <i>Social Sentiment analysis financial Indexes</i> H2020 ICT, 2015-2018	SSIX aims to provide European SME’s with a collection of easy to interpret tools to analyse and understand social media users attitudes for any given topic. These sentiment characteristics can be exploited to help SME’s operate more efficiently resulting in increased revenues. Social media data represents a combined measure of thoughts and views touching every area of life, covering topics and key players in the market for cybersecurity to continuously monitor relevant developments in the fields relevant to Decentr.
<b>ADRIATINN</b> <i>An Adriatic Network for Advancing Research Development and Innovation towards the Creation of new Policies for Sustainable Competitiveness and Technological Capacity of SMEs</i> IPA CBC ADRIATIC, 2013- 2016	The project aims at increasing the competitiveness of the Adriatic area SMEs and their extroversion capability through a cross-border ecosystem that fosters ICT adoption, innovation and specialization. Innovation and networking are the two keys for SMEs sustainable growth which in turn leads to the EU economy improvement. ADRIATINN builds a range of key components for the successful exploitation of Decentr results: a regional network of SMEs with innovation capacity, SME policies stakeholders, SME associations, tools and technologies for supporting innovative SMEs and entrepreneurs to successfully apply for funding, mentoring programmes, as well as collaborative workspaces.
<b>NCSA</b> <i>The National Cyber Security Academy</i> Welsh Government and University of South Wales (USW), 2016	The pilot National Cyber Security Academy (NCSA), the first of its kind in Wales and a major UK initiative, is being set up at USW’s Newport City Campus, and will take its first students in October 2016. USW and Welsh Government have joined forces to launch the innovative project to help address a shortage of cyber security skills and develop the next generation of cyber security experts. The NCSA could be used by Decentr to test existing scientific knowledge, training methods, models and, in particular, to ‘flight test’ any novel educational and training materials or solutions developed by the project.

<b>AC4SME</b> <i>Apprenticeship Coaches for SMEs</i> Erasmus+, 2016-2018	SMEs are less likely to take on apprentices than larger companies, whereas they represent two-thirds of private sector employment in Europe. The aim of the AC4SME project is to involve a growing number of SMEs in apprenticeship, by developing and training a network of SME apprenticeship coaches in Chambers of Commerce, as well as providing them with necessary tools to support SMEs in offering quality apprenticeship placements. The network established will be used to validate and spread Decentr outcomes also to a young target audience, becoming future SME entrepreneurs.
<b>EUPA-NEXT</b> <i>Validation of formal, non-formal and informal learning: the case of Personal Assistants</i> ERASMUS+, 2015-2018	The project has two main objectives: At the sector level the project aims to develop a European/International qualifications system for administration personnel in four EQF levels; At the policy level the project aims to identify the situation of the countries as far as ECVET is concerned and to develop national as well as comparative reports. The findings of the learning validation can be transferred to Decentr, supporting the generation of educational and training material in the project.

Besides the integration of previous project knowledge and results, Decentr also recognises that there are various European symposia and international conferences that will be helpful in further spreading the Decentr results while linking to and stimulating further international research endeavours. A few selected conferences that could potentially serve as a forum for Decentr are given in Table 2.

**Table 2: International Conferences for Dissemination and Communication of Decentr Project Results**

CONFERENCE TITLE	TENTATIVE LOCATION	DATE
SAFECOMP 2019/20 (The 38 <sup>th</sup> /39 <sup>th</sup> International Conference on Computer Safety, Reliability and Security	Trondheim, Norway	September 2020/2021)
ISGA(Institute of Security and Global Affairs) Opening Conference	The Hague, Netherland	November, 2020/2021
The O'Reilly Security Conference: Build better defences	Amsterdam, Netherland	November, 2020/2021
ICBSP 2017: 22 <sup>nd</sup> International Conference on Business Statistics and Probability	Zurich, Switzerland	January, 2021
IoTBDs 2017: 5 <sup>th</sup> International Conference on Internet of Things, Big Data and Security	Porto, Portugal	April, 2021
ICWIST 2018: 22 <sup>nd</sup> International Conference on Internet Technology and Secured Transactions	London, United Kingdom	May, 2021
ICIS 2019/2020: 22 <sup>nd</sup> International Conference on Internet Security	London, United Kingdom	October, 2020/2021

1.4 Ambition

1.4.1 Beyond the State-of-the-Art in Integrated and Secure, ICT, Blockchain, AI and Fintech

Terming the alternatives to what we have built as “state-of-the-art” is misleading due to any alternative platforms’ **restrictive uses** as data sharing and storage systems. Decentr comprises four interdependent **Core Technology Elements (CTE)**: **1.0.-** a radically-new decentralised **communications user layer** (CTE 1) that **applies decentralised technology** to data storage and exchange (as opposed to current blockchains that can *only apply* decentralisation to storage and digital trades); **2.0.-** a cooperative-game theory **consensus mechanism** (CTE 2); **3.0.-** a **currency exchange** gateway (CTE 3) **that is capable** of converting data into fiat money and other digital currency (which is a radical development of digital trading/fintech technology and applications that we see as the “*future of fintech*”); and **4.0.-** an **Artificial Intelligence (AI) agent** that, in conjunction with CTE 2, creates a radically-new **cloud computing security protocol** with enhanced privacy-aware analytics:

**1.0.- Decentralised Communications** (successful patent search carried out for core algorithms). Current so-called “decentralised” communications and social media platforms do not really work in any **effective and scalable** manner. “Decentralised” **communications and social media sites** are, on closer inspection, actually just **centralised** communications models “grafted” onto blockchain. As a result, they share a wholly unworkable **conceptual and technical misalignment** with true blockchain; specifically, it is not possible to effectively and seamlessly **integrate a centralised system with a decentralised system** (leading to the **data storage/sharing paradox**). The only other “alternative” for industry and individuals is the current, **hyper aggressively centralised** communications and social media platforms that on the whole do not work for industry due to the **restrictive nature** of the network effects created. Our system solves all the problems related to **decentralising dataflow** where this relates to communications and social media platforms by aligning **data storage with data sharing**. The Decentr project is ambitious as our aim is the **rapid decentralisation of the current internet** in order to encourage **data firms and marketplaces**, as well as other proprietary entities, public and private, to **release ever-more structured and targeted data sets** for reuse and exchange. As a result of assigning **socioeconomic value** to stored and shared data, Decentr aims to ensure it is in the **social, professional and economic** interests of **individuals, private and public** bodies to do so.

**2.0.- Consensus Mechanism** (successful patent search carried out for core algorithms). As it stands, blockchain has in most cases achieved little more than generating “virtual” coins that suffer reduced use due to high energy (or “gas”) requirements, which also creates friction in the form of transaction delays. Clearly, a more efficient and secure way to **assign and extract** value from data is required for a true data economy. What we propose is our radically-new **consensus mechanism**, built on **foundational decentralised NGI technology**, that is not based on cryptomining by a minority of blockchain nodes (called “proof-of-work” or “proof-of-stack”), but is instead backed by the security and immutability of digital IDs in the form of recorded data on every users **immutable Decentr ID**. In this way, our new paradigm is based on “Proof- of-Engagement” (PoE) as a radically-new, principal source of online value creation – one that is powered by the action of value creation *itself* through traditional devices (also called “nodes”). This is achieved because Decentr **reconfigures the dataflow** between users as **encrypted, decentralised networks**, which enhances security while reducing the friction and hence costs of current blockchain solutions. This is achieved by basing social and economic activity – not on traditional proof-of-work/crypto paradigms – but on **egalitarian and inclusive** social computing mechanisms underpinned by social computing protocols and algorithms.

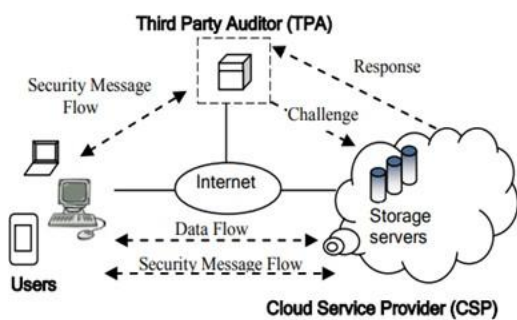
**2.1.- Securing Personal data to make the Internet Safer.** Our consensus mechanism is based on an **n-dimensional chain** as part of a **DPoS** with data value being further enhanced by **AI semantic analysis**. This is part of our layered security **MFA/SSM** protocol (successful patent search carried out for core algorithms) that enhances protection for data in **three key states: at rest, in use and in motion**. A user’s ID is informed by their private browsing and internet usage; the details of a user’s ID are anonymised and therefore known only to them and Decentr (or any service provider) has no way of accessing them (unless granted access in line with **GDPR** through **explicit, informed consent**). Independent value is assigned to a user’s Decentr ID, according to user activity: for example, the amount, quality and completeness of personal details uploaded would be assigned a high value. User activity, especially where this relates to visiting secure web sites would also record a high value: for example, a user who routinely visits sites with **HTTPS (HyperText Transfer Protocol Secure)**, which indicates that the website is protected by **Secure Socket Layer/Transport Layer Security** would record a higher value than a user who does not. Similarly, a user who browses sites with **Certificate Authority (CA)**, which verifies who the company is and that its transactions are authentic<sup>16</sup> would be assigned a higher value than a user who does not. Assigned value is also based on the quality of web browsing where this is consistent with **legal guidelines and regulations**, which will in turn help to enforce those regulations: for example, a user’s personal value would be assessed negatively if they consistently visited websites, such as pornography sites, that did not comply with the **Digital Economy Act 2017**, which is regulated by the **British Board of Film Classification (BBFC)**, and forces an age-verification system upon “commercial” websites that contain pornographic content.

**3.0 Native Currency Exchange.** We are developing a **native exchange** (CTE 3) that creates a radical new way to **exchange economic value** online. This native exchange will allow for the **value assigned** by our consensus mechanism (CTE 2) to **decentralised dataflow** to be exchanged for **goods and services and economic exchanges** across our platform, and converted into fiat money or cryptocurrency at the **point of sending and receipt** (successful patent search carried out on core algorithms). Our native exchange replaces

<sup>16</sup> Web browsers, like **Google Chrome, Firefox, and Internet Explorer** maintain lists of Certificate Authorities they consider trustworthy, whereas certain companies, such as **StartSSL** and **CACert** offer free certification.

**money-as-a- medium-of exchange** with **data-as-a-medium-of-exchange**, which makes all EU and global communications *and* transfers near friction (and therefore) fee-free. This is set to save PSPs up to **100% on global transfers** compared to standard PSPs while improving on the SEPA Instant Credit Transfer (SCT Inst) transfer times by up to **60-80%** – but on a **global not only** SEPA region scale. This is possible because where **data and digital trades** are *indivisible at the point of exchange* (due to having solved the **data storage/exchange paradox**) internal friction is removed with regards to both **information and economic value** transfer. This is true of fiat but also cryptocurrency, which still requires atomic swaps between currencies to make payments and trades viable.

**4.0.- AI-Enhanced Cloud Computing Security Protocol.** (Note: This protocol works *in conjunction with the SSM/MFA protocols assigned to our CTE 2 consensus mechanism [1.1].*) Considering that data stored on our platform is held on multiple system nodes (consistent with Holochain’s agent-centric protocols), our security protocols are based on cloud computing; the problem is, with current technology and approaches cloud computing is **not** immutably secure due to **servers** and **Third Party Auditors (TPA)** being vulnerable to malicious attacks (Figure 8). Our platform overcomes the problem of integrity and confidentiality of data storage in cloud computing by introducing a radically- new, efficient and secure protocol based on **Elliptic Curve Cryptography**<sup>17</sup> (ECC) combined with a **Sobol sequence** (Figure 9). To ensure the confidentiality and integrity of data stored in the cloud, we propose to use a variation on the **Efficient and Secure** protocol (successful patent search on core algorithms carried out) as developed the Department of Computer Science, School of Engineering & Technology, Pondicherry University, India<sup>18</sup>. This protocol is developed from the EEC construction and use of the Sobol sequence to randomly verify the integrity of stored data.



**Fig. 8 Cloud Data Storage Model**  
Server or TPA vulnerability means data is subject to malicious attacks.

This system is useful due to it being flexible **in terms of distribution** across multiple Decentr nodes, meaning the Sobol sequence can greatly enhance security protocols in conjunction with key SSM features: **1) decentralisation** as part of our decentralised communications layer **2) encryption protocols** of the highest level, and **3) data integrity** verification integration with our decentralised AI. AI data integrity verification is possible due to our SNNs being able to function as a sophisticated set of **“challenge-proof” gates** – part of our MFA layer – to verify data integrity in conjunction with our **co-operative-game theory** consensus mechanism. DecAI does this as part of its SNN function by reordering data points across software architecture “dimensions” (by way of analogy with Sobol

sequencing that forms successively finer uniform partitions of the unit interval and then topologically reorders the coordinates in each of its “dimensions”) to arrive at a **verification consensus**. This integrated set of security protocols is critical due to the fact these SNN “gates” become more efficient as the AI learns more about a user’s networked activities, and can in conjunction with ECC and the n-dimensional chain algorithms underpinning our consensus mechanism **dramatically improve** security protocols; in this way, each of our CTE’s enhances the security and veracity of the others through data reuse and exchange as well as securing the overall network, which forms the basic Decentr SSM.

<sup>17</sup> Enhancing Data Security Using Elliptic Curve Cryptography in Cloud Computing. (2016). *International Journal of Science and Research (IJSR)*, 5(7), pp.1884-1890.

<sup>18</sup> Syam Kumar, P. and Subramanian, R. (2015). “An Efficient and Secure Protocol for Ensuring Data Storage Security in Cloud Computing”, *IJCSI International Journal of Computer Science Issues*, Vol. 8, Issue 6, No 1, November 2011 ISSN (Online): 1694-0814 [www.IJCSI.org](http://www.IJCSI.org) [Accessed Nov. 2018]



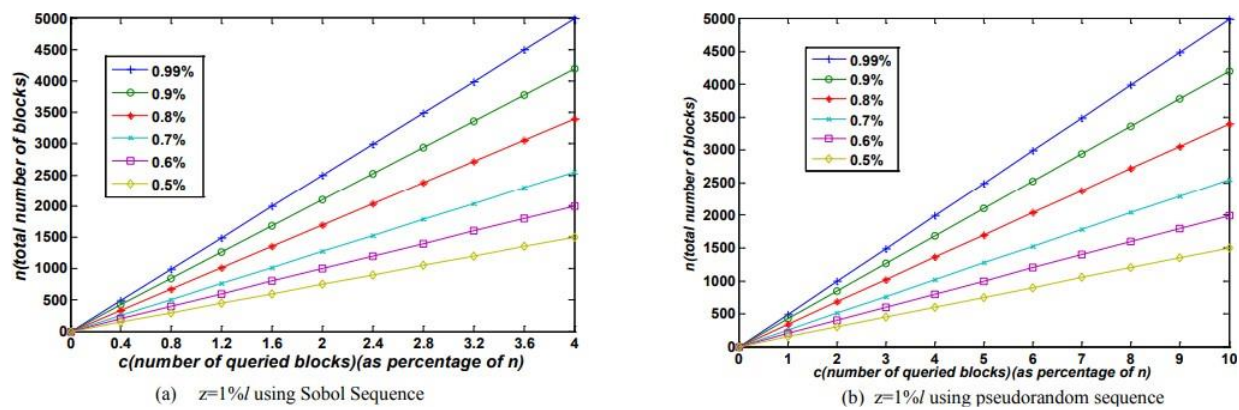


Fig. 9 (a), (b) Sobol and Pseudorandom Sequence Performance Comparison

This comparison shows that the pseudorandom sequence (b) performs worst, whilst the Sobol Sequence (a) rapidly converges to the solution. It has been shown that Sobol sequence can evaluate integrals more efficient than pseudorandom sequences, the topological nature of which can be understood and enhanced by our AI in conjunction with EEC and Decentr’s native n-dimensional chain protocols.

1.4.2 Enhanced Security Ensures Secure Data Storage and Sharing

This **radically-enhanced security protocol** is achieved by running our CTEs on integrated EEC, Sobol, n-dimensional chain (Figure 10) and DPoS algorithms: put simply, *without* this integration the twin dimensions of **secure data storage** and **secure data sharing** is *not* possible. As a result, our technology solves **key security aspects** surrounding the **data storage/sharing paradox** by storing copies of user data points across multiple nodes as **semi-autonomous dClouds**: this is a critical component of our decentralised SSM, whereby multiple copies of these semi-autonomous D-clouds are **distributed across** further multiple nodes and further duplicated as well. For the purposes of clarity, we are terming “multiple nodes” the “dCloud”; however, our design architecture means that **multiple copies** of this (and every) dCloud are also stored across multiple nodes, dramatically improving security (whilst also improving scalability due to requiring **no more power** or “gas” to run the network). This effectively means that the **more a user engages** with Decentr’s decentralised communications layer, the **more secure** this interaction becomes (which actually **reverses** the **data storage/sharing paradox**) through the creation of further semi-autonomous dClouds. This is because **data integrity** is constantly enhanced by the creation of further randomised variations of these semi-autonomous clouds. This helps **effectively mask** a user’s digital ID **the more a user re-uses and exchanges** data by 1) *effectively obfuscating the digital origin* of a public or private data source **in conjunction with** high-level encryption<sup>19</sup> and 2) *allowing our AI to track and model* the nature of these expanding semi-autonomous clouds via its SSN/n-dimensional chain function to identify malicious actors, malware or other **malicious software** or even malicious non-native artificial agents, which it can then flag as potentially harmful.

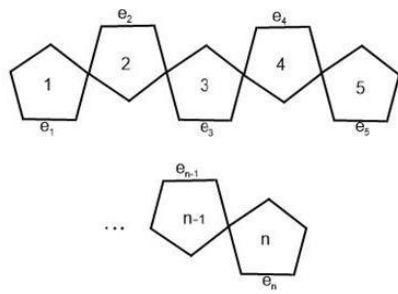


Fig. 10 n-Dimensional Pentagonal Cactus

This paradigm assigns value, both positive and negative (en-1) to evolving SNNs where “e” represents exponential data generation, reuse and exchange.

Decentr’s security is further enhanced due to the fact these networked dCloud structures are far too complex for any human or existing artificial agent to track: our AI will be trained to “understand” the topological and dynamical nature of our **multi-dimensional site architecture** and the EEC and n-dimensional chain protocols and algorithms on which Decentr runs. Moreover, due to these multi-layered security protocols, even our AI is only capable of **drawing inferences** from the nature of these evolving dClouds, without needing (or having the capability or access) to interrogate the details of the user recording them, thus further enhancing internet security while **simultaneously further enhancing personal privacy** online. These security protocols – which not only *solve* the data storage/sharing paradox but **reverse** it

– further encourage the widespread and exponentially increasing reuse and exchange of data as part of a burgeoning, safe and secure, true data economy, achieving a **fundamental goal** of Decentr in line with the aims laid down in the Topic Description.

<sup>19</sup> Looking ahead, it will also become increasingly important for encryption services to cover mobile email applications (which is a priority for Decentr). The Radicati Group predicts that 80% of email users will access their accounts via mobile devices by 2018, but more than 35% of organizations currently using email encryption say their users currently lack the ability to send secure messages from their mobile email client.



## 2. Impact

### 2.1 Expected impacts

To understand the **scale and scope** of the **potential impact** of Decentr it is necessary to understand why our data economy model and potential DeFi applications is so radically different from all **current models** that attempt to create a “true” data economy. In order to do so, this section will briefly address the existing ad hoc models of data sale and usage, and compare these with the advantages of our **horizontal data model**, using our primary “end user”, our bank/PSP partner’s planned pilot programme of our tech to highlight the **broader disruptive** possibilities across multiple **vertical** industries, SMEs and large-scale enterprises.

The problem as regards creating a true data economy is arriving at **an understanding** of what a data economy **is and is not**: our R&D has demonstrated that **all current approaches** to creating a data economy are not **scalable and sustainable**. This is because all existing B2B/B2C models require data to be **bought and sold** in data “marketplaces” – in the same way as stocks, white goods and cattle – which defines this so-called “economy” as merely another type of service, and not a real “economy” of any **serviceable and universally deployable** kind. The Industrial Data Space (IDS) model, on the other hand, is comprised of so many layers designed to ensure security that **network effects are restricted**: as a result, pursuing *either* of these approaches inevitably leads us back to the **data storing/sharing paradox**.

### 2.02 Why the B2B/B2C and IDS Models are Part of the Same Problem

We must view the IDS and B2B/B2C models as representing a **joint failing** as regards a **standardised** data economy. This is due to each representing what is effectively a “complementary” aspect of the **data storing/sharing paradox**, with the IDS model providing a **limited solution** that, as a result of these limitations, is part of the **wider problem**. The B2B/B2C model, on the other hand, creates its own limitations: the problem with creating a **sustainable data economy** using the B2B/B2C model is that “fiat-money” creates an **unworkable hindrance** to making such an economy mainstream: this is because where an attempt is made to create a data economy by placing the greatest emphasis on the “**buying**” and “**selling**” of data by using a **third-party medium of exchange** (i.e., “*fiat-money*”) then the emphasis will always be on the *pursuit* of the medium of exchange, and *not* the **refinement and quality** of the data itself (**unstructured and unrefined** data being one of the key impediments to a “true” data economy).

As a result, the above models cannot be considered to represent the definition of a data economy – or *any kind of* economy – and pursuing them will never create one. By default of definition and deployment, pursuing such data economy “models” simply encourages the **worst excesses** of the real-world economy. Where such a model involves the selling of B2B/B2C data then data becomes just another **disposable commodity** – a *means* to an end (i.e., that end being to make more units of exchange – “*fiat-money*”) – and not the **means and the end**, which is what data represents on our platform. The **reason it is critical** that this commoditisation of data **does not happen** is because of the fact that if users are required to be “pay for” data – which is how the current B2B/B2C data economy model is set up – then this risks **digital economic segregation**, along the lines of those individuals and businesses that **can and cannot afford** to buy data. This will inevitably create an **impoverished** “haves/haves not” data marketplace (rather than a true “economy” per se) – one that mirrors the worst excesses of the real-world capitalist and free market economic systems, rather than building on those aspects that promote **equality, fairness in trade and commerce** and economic independence for every citizen. Decentr achieves this socioeconomic paradigm by **relocating economic value** to data *itself*, giving every data subject, whether individual or industry, the opportunity for egalitarian **wealth-creation and distribution** from their data or data they share and interact with.

### 2.03 Why Decentr is a Data Economy Solution for Individuals and Industry

A data economy whereby **data – not money** – is the only value that can be **traded and exchanged** is the key to **bridging** the B2B/B2C/IDS “paradox”, which, as mentioned, is a **good example** of the **data storing/data sharing paradox** that Decentr is solving. As a result of removing fiat-money as a medium of exchange, Decentr places the primary emphasis on the **generation, reuse and exchange** of increasingly **superior, structured and refined** data, which in turn delivers increasing data/user value – all while radically **enhancing security** at **every data point of every end-to-end user experience**, personal, commercial and

industrial. This simultaneous exchange of **information and value** has been identified by us as applicable in **many industries**, including supply chains, Telcos and banks/PSPs – all industries that generate vast amounts of public, private and PSI data that, once given a **payable, tradeable and exchangeable** value on Decentr, can be used by these companies to achieve ever-greater internal efficiency whilst offering improved services at **reduced costs** to customers.

Decentr knows the **distinction** is important to make between the **Industry 4.0** data model – whereby Big Data plays a **minor role** and the emphasis is on **supply chains, internal data**, etc – and B2B/B2C sales models, which exist to **sell refined data**: this distinction is critical in order to ensure that the requirements of each are met by the Decentr solution, thus fulfilling a comprehensive “definition” of a data economy. The ID-verification pilot programme we will undertake is **significant** in this regard: by using the method of customer ID as the means of both **verification and payment for transfers**, the intersection between the **internal data needs** of the IDS model and the **value-creation for customers-as-data subjects** will be demonstrated – a world first that we predict will **catalyse rapid commercial** and consumer uptake of our technology.

2.04 Specific Decentr Impacts

The expected impacts of Decentr are:

A

OVERALL

2.4.1 *Personal data protection is improved, and compliance with GDPR (and other relevant legislation) is made easier for economic operators.*

Decentr complies with GDPR by default of design and deployment, due to the fact the value of personal data on our platform is **directly linked to security and immutability** as the primary method of ensuring its veracity, meaning data is the **only means and method** of payment in a true data economy. In this way, Decentr ensures that data protection, reuse and exchange is made easy for economic operators due to the fact that all data is made available through **explicit, informed consent** due to this consent being required to release any data for reuse. As a result, economic operators are assured that all data they reuse on our platform is fully GDPR compliant, representing significant cost and time savings for economic operators and their **Data Protection Officer’s (DPO)**. This assumption has been borne out by our bank/PSP partners who have identified security as regards a user’s personal ID, which is **central to our design architecture**, as being a feature that will be instrumental to them (and other banks, PSPs, and financial institutions) in **expediting ID verification** as part of their global/Spanish/LAC business operations while increasingly using **data-only** to make EU/global payments and trades.

2.4.2 *Citizens’ trust is improved as privacy-aware transparency and control features are increasingly streamlined across data platforms and Big Data applications.*

The Decentr platform by design has elements of a “blockchain/wallet browser” that contains features and settings, including a user dashboard and wallet that place the user in control of his or her browsing experience. As a result, **privacy-aware transparency and control features** are increasingly streamlined by default across **all** data platforms and Big Data applications as users browse the web and adjust Decentr security and privacy settings for their **own purposes**. Our tech also allows users to interrogate what data any site or platform wants to know about them, and if they **give explicit consent** for this information to be shared, their personal value rises, hence **encouraging the exchange** of this data: our bank/PSP partners have expressed interest in this feature due to the fact it encourages the exchange of **detailed and verified** user data and ID that cannot be **altered or falsified**.

Further, our radically new MFA makes the Decentr network **immutably safe and secure** for data reuse and exchange. Once completed (M33), our platform prototype will enable (subject to explicit, **informed consent** where appropriate) all proprietary and closed data on the existing internet to be reused and exchanged **securely and immutably**, and in a manner that is highly **transparent, traceable, targeted and targetable**. This will ensure compliance with ownership and copyright and fair use regulations and directives, including **Directive on Copyright in the Digital Single Market 2016/0280(COD)**, also known as **EU Articles 11 and 13**. In this way, Decentr effectively acts as a decentralised “security buffer” against the intrusive vagaries of the wider internet, greatly increasing citizen’s trust in data exchange and reuse, and hence **exponentially redoubling** its value as part of a “true” **data economy** while always ensuring the user is firmly in control.

2.4.3 *Better value-creation from personal and proprietary/industrial data.*

This aspect is literally hardwired into the R&D, design and deployment of the Decentr platform, which replaces **money-as-currency** with the exchange and reuse of **data-as-currency**. This means, in effect, that the massive **widespread reuse and exchange** of data is encouraged by allocating a payable and exchangeable, socioeconomic value to every user who **generates, reuses or exchanges** data. This function of **data value allocation** is critical in order to move towards a true, egalitarian **data economy**.

Data is transforming virtually **all aspects** of our economy and society; however, as Jeremiah Smith, founder of the DX Network notes “*the true promise of the Data Economy remains largely unfulfilled because we still lack the technology to allow for standard, secure and efficient data exchange*”<sup>20</sup>. Trading data is currently served by different types of **marketplaces** in a similar way to shares and currencies that are traded on different types of exchanges: for example, a **personal data** marketplace, such as **Datum**, **DataWallet** and **fyssical** enable individuals to choose who they sell their personal data to and **directly receive** the proceeds, while a **business data** marketplace, such as **Axiom** and **Orb Intelligence** allow two companies to buy and sell industry data from each other, including localised product prices, insurance claim statistics or data about recent investments deals in a given industry. Although different data marketplaces have varied properties depending on their specific use case, in general, the data **marketplace paradigm** allows for four key **value-creation dimensions** Decentr supports:

1. **Crowdsourcing:** by making *self-serve data selling* a reality, they provide the solution to move away from inaccurate/expensive single-source data.
2. **Aligned incentives:** data owners/collectors directly benefit from keeping data **in structured form** and making it available to others.
3. **Standardisation:** by design, a marketplace defines a **common data model** and interface for buyers and sellers to exchange data.
4. **Fairness:** instead of a having a central authority pricing data, providers can **set their own prices** while consumers can **choose who they buy from**.

Regardless of the increasing ubiquity of such marketplaces, the uptake of a true data economy has been slow. To understand why Decentr – and not data marketplaces alone – is the **missing backbone** of the data economy, the three fundamental roadblocks **holding back its full potential** need to be understood in the context of the above four points:

1. Most data exists in **unrefined** (or unstructured) form and it is **non-trivial** to convert it into structured data, the format needed for use in software.
2. Data owners use **incompatible data models** to structure their data which is kept in isolated silos although often sought-after by others.
3. No one has figured out how to **price and exchange** data efficiently yet.

Decentr **comprehensively addresses** these seven points by **assigning value to all data sharing activities**, whether exchanging or reuse, creating a **universally compatible** data model, while creating the environment for **structuring** unstructured data through decentralised **data storing and exchange**.

B

ECONOMIC IMPACT AND GROWTH POTENTIAL

**Note:** We base our projections on *Econometric Models*<sup>21</sup>, which are useful for forecasting future growth potential by measuring past relationships among **relevant variables**: in the case of our projections, these include **previous annual user uptake of new platform technologies** consumer spending and currency transfer and exchange online (especially in core targeted demographics), and the like, and then **forecast** how changes in **certain variables** will affect the future course of other variables and produce unique outcomes. This is in conjunction with certain assumptions our R&D makes as regards heterodox and behavioural economic principles.

<sup>20</sup> Towards Data Science. (2019). *Data Marketplaces: The Holy Grail of our Information Age*. [online] Available at: <https://towardsdatascience.com/data-marketplaces-the-holy-grail-of-our-information-age-403ef569fffb> [Accessed 28 Jan. 2019].

<sup>21</sup> Asteriou, D and Hall, S.G. (2011). “The Classical Linear Regression Model”. *Applied Econometrics*. New York: Palgrave MacMillan.

1. *20% annual increase in the number of data provider organisations in the personal and industrial data platforms.*

We anticipate **Year 1, 22%** annual increase across private and public domains rising to an annual yearly increase of **29-31% on average** due to two key factors: **1) an expanding network of PSPs** through connections with our commercial stakeholders; **2) expanding commercial connections** in analogous industries, including retail supply chains, Telcos through our VC/investor connections, coupled with our communication and dissemination activities. We have already engaged with several leading data provider organisations, including **Acxiom, Corelogic, Datalogix, DataSift, eBureau and Gnip**, who have borne out the validity of our technology to their industries as regards freeing up data reuse and exchange. This rapid industry subscription is because our system **streamlines data reuse and exchange** by making it GDPR compliant while removing barriers to exchanging data. This is achieved by making its acquisition free for user/buyers, thus removing the **costly and inconvenient** requirement for data providers to have to market and “sell” data to prospective user/buyers.

As a result, the reuse of **potentially valuable** data in conjunction with the **digitisation of EU industry** as part of a digital single market can be realised, whilst the continued development of KBC as a valuable resource for SMEs and multinationals will be greatly enhanced by the same implemented system. This is in line with the third pillar of the **Digital Single Market (DSM)** strategy to “*maximise the growth potential of the digital economy*”<sup>22</sup> by leveraging and promoting different technologies and actions, such as IoT, cloud computing, standards, skills and e-government. This will allow public sector data in particular to be reused for other purposes, including individual and commercial, which will:

- a. **Stimulate** economic growth and spur innovation: public data has significant potential for reuse in new products and services;
- b. **Help** address societal challenges with the development of innovative solutions such as in healthcare or in transport;
- c. **Enhance** evidence-based policymaking and increase efficiency in public administrations;
- d. **Become** a critical asset for the development of new technologies, such as artificial intelligence (AI), which require the processing of vast amounts of high-quality data;
- e. **Foster** the participation of citizens in political and social life and increase the transparency of government.

2. *30% annual increase in the number of data user/buyer organisations using industrial data platforms*

We anticipate a **Year 1, 36%** annual increase rising to an annual increase of **46-48% on average** due to the fact that potential data user organisations who currently **do not use data** due to the costs involved will **never be required** to “buy” data on our platform. These users are largely represented by SMEs who either do not have an allocated budget for data purchase, or the budget is **disproportionately small** compared to their marketing budget (often due to an inability to know how to easily **acquire and reuse the data**: both issues Decentr solves).

Instead, on Decentr, SMEs and multinationals will themselves be encouraged as part of our **Data Space Model** (see Figure 1) to – not only use data they have acquired – but also exchange and reuse **their own PSI and private data** as a means of personal **social and economic value creation**. Incentivising the **freeing up and structuring of** vast amounts of data is Decentr’s primary goal: the confidence to do so will be engendered by our conceptual model and technology deployment in **SMEs and other potential data users**. Our radically-new **socioeconomic paradigm** is how industrial and other data platforms achieve economic value and are able to supply **high quality, refined, targeted datasets** in the first place – **without requiring** any form of “fiat-money” payment from data users to access this data. This paradigm will in turn encourage SMEs and others to exchange and reuse data, becoming **providers** themselves, as part of the Decentr network, which will create the socioeconomic foundation for a true data economy.

3. *50% annual increase in number of users (data subjects) in the personal data platforms*

We anticipate an annual yearly increase rising from **Year 1, 51%**, averaging out at **62%**, in users in **personal data platforms**: this figure is conservative, due to the fact that Decentr puts in place a system whereby **data users are also data providers** as part of a true data economy. This means that the

<sup>22</sup> European Commission - European Commission. (2019). *Digital single market*. [online] Available at: [https://ec.europa.eu/commission/priorities/digital-single-market\\_en](https://ec.europa.eu/commission/priorities/digital-single-market_en) [Accessed 6 Feb. 2019].



figure of **62%** is sustainable and indeed exceedable indefinitely as new personal data platforms are built out **on top of** our open solution in conjunction with our partners and Decentr engineers, while the Decentr platform itself is set to exceed even this figure, at a projected annual subscription rate of **74%**, which takes into account our platform’s **specific mandate to free up** data for **personal data subjects** in order that they can individually benefit from data reuse and exchange.

**4. 20% annual increase in volume of business (turnover) channelled through the platforms**

In line with user/buyer and data provider subscription, we anticipate a **Year 1, 27%** annual increase in volume of business rising conservatively to **Year 5, 69%** due to the exponential nature of industry build out on our horizontal solution. This increase takes into account the projected **1.5%** of total international remittance market (**US \$900BN**), targeted by our bank/PSP partners by **Year 5**, with analogous business volume increases based on further bank/PSP subscriptions (**Xoom, Santander**) projected at **0.12%** of this market share over the same period. This is a result of Decentr stimulating **1) consistent industry and individual (customer, other stakeholder) subscription** and build outs and **2) massive social engagement** across our platform and the wider internet, fostering the **unprecedented** generation, exchange and reuse of highly targeted, relevant and socially beneficial data that can be used to exchange socioeconomic value – **globally, conveniently, cheaply and fast.**

**2.05 Additional Substantial Impacts that Bring other Important Benefits**

The Decentr project offers hitherto unimagined analogous **social and economic** and legacy **research & development** opportunities. This is in conjunction with creating opportunities for the rapid **digitisation of EU industry** and the promotion of market **competitiveness and commercial growth and stability** while promoting **energy savings and sustainable environmental initiatives** in several **critical and urgent** areas:

**1**

**FASTER, CHEAPER, “GAS”-EFFICIENT CROSS-BORDER TRANSFERS**

Decentralised data exchange as recorded on a user’s Decentr ID is assigned economic value through **democratic community engagement and consensus** coupled with enhanced security and immutability. This interrogatable data stream **locates** a user’s Decentr ID as the primary online “value store”, replacing “fiat-money”-as-a-universally-agreed “value store” to create the foundation for our proposed new EU and global **socioeconomic** paradigm. Our technology and concept reflect a variety of long-term **economic and institutional transformations** promoting KBC in many OECD economies. Many firms are now investing as much or more in KBC (which includes a broad range of intangible assets, such as research, data, software and design skills, which capture or express human ingenuity) as they are in physical capital; including machinery, equipment and buildings.

As a result, the integration of Decentr with the existing internet is set to create a data economy underpinning a true IoV. By integrating verification and data value so that the two are **indivisible at the point of transaction** Decentr is set to greatly enhance the implementation in **2018/2019** of an open, single **EU financial market**, which is critical for the future of a competitive and cohesive EU society at all levels. This vision is currently being pursued by more than **1,000** EU banks and Payment Service Providers (PSPs), or **25%** of the EU total, in line with the EU’s second Payment Services Directive (**PSD2 – EU Directive 2015/2366**) and the SEPA Instant Credit Transfer Scheme (**SCT Inst**). We propose that for EU industry to continue to lead the world requires the concept of an open, **digital single and financial** market to be **extended – urgently, globally and sustainably**. This needs to be done as part of a foundational, open, immutable IoV that ensures **value** is exchanged online as quickly as **information**. This will create a **socioeconomically** beneficial paradigm whereby global **communications** and **payments** take place simultaneously as **indivisible** real-time exchanges, with **reduced friction** minimising user and system transaction costs.

Decentr achieves this by eliminating the lack of **interoperability** and **non-standardised Application Programming Interfaces (APIs)** as the impediment to immutable and secure, near real-time exchanges. Decentr is set to remove **currency, communications** and **API misalignment** by delivering a single, **standardised** interface, **sustainably** powered by **existing internet user** engagement. Due to our platform requiring no more electricity (or “gas”) than current global internet energy consumption, savings for users and the **environment** will be dramatically improved: our radically-new technology is set to save **0.23%** of the world’s annual electricity consumption (or **US \$2.6BN**), when compared with alternative blockchain solutions. Our platform is set to achieve this by **replacing** the **resource-intensive traditional consensus mechanisms**, such as Proof-of-Work (PoW) used in the bitcoin blockchain that includes highly energy-consuming “mining” activities employed by blockchain “nodes” (or traditional devices) with the **devices** used by **regular internet users** (also called “nodes”), who, on average, consume **2700% less** electricity **per day** than a blockchain node uses for a **single digital transaction**. The energy conserved is **returned** to users as **payable and tradeable** value, representing further savings for users by offsetting currency transfer (and other commercial) costs by up to **97.8%** when compared with current PSPs.

This **dynamic improvement** is possible due to the fact that on Decentr the mechanism to exchange *and* measure “value” is the **same as that** used for verification. This paradigm is set to revolutionise many industries, such as banking and e-commerce, including:

2

INTERNATUIONAL TRANSFERS/INTERNATIONAL REMITTANCE MARKET

This market is only one of several US \$BN payment and economic markets that our platform is set to disrupt in conjunction with our commercial partners. Because Decentr decentralises **data exchanges** in the same way as blockchain decentralises **digital exchanges**, the exchange of data and digital value are **indivisible at the point of exchange**. This removes nearly all friction – communications and payments – and hence nearly **all transfer fees**. As a result, our bank/PSP partners predict by **Year 5** to gain market share of **1.5%** of total international remittance market (**US \$900BN**), which equates to **\$4.5BN**. For transfers, our partners accrue on average **6%** transfer fees equating to **Year 5 T/O \$810MM**. Our partners’ customer fee of **6%** undercuts **96%** of the **396** leading PSPs by between **3-14%**, and up to **100%** of the same PSPs when adjusted for our game-changing tokenomics, because unlike sending money abroad with regular PSPs, our internal tokenomics provides a buffer against unfavourable exchange rates as transfers use our **internal rate of exchange**. This means that if our native token is strong against fiat, the internal exchange rate **does not change** but the transferor/transferee **loses less** upon exchange into fiat, allowing PSPs to offer their customers unparalleled new products and services at greatly reduced fees and charges while staying competitive with digital-only fintech start-ups and SMEs.

3

ENERGY SAVINGS AS PART OF AN INTEGRATED IOV

The energy savings (mentioned in the contest of the internet in 2.0.) are **multiplied many times** when the same energy redistribution system is applied to IoT devices (that we are researching with our commercial partners). According to *IEEE Consumer Electronics Magazine* Editor, **Peter Corcoran**, energy is the primary determinant of the “*long-term sustainability of the Internet of Things*”<sup>23</sup>. For the EU to continue to lead the world in **sustainability** initiatives while promoting a cohesive society at all levels requires an **integrated Internet of Things (IoT)** that – through a radical **redistribution of current user energy consumption** of **US \$7 trillion** per year<sup>24</sup> – becomes near **self-sustaining**. We propose to achieve this by ensuring that a next-generation IoT is primarily powered and funded by **Smart City** and **Internet of Things (IoT)** applications and devices (called “nodes”) *themselves* (along with traditional devices, as covered in 2.0.). We propose that this existing **energy consumption** can be **efficiently redistributed** across an integrated IoT in line with **Internet of Energy (IoE)** principles to reduce reliance on current **primary power sources**, including batteries and grids, by up to **45%**, offsetting a predicted **40%** increase to **2030**.

<sup>23</sup> Corcoran, P. (2018). 2016 Index IEEE Consumer Electronics Magazine Vol. 5. *IEEE Consumer Electronics Magazine*, 5(4), pp.137-147.

<sup>24</sup> Siegel, J., Kumar, S. and Sarma, S. (2018). The Future Internet of Things: Secure, Efficient, and Model-Based. *IEEE Internet of Things Journal*, 5(4), pp.2386-2398.

A true IoE requires the implementation of IoT technology into distributed energy systems to **optimise the efficiency** of energy infrastructure and **reduce wastage**. This is achieved by creating a network of sensors that have various applications, such as power monitoring and **demand-side** energy management. Consumer appliances with IoT functionality are able to help **balance energy demand**: we propose to **optimise this balance** through the innovation of a radically-new, 4G LTE-A compatible **hardware device**, called a “**Smart Chip Node**” (SCN; successful patent search carried out), which we already have in R&D. SCNs are designed to be integrated with IoT devices to redistribute **energy and collected data** across an integrated IoT, assigning each with a **redistributable and payable** “value” on a user’s Decentr ID that reduces overall network costs. Successful **SCN development** is critical for a sustainable and socially beneficial IoT: our SCN will ensure that all users (through Smart Devices fitted with an SCN) effectively “subsidise” our IoT through **existing internet and device usage**, meaning our proposed IoT does not consume **a single KWh more electricity** than users’ current energy needs (and increasingly *less* energy as adoption of our solution increases across **rapidly integrating** IoT/IoE/IoV industries, applications and devices).

This is achieved by our SCN deploying twin redistributable values: **data and energy** (data being a dimension current IoTs are not able not exploit as inherently valuable) through **community consensus** across our **IoT**, using a radically-new **consensus mechanism** based on **cooperative-game theory**<sup>25</sup>. For example, SCNs show promise to network **data-as-redistributable-value** (from wireless devices) and **energy-as-redistributable-value** (from systems in which access to power lines is trivial, whereby 5 or 3.3 V adapters enable USB-powered sensor networks to operate in perpetuity), with each **reducing wastage of the other**. This is not achievable on a large scale using current non-integrated IoT networks, which are typically limited in scope, with **less than 10** nodes in a network that can **vary widely in power consumption**, depending on the application. Our solution to create this sustainable technological and **socioeconomic** paradigm is the wide-scale commercial deployment of our SCN; this radically-new System on Chip (SoC) design will transmit data from users’ Smart Devices to their online Decentr account, where **energy/value** will be **efficiently and sustainably redistributed** across an integrated IoT network, with the **surplus energy conserved** being *credited* to users as **payable and tradeable economic** value as part of our IoV that will in part fund users’ IoV applications and hence the wider network in perpetuity.

4

INNOVATION IN THE ARTS

Decentr aims to further enhance the close links between Europe’s global **political and economic** influence and its cultural richness and diversity. Our platform aims to assist with the challenge of striking the right balance between different legitimate public policy objectives in the arts, including the promotion of cultural diversity outlined in the **Community’s action under Article 151(4)** of the Lisbon Treaty: specifically, Decentr is predicted to enhance **copyright enforcement and facilitate claims** by keeping a record of the work of creatives, both physical and digital, as interrogatable data as part of a user’s personal ID, saving as much as **US \$300MM** annually (or **0.06%** of the estimated **US \$5BN** lost to copyright infringement) in copyright disputes through decentralised arbitration, while; reinforcing the “**Television without Frontiers**” Directive with an interrogatable user ID record, able to confirm compliance with this Directive. The stimulation of the arts and the resulting boost to foreign trade and tourism is set to add around **US \$345MM** to the EU economy over **5 years**.

2.06 Adhering to Framework Conditions; Regulations, Public Acceptance and Follow-On Financing

By ensuring Decentr is a leader in **Business Continuity Management (BCM) Governance** and **Risk and Compliance (GRC)** we are able to **balance risks and opportunities** and react accordingly. We are through interdisciplinary research with our commercial and R&D partners ensuring our technology complies with all relevant regulations as regards data privacy; this includes **GDPR, Article 8 of the EU Charter of Fundamental Rights**, that enshrines the protection of personal data is part of Europe’s common constitutional fabric, and the *EU proposal for provisions on Cross-border data flows and protection of personal data and privacy*.

<sup>25</sup> Cooperative-game theory describes the ongoing, qualitative and quantitative “proof-of-engagement” assessment of transmitted SCN user data among cooperating player (or “user”) coalitions.

Article 1 **Cross-border data flows**, 1. a), b), c) and d), which facilitate cross-border data transfer to promote a digital economy, and Article 2 **Protection of personal data and privacy** 1, 2, 3 and 4, which outline the obligations of each party as regards data exchange. Adherence to and compliance with local and EU **legislation and directives governing** the exchange of both data and currency (as our system makes the two indivisible), is critical for **widespread mainstream uptake** of our system in conjunction with our commercial and other partners. With this in mind, we are developing CTE 2 and CTE 3, as well as our white papers and analogous research, with commercial bank/PSP partners to ensure Decentr further **adheres to EU law** by developing system **safeguards and security protocols** that ensure the transfer of personal data abroad is on the basis of what *Communication from the Commission to the European Parliament* (COM[2017] 7 final), terms a “*Commission ‘adequacy decision’*”. For Decentr users, this Commission is by default of our standardised platform establishing that a non-EU country **provides a level of data protection** that is “*essentially equivalent*”<sup>26</sup> to that in the EU. In this way, Decentr ensures that the free flow of personal data to a third country is **without the need** for the data exporter to provide **further safeguards** or obtain any authorisation as such safeguards are inbuilt as part of our **core design architecture**.

Decentr development objectives **are closely aligned** with our ongoing **international research activities**: further research before, during and after the project duration will be undertaken by our R&D and commercial partners to ensure Decentr protocols are in line with the **ISO/IEC 29100:2011 and ISO/IEC 27001:2005** best practices and privacy framework, **Charter of Fundamental Human Rights of the European Union 2009** and **Guidelines on FAIR (Findable, Accessible, Interoperable, Reusable) Data Management in Horizon 2020**, as well as supporting the aims of the **International Association for Trusted Blockchain Applications (INATBA)**, which are to **converge regulatory approaches** to blockchain and other distributed ledger technology (DLT) while promoting an open, transparent and inclusive **global model of governance** for blockchain and other DLT infrastructures and applications. This is in conjunction with SSH, research and academic experts we are engaging with (including **School of Sociology and Social Policy, Leeds, London South Bank University (LSBU)**; sociology and social policy) and commercial/technical, including the **Fraunhofer Society** and the **Max Planck Society**) and relevant independent researchers to **leverage the development** of the technology proposed.

### 2.07 Industrial/Commercial Exploitation of Decentr

**Commercial and industrial involvement** and the involvement of governmental and regulatory bodies and agencies is critical in order to ensure **rapid and immediate**, large-scale deployment and mainstream uptake of Decentr in line with EU regulations and directives. To these ends, we are, in conjunction with our bank/PSP partners, further engaging with organisations that are sub-categorised as follows:

#### *Stakeholder Group*

All stakeholder engagement (outreach, activation, developments and assessment) will be supervised by a **dedicated team** organised into the project’s **Dissemination and Exploitation of Results Steering Committee (DEOR-SC)**. The definitions and segmentation of these audiences is critical in order to refine our communications and dissemination strategy by ensuring we are targeting the **correct stakeholder group** or subcategory using the correct approach at the correct time; e.g., subcategories, such as Think Tanks, will be approached at the inception of the project with a view to encouraging their participation for long-term research, **analogous social benefits**, and the like, whereas the **short-term economic, security** and other gains will be emphasised when approaching commercial entities, such as SMEs, and the like.

The **overall project target audience** is defined as the wider audience that will take advantage of our **horizontal** solution, in which can be situated commercial **verticals** including banks/PSPs and other financial companies, SMEs and large-scale enterprises. This wider audience is represented by businesses, financial bodies, public bodies and their administration, civil society, Community-Based Organisations (CBO), Civil Society Organisations (CSO), Think Tank, experts and researchers, the European Union’s correlated bodies and bureaucracies with whom we are, or will be, engaging and are organised in categories per the impact setting and benefits.

<sup>26</sup> Judgment of the Court of Justice of the EU of 6 October 2015 in Case C-362/14, **Maximilian Schrems v Data Protection Commissioner**, points 73, 74 and 96. See also recital 104 of the GDPR and recital 67 of the Police Directive which refer to the standard of essential equivalence.



Impact on Stakeholders

The below listed subcategories (Table 3) is populated by specific agencies and entities, which demonstrate some overlapping interests between subcategories. Decentr will in conjunction with our commercial and marketing partners generate linking developments in a variety of spheres related to the Digital Market (see “Synergetic and Strategic Partnerships” column [non-exhaustive]).

Table 3: Stakeholder Group: Expected Impact/Benefits: Short, Medium and Long-term

STAKEHOLDER GROUP	IMPACT: SHORT TERM	SYNERGETIC PARTNERSHIPS
Businesses (SME, Industry, commerce).	Reduced payments and other costs, enhanced security, and improved communications with customers and other stakeholders.	(Supply Chains) Aldi (Sp./UK), Carrefour, Tesco (UK) (Telcos) Duetsche Telecom, Huawei, Swisscom.
Financial intermediaries (banks, savings and lending institutions, pension funds, mutual funds, insurance companies, PSPs).	Reduced payments and other costs, enhanced security, and improved communications with customers and other stakeholders.	(PSPs) Global Exchange, Zoom, Santander (insurance) AXA, Allianz SE (pension/mutual funds) Egon, Alliance Trust, Aviva, MoneyFarm.
Financial markets (equity markets, bond markets, derivative and options markets, futures and commodity markets, other ancillary actors).	Reduced payments and other costs, enhanced security, and improved communications with stakeholders, as well as access to alt. trading options and financial instruments. This will stabilise real-world equity and commodity markets by moderating the imponderables of the fractional free-reserve banking system while minimising financial instability associated with a debt-based economy.	(Commodity traders) Trafigura, Gunvor, Archer Daniels Midland, Noble Group (ancillary) The European Association for Business and Commerce (EABC), The European Small Business Alliance (ESBA), The European Federation of Accountants and Auditors (EFAA), The Network of European Financial Institutions for SMEs (NEFI), The European Banking Federation (EBF).
Governments and related institutions and bureaucracies.	Improved interaction with citizens and enhanced ability to ensure taxation and other legislative compliance, enhanced access to voting and other public services, etc.	The EU Observatory on Cybersecurity and Privacy, European Association for Digital Humanities (EADH), The European Association of Co-operative Banks (EACB), The European Citizen Action Service (ECAS), The Ecommerce Foundation, The European Association of Development Agencies (EURADA).
Statutory bodies with sectoral responsibilities (utility regulators).	Improved data access to improve overall efficiency and public services.	Cyprus Energy Regulatory Authority (CERA), The Danish Energy Regulatory Authority (DERA) The Bundesnetzagentur (Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway).
Statutory bodies with *regional responsibilities (local councils).	Improved data access to improve overall efficiency and public services.	<i>*In conjunction with the Council of European Municipalities and Regions (CEMR) 55 national associations of towns, municipalities and regions from 41 countries.</i>
Statutory bodies with subject-matter responsibilities (agencies, markets and regulatory institutions, etc.).	Improved data access to improve overall efficiency and public services.	Court of Justice of the European Union (CJEU), European Central Bank (ECB), European Court of Auditors (ECA), European External Action Service (EEAS) European Committee of the Regions (CoR).
BENEFICIARIES (BNF)	IMPACT/BENEFIT: MEDIUM-TERM	STRATEGIC PARTNERSHIPS
*Civil society.	Dramatically improved communications between all civil bodies that will promote the wider sharing of common interests and collective activity.	<i>*In conjunction with the European Economic and Social Committee (EESC), including representatives of member states, parliamentarians and local and regional authorities.</i>
Scientific experts and researchers and ancillary bodies.	Dramatically improved communications between academic and analogous institutions, coupled with assigning academic research with a tradable value, will promote large-scale projects and collaborations that are not currently possible or practical.	EDiMA (the trade association representing online platforms and other innovative tech companies), The European Digital SME Alliance, Krakow School of economics, Centre national de la recherche scientifique (CNRS [Fr.]).
The European Union's correlated bodies and bureaucracies.	Dramatically improved communications between the EU's correlated bodies and bureaucracies will improve efficiency, reducing costs while offering citizens a greatly improved service.	DGsConnect, ECFIN, EMPL, FISMA, EASME, EUROCHAMBRES, European Union institutions and bureaucracies (departments, executive agencies), EU Blockchain Observatory and Forum, The EU Observatory on Cybersecurity Privacy, European Association for Digital Humanities (EADH), European Economic and Social Committee (EESC).
OTHER STAKEHOLDERS	IMPACT/BENEFIT: LONG-TERM	STRATEGIC PARTNERSHIPS
CSO, CBO, ancillary bodies.	Over the long term, dramatically improved communications between CSOs and CBOs will continue to promote the wider sharing of common interests and collective activity.	Committee for Human Rights (It.), Share The World's Resources (STWR; UK), Synergie développement et partenariat international (Ch.), United Network of Young Peacebuilders (Dk.), Verein zur Förderung der Volkerverständigung (Au.), The European Association of Development Agencies (EURADA).
Think Tanks.	Dramatically improved communications will encourage public collaboration and interest, leading to improved public policy suggestions and recommendations.	Neweconomic.org (UK), Centre for European Policy Studies (CEPS), Centre for the New Europe (CNE), European Centre of Excellence for Countering Hybrid Threats (Hybrid CoE).
The media.	Over the long term, the media will benefit our project through awareness-raising while themselves benefiting from new communications platforms to disseminate information and services to customers.	Bertelsmann, Sky, ITV, Vivendi, RELX Lagardere, Wolters Kluwer, ProSiebenSat and local and regional media outlets.



Individuals from the TGP and BNF are **inclusively participating** in the project design and, if approved, will **similarly** participate in the preparation, production and assessment of the project results/outcomes. They will engage in all WPs in either an advisory or a feedback role, with a particular focus on WP7 (DEOR).

2.2 Measures to Maximise Impact

a) Dissemination and Exploitation of Results

The distribution of the project outcomes will be the subject of specific activities within WP7. Upon the initialisation of the project’s activities, a Communication and Dissemination Plan will be created and further updated to ensure maximum visibility and impact of the project outcomes in accordance to **Article 38 “Promoting the Action - Visibility of EU Funding”**. A **Communications and Dissemination Manager** will guide and lead all communication and dissemination activities in the project. Our Commercial partners have committed to collaborating with Decentr in the dissemination of results. Their own communication channels (e.g. websites, newsletters, social media accounts etc.) and networks will be leveraged in order to disseminate the results of the project as soon as they are available. All project members are expected to contribute to the dissemination of project results through appropriate press releases in their respective countries as well as to organize tutorials at major conferences in the different fields that are relevant to the present project. Decentr will disseminate results individually or jointly through scientific publications and magazine articles, oral and poster presentations, policy recommendations (policy briefs) based on the findings of the project.

b) Key Performance Indicators (KPIs) and Impact Transmission Mechanisms

Table 4 outlines the expected impact dynamics activated by the achievement of each project objective and (sub)objective. Decentr will generate and disseminate research during and after the project, with a lasting legacy impact expected for ongoing EU technology and SSH research.

Table 4: Decentr Objectives, KPI’s and Transmission Mechanisms

(SUB)OBJECTIVES AS PER SECTION 1.1	WP	ASSOCIATED KPIs	IMPACT TRANSMISSION METHOD
01.1.-Inter-disciplinary research of DECENTR DApp compatibility with existing web browsers, including Chrome and Firefox. 01.2.- Development of DECENTR’s radically-new consensus mechanism. 01.3.- Development and testing of DECENTR’s Multi-Factor Authentication (MFA) layer. 0.1.4.- Development of DECENTR’s native currency exchange.	2, 3, 4, 6	Ø Development of technology white paper ( <i>as part of</i> 0.2.1, WP7) with R&D partners on compatibility with existing web browsers (in conjunction with all CTE builds). Ø Completion of DECENTR’s consensus mechanism, ensure compatibility with other DECENTR CTEs. Ø Successful testing of DECENTR’s MFA with other DECENTR CTE’s. Ø Completion of DECENTR’s native currency exchange compatible with other DECENTR CTE’s.	1) Publication of white paper on our website and distribution to our research and commercial partners. 2) Integration into DApp for pilot program details to stakeholders via communications part DDI, press releases, etc. 3) Integration into DApp for pilot programme/r (as in point 2). 4) Integration into DApp for pilot programme/r (as in point 2).
02.1.-Interdisciplinary research of DECAI Application Programming Interface (API) compatibility with existing open data and data marketplaces. 02.2.-Develop the DECAI public interface, which will allow users to access all DECAI’s data sharing functions, features, tools and insights. 02.3.- Testing of DECAI security protocols.	5, 6	Ø Development of DECAI’s section in white paper ( <i>as part of</i> 0.1.1, WP7) with R&D partners on compatibility with existing web browsers (in conjunction with all CTE builds). Ø Completion of the DECAI public interface to ensure compatibility across CTEs, as well as open/public APIs. Ø Successful testing of DECAI security protocols to ensure immutability and compatibility across CTEs.	1) Publication of white paper on our website and distribution to our research and commercial partners. 2) Integration into DApp for pilot programme/release of details to stakeholders via communications partners/ media via DDI, press releases, etc. 3) Integration into DApp for pilot programme/release of details (as in point 2).
03.1.- Develop two in-depth, white papers as well as periodic reports on 1) technological development ( <i>as part of</i> 0.1.1, 0.2.1, WP7; in conjunction with technology partners) and 2) SSH/ethical/legal/compliance (in conjunction with research partners, including School of Sociology and Social Policy, Leeds, London South Bank University (LSBU)). 0.3.2.- Continued research into legal, ethical and social aspects with experts as a part of ethical white paper and also legacy research. 0.3.3. Communicating R&D findings and progress with data providers through our white papers and reports.	1, 2, 3, 4, 5, 7	Ø Additional whitepaper completed as the result of successful interdisciplinary research completed with academic research, and commercial/technical partners, including the Fraunhofer Society and the Max Planck Society, to benefit ongoing technology development. Ø Ongoing communication with compliance/SSH partners, including Victor Poljakov, Association NEST, Duncan McCann, Neweconomics.org. Ø Ensuring communication and dissemination of findings with PSP partners GLBL, Xoom and Santander, as well as other data providers.	1) Publication of our white papers on our website, dissemination amongst stakeholders, promotion of main findings in mainstream press, including articles on DDI and associated investor/technology platforms. 2) Research published as part of our SSH/ethics/compliance white paper ( <i>as part of</i> 0.3.1, WP7), as well as released as mamstream articles for online platforms, etc. 3) Publish white papers and reports disseminated to stakeholders with a view to with a view to gaining feedback, prior to pilot programme, to make any final technology/conceptual adjustments.
0.4.1.- Demonstrate completed DECENTR prototype to PSP partners (M33). 0.4.2.- Launch ID verification pilot programme in conjunction with PSP partner customers in target demographic (Spanish/LAC market).	1, 6, 7	Ø A successful demonstration amongst stakeholders, resulting in constructive feedback, in conjunction with stakeholder white paper/report review, prior to pilot programme. Ø Successful launch of pilot programme in conjunction with GLBL, piloting ID-verification across three countries.	1) Closed demonstration with stakeholders, consortium partners as well as SSH, IIRS, DEOR partners. 2) Successful semi-open ID verification pilot programme across Spain, Peru and Venezuela with near instantaneous and repeatable ID verification for Global Exchange customers.

2.2.1 Dissemination and Exploitation of Results Plan (DEOR-P)

The DEOR-P describes the activities to be performed and the channels to be used to engage targeted audiences and stakeholders, promote and **disseminate** the project and its outputs, and to **encourage the use** of the project results **during the project scope and beyond**.

**Dissemination** – Raise **awareness** of the project results, its rationale and objectives, the partnership and generate **synergetic and strategic partnerships**.

**Exploitation** – Effectively and pro-actively **transfer knowledge**, resulting in **uptake** and exploitation of the project results by the project identified target audiences.

Exploitation Goals

The goal of the exploitation plan is to develop strategies for the exploitation of the project results, explore their wider use, sustainability and business feasibility, as part of maximising the R&D outcomes of our interdisciplinary approach. The initial exploitation plan will be launched as soon as a clear description of the expected outcomes is documented in practice. It will incorporate all actions involved in the establishment of an environment for the wider use of Decentr results, and the potential for sustainability of project outcomes – including the individual exploitation plans of commercial partners based on their contributions and developments within the project, and their business development strategy, especially where these pertain to patentable technology and algorithms identified in successful patent searches (Table 5).

Table 5: Foreseen Exploitation of Decentr Project Outcomes by the Consortium Members

EXPLOITABLE OUTCOMES	EXPLOITABLE OPTIONS AND POTENTIAL CUSTOMERS	LICENCE
<i>Foundational open source technology</i> that creates a <b>decentralised user layer</b> for the current <b>centralised internet</b> . Open source components are an important resource that helps development teams create superior products, faster, and are hence uniquely and rapidly exploitable <b>at scale</b> .	Being a hyper networked open source horizontal solution means DECENTR will exploit both 1) <i>DApp-wide network effects</i> to create rapid mainstream public adoption of our tech and 2) <i>Industry network effects</i> where SMEs, multinationals (including our PSP partner, GLBL) and others build on our software to engage with their stakeholders on our DApp.	OSI (Open source Licence) Can be freely used, modified, and shared for commercial and non-commercial use <i>With massive individual and industry subscriber acquisition, we can then exploit:</i>
<i>Industry verticals built on our DApp</i> are able to build out their own solutions using our open source components, including <b>security, AI and decentralised communications</b> components.	As it is <b>free</b> for SMEs, multinationals, etc (as well as individuals) to build solutions on our decentralised platform, DECENTR is uniquely exploitable to/by industry. This is due to the integrated, hyper secure and networked nature of the solutions <b>users build</b> with us. DECENTR subscribership is further boosted due to the <b>unforkable</b> nature of our DApp.	OSI (Open source Licence) Can be freely used, modified, and shared for commercial and non-commercial use <i>Ø However, companies who wish to include certain of our algorithms in their products, need to comply with:</i>
<i>Patents(a)</i> (successful patent searches carried out by COMM’s CTO) for 1) the integrated n-dimensional/DPoS/EEC algorithms underpinning our MFA/SSM security layer (CTE 2), 2) the n-dimensional chain/DPoS/EEC algorithms underpinning our <b>consensus mechanism</b> (CTE 2), 3) the <b>radically-new</b> (not built using any existing paradigms) decentralised algorithms for our <b>communications “user layer”</b> (CTE 1) and 4) the topological algorithms underpinning DECAI’s DL SSN RNN function.	Patented technology (subject to issued patents) will be <b>exploited</b> whereby individuals and industry that require <b>deep integration</b> of our tech into their proprietary products <i>where the products do not form</i> an integrated solution built as part of our <b>foundational tech</b> .	<b>Dual (GNU GPLv2 compliant/proprietary)</b> <i>Ø The range of proprietary applications include “intelligent” GPS and tracking systems (we are engaging with GM), household Smart devices, etc, but only where these devices do not form part of an integrated IoT/Smart City solution supported by our:</i>



<i>Patents (b)</i> (successful patent search carried out by COMM's CTO) and 5) the technology underpinning our SCN chip.	Our SCN chip (subject to issued patents) will be supplied to <b>IoT/Smart city developers</b> under licence to COMM/DECENTR, AIR/BISITE. This SCN is uniquely exploitable as any device (built by a third-party developer) that <b>connects to our foundational tech</b> via our SCN requires no additional licence (as described in <i>Patents (a)</i> ) hence encouraging mass uptake of SCN (and e-SIM) devices with integrated algorithms compatible with our DApp.	<b>Proprietary License</b> <i>Ø The widespread global uptake of our Dapp/IoT proprietary licensing of our SCN chip will encourage will allow us to exploit:</i>
<i>Native payments solutions.</i> DECENTR's radical payment solution, which exchanges <b>data-as value</b> and not currency-as-value, is set to save industry and individuals up to <b>100%</b> on exchange fees for global payments.	Exchanging <b>data-as-value</b> is free on our site – and even <b>rewarded</b> by default of our <b>internal economics</b> . This leads to a potential scenario whereby, for example, a user transfers \$1.00 of value but actually <b>receives \$1.01</b> by way of an increase in their <b>Personal Data Value (PDV)</b> for undertaking this action (whereby our <b>consensus mechanism</b> deems this exchange of significant socioeconomic benefit). However, when this data is <b>exchanged into fiat or digital assets</b> via our native exchange it accrues a <b>6% exchange fee</b> for individuals. Industry pays <b>no fees on currency exchange</b> , further exploiting massive uptake of industry (where we accrue more revenue by virtue of <i>Patent (b)</i> ).	<i>Ø Integration of our payments solution into vertical commercial solutions built on our site is free. It is not technically or conceptually possible to deploy our payments solution by any company as part of a solution that is not built on our platform, unless a company built an identical platform, which would contravene accompanying licences under Patents (a) and likely Patents (b). This combination of multi licensing arrangements ensures the value of:</i>
<i>DECENTR (DEC) native token.</i> The unparalleled utility our native token has makes it a uniquely valuable commodity, as this token is set to exclusively underwrite a safe, secure and immutable global data economy.	With only DEC 100 million ever created (and without the ability to fork DEC, which creates the kind of unstable and unsustainable <b>deflationary economies</b> seen with current crypts) we estimate a conservative 400% rise in value by <b>Year 5</b> , equating to <b>US\$ 30BN</b> , creating a free, open data economy by <b>Year 7</b> underpinned by as much as <b>US \$1.5TR</b> (or 1% of the GWP) in liquid and other <b>digitised assets</b> (due to wider DEC trading, our <b>internal economics mechanism</b> , and <b>patent royalties</b> ).	<i>Ø DEC is tradable as a utility token (as defined by the "Howey Test"), which circumvents onerous SEC compliance regulations (in the US, with the FCA in the UK having rejected SEC definitions) related to security tokens. This "utility" further opens up possibilities (that meet our, and GBL's, CSR remit) for expanding financial tools for the unbanked and uncredentialed due to automated AML/KYC compliance as part of DECENTR Dapp protocols.</i>

3. Implementation

3.01 Work plan, Work packages, deliverables

3.01.1 List of Work Packages

Decentr development and deployment is structured into seven work packages, each dedicated to a specific core aspect of the overall project, ensuring Decentr reaches the project objectives within the planned 36 months [with 10 months remaining as of V2.1 April 2020] project duration. Therefore, each work package is broken down into specific tasks and related deliverables. Furthermore, all work packages and tasks have a dedicated team leader, overseeing the efforts needed to fulfil the tasks, coordinating efforts and reporting to the coordinator where unforeseen problems arise. The work packages are planned to follow an agile model and overall methodology, ensuring that the output of the earlier work packages is consistent with the following/adjacent ones while ensuring the required knowledge and documents are available as, when and where necessary to inform analogous tasks and work packages. In order to monitor this timeliness of delivery, major project outputs are linked to strategically placed milestones, enabling performance measurement and timely risk mitigation throughout the project life cycle.

Table 6: List of Work Packages

#	WORK PACKAGE TITLE
WP1	Project Management and Coordination
WP2	Core Technology Element (CTE) 1: Development of Communications/User Layer
WP3	Core Technology Element (CTE) 2: Development of Consensus Mechanism
WP4	Core Technology Element (CTE) 3: Development of Native Currency Exchange
WP5	Core Technology Element (CTE) 4: Development of DecAI ANN
WP6	Complete integrated Decentr prototype/pilot programme
WP7	Dissemination, Communication and Exploitation of Results
TOTAL	



### 3.1.2 Overall Work Plan

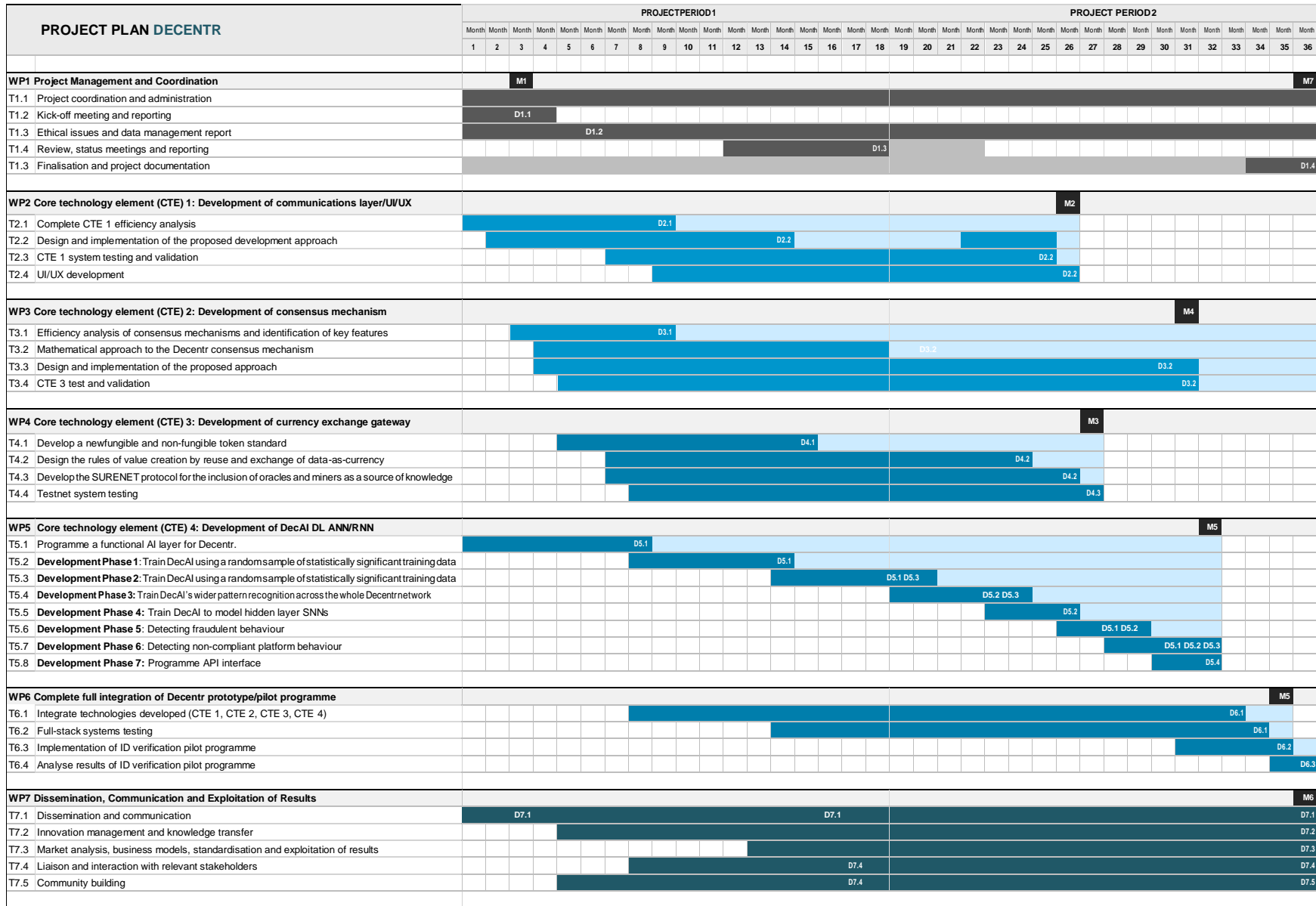


Fig. 15 Decentr Project Plan

### 3.01.2 Description of the Work packages

WP NUMBER	1	START DATE	M1
WP TITLE	Project Management and Coordination		
OBJECTIVES			
<p>The main objective of this WP is the coordination of the project and the reporting during the project, as well as compliancy with ethical and data privacy standards. The scientific work will be assisted, monitored and the administrative tasks will be performed all in order to pursue an effective and most productive project performance. A kick-off meeting will be organised at the beginning of the project to allow the project to be discussed and to assure that all commercial and other partners that Decentr comprises a cohesive team and a set of shared aims and goals. It will provide an important basis for guaranteeing regular and constructive dialogue, communication and exchange between stakeholders and decentralised teams. There will be a summarised overview of the meeting for interested external experts/ other third parties provided by the coordinator. There will also be an overview which on the work progress and next steps, this information will partly be disseminated on the project website to serve our partners and the wider public. More detailed technical and management information will be delivered in the form of reports to the EU, including final project documentation and publication at the end of the project. A report on ethical and data management strategies for the project will ensure appropriate implementation of applied ethics and privacy throughout the project.</p> <p>WP1 will have to make sure that the skills, capacities and efforts of all involved partners are fully integrated and all put to the benefit of the project. Therefore, a specific task in this first WP will be to monitor and assist the progress and ongoing improvement of the project. A main characteristic of the first WP will be the monitoring of the achievements of the other work packages, the time-frame of the project and the regular finalization of deliverables and milestones, as well as ethics and privacy monitoring, which guide the output of each WP throughout the entire project. The monitoring of these achievements will require a continuous and consequent focus on the project plan, the results and the objectives in general.</p>			
DESCRIPTION OF WORK			
<p><b>T1.1 Project Coordination and Administration:</b> This task is designed to oversee the objectives of the work packages. It is therefore characterized as the general project coordination and administrative management. As such, this task includes effective communication among stakeholders and decentralised teams, assisting and monitoring the scientific work, overseeing the whole project as well as collecting and delivering reports on time. The task will be the guiding-line of the whole project in order to keep focussed and to act as effective and efficient as possible. This task will be managed by the appointed project coordinator and in cooperation with the Decentr team and external partners - especially regarding the input for administrative aspects of the various fields.</p> <p><b>T1.2 Kick-Off Meeting and Reporting:</b> The WP1 leader is responsible for organising a kick-off meeting and for reporting on this meeting at the beginning of the project. The kick-off meeting should establish an initial information exchange and the task delegation among stakeholders and decentralised teams, which is the basis for a successful collaboration and for a high quality of the project outcomes. An important aspect of this kick-off event is to meet each other in person, which also contributes to a better understanding and a feeling of trust between stakeholders and decentralised teams.</p>			

**T1.3 Ethical Issues and Data Management Report:** A data management plan will provide analysis of the main elements of the data management policy used in Decentr, with regard to all datasets that will be generated and used. The data management plan will follow the H2020 guidelines, including ethical and privacy aspects to be respected throughout all project phases.

**T1.4 Review, Status Meetings and Reporting:** The project will include project status meetings in different partner countries and a mid-term status report. In these meetings, the progress of the project will be discussed and ongoing feedback and updates can be given. This will guarantee that the project works at an optimized level and – if needed – it will provide an opportunity to improve the progress of the project.

**T1.5 Finalisation and Project Documentation:** The final task within this first WP will be aiming at the final project documentation. It will summarise the work and the outcomes of all WP's, including the methodology, the final results and lessons that were learned in the project.

## DELIVERABLES

**D1.1 - Kick-off Meeting Report (M3):** A kick-off meeting report will be provided within the first two months of the project. It will contain the meeting agenda, participant list, and all relevant information on important company and stakeholder decisions. This report will contribute to a shared understanding, so the company and stakeholders can start at a level of effective communication.

**D1.2 - Data Management Plan (M6):** The Decentr Data Management Plan is an important management tool, guiding constant ethical and privacy assessment on all data sets collected, generated and used. It will consider ethical and privacy aspects on data management, sharing, processing and archiving.

**D1.3 - Status Report and Financial Overview (M17):** At the mid-term point of the project, a status report will be produced. It will primarily focus on the progress of the project. It will not only present all project accomplishments, but it will also identify the obstacles that came up in the first period. Special attention in this report will be given to the reflection on the communication between stakeholders and decentralised teams.

**D1.4 - Final Project Documentation and Financial Reporting (M29):** The final deliverable of the first work package will contain the project documentation, where the achieved objectives will be described. It will also include the difficulties, which came up during the project. Also insights for further research will be documented and described.

WP NUMBER	2	START DATE	M1
WP TITLE	Core Technology Element (CTE) 1: Development of Communications/User Layer		

## OBJECTIVES

### WP2: Objectives

The overall objectives of this WP, led by Decentr are to complete final CTE 1 development (concurrent with CTE 2 development in WP3). This WP comprises the core technology that underpins Decentr, as it allows all data online to be decentralised as regards dataflow.

**Note:** We have built the core back end tech for this CTE (TRL 5 in back end testing), greatly mitigating development risks, costs and resources, while validating the viability of the conceptual and technological basis for this project.

## DESCRIPTION OF WORK

### Description of work

**T2.1 – CTE 1 efficiency analysis:** *Complementary to T5.1 – Efficiency analysis of consensus mechanisms and identification of key features to be integrated* (WP5) this task uses the following tech to improve the validity our analysis: solidity language written cases with solc, which has been coded in C++ solc-js and Emscripten to cross-compile from the solc C++ source code to JavaScript. Remix will also be deployed as an efficient compiler for small contracts. To build our blockchain testnet we will use GanacheCLI (or Testrpc): GanacheCLI (previously Testrpc), a NodeJS package, is a fast and customisable blockchain emulator. It simulates our network on a single computer and allows calls to be made on the blockchain without any of the inconvenience of running a real node. This will greatly facilitate our analysis, representing significant time and cost savings.

**T2.2 – Design and implementation of the proposed approach:** *Complementary to T5.3 – Design and implementation of the proposed development approach* (WP5), we will use Coinbase API to optimise integrated implementation of the user layer. Blockchain as a Service (BaaS) will also be deployed. BaaS is basically an offering which allows its users to leverage cloud-based solutions to build, host and use their own blockchain apps, smart contracts, and functions on the blockchain while the cloud-based service provider manages all the necessary tasks and activities to keep the infrastructure agile, operational, safe and immutable. Tierion's technological infrastructure, the Chainpoint Proof protocol, will come into play whenever a user adds something in Tierion's data store. Chainpoint and Tierion's API anchors the data to the blockchain in order to generate a timestamp proof. Chainpoint also has the capability to create millions of proofs per second because of its highly scalable architecture. It also adds accuracy to its proofs by collecting data from Network Time Protocol (NTP) servers and the National Institute of Standards and Technology (NIST) and linking anchors to both the bitcoin and ethereum blockchain.

**T2.3 – CTE 1 system testing and validation:** This task is to validate the public exposed interfaces to verify separate systems operate well together. *Complementary to T5.4 – CTE 3 test and validation* (WP5) this task will use Tierion to enable us to create a verifiable database of any data or process on the blockchain by offering developer tools & API to add data to the distributed ledger. Tierion has also developed an open standard called ChainPoint for recording data and generating receipts that contain all the info needed to verify the data without relying on any intermediaries. Tierion sees a future where the blockchain is used to verify everything from medical records to online purchases to reduce the cost and complexity of trust.

**T2.4 – UI/UX development:** This task will develop and build a radically-new interface that meets the needs of our platform across all devices. Using evidence-based design – a structured process where decisions are grounded in rational methodology and meticulous data review, we will ensure our UI/UX experience on mobile apps (iOS, Android + others) as well as web and native applications (macOS, embedded, devices) is user-centric, intuitive, convenient and above all fun for users to engage with.

## DELIVERABLES

### Deliverables

**D2.1 - CTE 1 analysis report (M9):** This will ensure the team has a complete understanding of the fundamental technology underpinning our decentralised communications system.

**D2.2 - A working proof-of-engagement CTE 1 communications prototype (M, 14, M25, 26):** This prototype will be ready for integration with CTE 2, CTE 3, and CTE 4.



WP NUMBER	3	START DATE	M3
WP TITLE	Core Technology Element (CTE) 2: Development of Consensus Mechanism		
OBJECTIVES			
<p>The overall objectives of this WP are to research in the design of the CTE 2 based on an optimal consensus mechanism able to decide which "value transference" must be linked to the distributed ledger, optimising the processing loads (and thus, the energy consumption) and guaranteeing an automated, efficient, transparent and fair decision-making procedure. This <b>consensus mechanism</b> will avoid costly “Proof-of-Work” PoW (e.g., Hashcash) and will seek out the social agreement of the node/user community, using methods focussed on a “Proof-of-Engagement” (PoE) by applying game- theory and graph -theory to weighted complex networks built over the users’ community interactions.</p>			
DESCRIPTION OF WORK			
<p><b>T3.1 – Efficiency Analysis of Consensus Mechanisms and Identification of Key Features to be Integrated:</b> In this task, Decentr will carry out a deep analysis (mathematical base, resource-consumption, key-aspects, validity, fault tolerance, etc) of some of the most commonly used consensus mechanisms: PoW (e.g., Hascash used in bitcoin), PoS (e.g., NXT), hybrid consensus mechanisms (e.g., Casper FFG for Ethereum), DPoS (e.g., Lisk), Raft, BFT family. This study will set the base for the Decentr model, whereby the advantages of these methods will be transformed into a complex network-based model, highlighting those aspects that will contribute to increase the trustworthiness and transparency of the mechanism, reducing the resource consumption demanded by these mechanisms and strengthening the response of the algorithm against the known threats for the DLTs.</p>			
<p><b>T3.2 – Mathematical Approach to the Decentr Consensus Mechanism:</b> Decentr will define in this task the mathematical model that will support the Decentr consensus mechanism. It will be based on complex networks principles, which will be used to model the Decentr community and the relationship and governance model established among its users (nodes). The interactions (message and value exchange) carried out among different users, can be modelled by means of graphs (n-dimensional chains linking users that has exchanged some value or has participated actively validating blocks), and these graphs can give an idea of the commitment of these users in the Decentr community to ponder the value of each user’s contribution (useful to design a rating system). Additionally, if we design a cooperative game and we apply it to these weighted graphs, we are able to define a “democratic mechanism” (something similar is used in DPoS’ solutions) to measure the “quality” of the user and making this node responsible for the transactions’ validation. This idea will be evolved in conjunction with the intuitive property certain games have of “snowballing” – specifically, a game is convex if its characteristic function is supermodular<sup>27</sup> – with the conclusions extracted from the research activity developed in the T5.1 and will be realised in a mathematical model able to describe the consensus mechanism of Decentr.</p>			

<sup>27</sup> "Supermodularity" is used in the social sciences to analyse how one agent's decision affects the incentives of others, and is a core theory underpinning the nature of Decentr user ID value fluctuation.

**T3.3 – Design and Implementation of the Proposed Approach:** Once the consensus mechanism is designed (T5.2), the protocol as regards the solution defined for Decentr will be implemented. In order to implant the consensus mechanism, it will need to be integrated in the architecture defined, bearing in mind the structure of the network, the roles and services of the nodes and the propagation and replication and governance models applied to the distributed ledger. Decentr will identify the necessary interfaces that should be developed for the interoperability of the consensus mechanism. Finally, the algorithms and modules will be developed/programmed (using the language defined in the solution requirements – TX.X- , e.g., jscript), for its latter validation both as an isolated block and as part of the whole architecture.

**T3.4 – CTE 2 Test and Validation:** This task is designed to define a test plan and assess the results of the consensus mechanism implemented. To this end, the test plan will be defined, aiming to apply a metric able to measure the deviation of the implemented solution, from the mathematical model defined. To simplify this process, the validation will be performed in a test-environment using the core services of a well-known solution (e.g., Ethereum) that will simulate a real-environment, reducing the efforts and resources needed. As a result of these iterative-tests, the consensus mechanism will improve its performance, by incorporating the modifications designed after observing these test results. The results of these test and the integration plan for the consensus mechanism module, will be provided together with the algorithms.

## DELIVERABLES

**D3.1 - Decentr Consensus Mechanism Model Report (M9):** This report will include the conclusions inferred after the deep revision of the current consensus mechanisms, providing an efficient model for the consensus achievement in the Decentr solution.

**D3.2 - CTE 2: Decentr Consensus Algorithm (M20, updates in M30, M31):** Implementation of the model described in T5.2, validated in a testing environment. This deliverable will also include the pertinent documentation for its integration in the Decentr solution.

WP NUMBER	4	START DATE	M5
WP TITLE	Core Technology Element (CTE) 3: Development of Native Currency Exchange		

## OBJECTIVES

The overall objective of this WP is to develop a CTE 3 native currency exchange gateway that will allow for data exchanged as currency to be converted into fiat or other digital assets at both the point of sending and receipt. Decentr's native currency (DEC) allows individual and business users the flexibility of converting data "value" (or "knowledge-based" value) into digital currency and fiat, and its implementation and will be in line with new standards of fungible and non-fungible tokens.

## DESCRIPTION OF WORK

**T4.1 – Develop a New Fungible and Non-Fungible Token Standard in Ethereum Standard:** This task is designed to create a **new standard token** to enable our native currency. While fintech Ethereum-based tokens are based on the fungible token standard ERC-20, a new standard ERC-721 has been created for the “NFT Non Fungible Tokens standard” by the creators of CryptoKitties, converted into the standard de facto for the virtual currencies, while only recently the ERC-821 came up as a more sophisticated approach by Decentraland.org. The goal of this task is to further develop further the ERC-821 standard for reflecting the double nature fungibility and non-fungibility of our native currency. Instead of a standard, an integral Smart Contracts system that satisfies the requirements of the Decentr native currency will be developed, in a similar way to the Alastria Ecosystem is developing the AlastriaID from four Smart Contracts.

**T4.2 – Design the Rules of Value Creation by Reusing and Exchanging Data-as-Currency:** This requires integration with our consensus mechanism (CTE 2, WP 3), and is designed to ensure data gains in positive value by reuse and exchange between individuals, companies, and our AI, as we consider people and artificial agents (built on DecAI) to be “peers” in the value creation process of data.

**T4.3 – Develop the SURENET Protocol for the Inclusion of Oracles and Miners as a Source of Knowledge:** The SURENET protocol allows external parties to approve the validity of the data, adding consistency to the network and the data that has been validated. SURENET is a DCN (Decentralised Compliance Network) composed of computers and devices, called “nodes”. They all use the same software, which will be used for the verification tasks that will be necessary for the proposed work. It works over the abstraction for a network of independent providers implemented as algorithms, called “analysts”, to offer RC (Research & Claim) services to the clients, in our case, to validate the data value exchange. Our goal is to develop the SURENET protocol which will the integration of external data validation mechanisms.

**Reputation-Based Mining protocol (RBM):** Miners, as analysers or witnesses, do not need to spend time on nonsense computations to mine blocks and instead must fulfil task assignments. A Proof of Reputation (PoR) as a combined Proof of Work and Proof of Authority is proposed.

**Reputation-Based Task Assignment protocol (RBTA):** it is an algorithm based on e-auctions and citation auctions that lets the network assign tasks to analysts in a decentralized, fair, uniform, and unpredictable yet deterministic way, similarly to previous technology built by Decentr.

**T4.4 – Testnet System Testing:** When writing Smart Contracts for the EVM (Ethereum Virtual Machine), i.e. the Ethereum blockchain, one needs to pay for their launch and usage in gas. This cost can be prohibitive in times of network overuse and it can also be financially dangerous – a bug deployed on the live network is a bug forever open to abuse. Any change on the Ethereum blockchain is permanent and cannot be undone. Testnets are copies of the Ethereum blockchain almost identical in every way to the Mainnet except in the fact that their Ether is worthless. We will use the Rinkeby Public testnets which are available to everyone, they're connected to the internet. Anyone can connect to them at any time, even from popular wallet interfaces like MyEtherWallet or MetaMask. Using the Rinkeby testnet for creating all Agile sprints for the development of the platform, the protocol, and the tokens, with the right oracles as miners in the selected sources of knowledge, initially based, but not restricted to, people as users.

## DELIVERABLES

**D4.1.- A Protocol of NFT-FT Token for our Native Currency (M15).** This delivers the basic token design that is compatible with our platform, native exchange and internal economics.

**D4.2.- A Surenet Protocol for Oracles Inclusion (M24, update in M26).** This delivers a DCN, which is a system that processes Research & Claim (RC) requests for collecting useful knowledge. In particular, based on new machine learning tools (developed as part of our DecAI, WP5), the Surenet protocol is an incentivised and verifiable construction built on several innovations.

**D4.3.- A Platform Developed on a Rinkeby Testnet (M27). - A Platform Developed on a Rinkeby Testnet.** This will deliver a native currency exchange gateway that offers decentralised settlement and liquidity services at both the payment and transaction destination.

WP NUMBER	5	START DATE	M1
WP TITLE	Core Technology Element (CTE) 4: Development of DecAI DL ANN		
OBJECTIVES			
<p>The overall objective of this WP is to create an integrated yet autonomous AI layer that is able to interact with human users as part of the Decentr platform. By analysing re-used and exchanged public and proprietary data (subject to permissions and restrictions) the AI will need to be able to reconcile the dimension of textual content with that of interactions, and to extract meaning from this pragmatical network. From what the AI has learned from the data, it will also be able to generate new textual contents and social behaviours, modelling all possible intellectual processes used to arrive at the data outcome.</p> <p><i>This will require several AI and artificial agent layers as follows in Description of Work:</i></p>			
DESCRIPTION OF WORK			
<p><b>T5.1 – Programme a Functional AI Layer for Decentr:</b> This task covers the basic DecAI architecture, building the vertebrates and supports for all the AI solutions. This allows training and testing for compatibility across all Decentr CTE’s. In this phase, different techniques (various NLP technologies, DL, RNN, and related technologies) will be tested in order to find the best approach in terms of efficiency and scalability.</p> <p><i>Simultaneously programme AI functions with the following attributes:</i></p> <p><b>T5.2 – Development Phase 1: Train DecAI for pattern mining capabilities using a Random Sample of Statistically Significant Training Data.</b> This task will focus on the <b>topological aspect</b> of the AI’s “understanding”: by analysing the network of interactions developed on Decentr. The AI will uncover interaction patterns from the data and identify meaningfully similar behaviours. Based on this training phase, our AI will also be able to autonomously generate and categorise new patterns of interaction, modelling these that it has “observed” on Decentr.</p> <p><b>T5.3 – Development Phase 2: Train DecAI for NLP Using a Random Sample of Statistically Significant Training Data.</b> This task covers the <b>content aspect</b> of the AI’s “understanding”: by analysing the content (for both structure and for natural language processing [NLP] properties that give this content greater inherent value in conjunction with our consensus mechanism) managed by Decentr and generated by Decentr users. The AI will learn to extract meaning through the use of different NLP techniques. Therefore, DecAI will be able to identify human inputs/outputs by using a sophisticated NLP layer. This will be achieved by integrating pre-NLP Syntax, Semantics and Pragmatics analysis functions, taking into account elements of Distributional Frame-Based,</p>			



Theoretical, and Interactive Learning. Based on this training phase the AI will be capable of generating autonomously new, relevant and meaningful content.

**T5.4 – Development Phase 3: Train DecAI’s Wider Pattern Recognition Across the Whole Decentr Network.** This task is designed to ensure our AI completely relies on networked topological and dynamical Decentr data, and derives any outcome or model from this data (rather than unstructured or unrefined data) itself. Once pattern recognition across the whole network is achieved, DecAI development moves onto;

**T5.5 – Development Phase 4: Train DecAI to Model Hidden Layer SNNs.** Based on the previous training phases the AI will need to prove to be able to autonomously generate new and meaningful content and credible patterns of interaction. This task is designed to ensure that the NLP + Network analysis layer the AI can perform modelling on an SNN at the level of the AI’s hidden layers in order that DecAI can model all possible variations of data that a human user could have employed in their reasoning to get from inputs to output. This radically-new type of ANN is able to “synthesize the concepts” evolving in the SNNs. In reaching a result, the AI simultaneously obtains the collateral result whereby it can generate concrete examples representing the concepts it has learned (acting as “generative network”).

**T5.6 – Development Phase 5: Detecting Fraudulent Behaviour.** Test DecAI on recognising fraudulent behaviour patterns through procedures that simulate this type of behaviour in interactions across the network. This task is critical to ensure DecAI, in conjunction with Decentr’s multi-layered security protocols, is able to act as “sentinel” that can help reinforce ethical behaviour on the platform.

**T5.7 – Development Phase 6: Detecting Non-Compliant Platform Behaviour.** This task will test DecAI to recognise behaviours that do not comply with the rules of the platform or are illegal. Based on the censorship behaviour of platform users (with users having the power to report illegal or unethical content, initially to human moderators), our AI will learn to abstract rules and apply gradual moderation to the platform in order to make it autonomously compliant.

**T5.8 – Development Phase 7: Programme API Interface.** This task is designed to ensure open operating parameters allow DecAI to further improve its hidden layer variations by developing an API to give it access to selected open and private databases. Once DecAI can manipulate this data as part of its open/closed function, DecAI’s output function will be continually re- tested in order to ensure its outputs are consistent with analogous human outputs. **Enhanced Security protocols.** Security aspects of the API will be also addressed at this (and T5.6 and T5.7), as the content will be encrypted and every interaction will be logged. Security protocols are developed in line with consensus mechanism (WP2) security protocols and algorithms.

## DELIVERABLES

**D5.1 - A Working DecAI AI Layer (M8, updates in M14, M19, M28, M31):** This layer is designed to achieve several operational goals: **Ensure Randomness** so that the AI is not learning or “replicating” patterns (or biases) that are not actually present in the macro data. This includes wider pattern recognition across the whole Decentr network of interactions (also for detecting fraudulent behaviours; T) and the ability to extract meaning from written content. **DL RNN function.** Critically, this function will be a generator/container of potential “universes” – similar to the one from which the AI has learned from the SNN interaction. This idea is based on the fact that Decentr’s DL RNN is able to abstract the data that the network has to provide and that the Decentr network/SNNs contain and show concepts with defined and “predictable” topological and dynamical patterns (which is the result of decentralised dataflow in a casual system). Therefore, our DL RNN would be (in the broadest sense) the compressed version of the Decentr network itself – heuristic and other intellectual human shortcuts and all. As a result, DecAI is set to run on algorithms that are consistent with human ethical practices, and will be able to improve on and maintain these algorithms by interaction with our wider network.

**D5.2 - A Working DecAI Generative Layer (M23, updates in M26, M28, M31):** This layer will be able to generate autonomously combined new and meaningful content and credible patterns of interaction. This is achieved because, in any specific case, the DL RNN learns an aspect of the Decentr network through multiple interrelated SNN functions – which includes all decentralised data storage and sharing across our decentralised user layer. In doing so, new examples can be extracted (i.e., structures similar to the one from which it has learned). This means the actual Decentr network, comprised as it is of composite SNNs, is a particular example of the concept that the ANN has learned. In this sense, the relationship between DL RNN and the Decentr network is similar to that of the generative network/example. In this way, DecAI has the ability to “choose” the strongest elements of the hidden layer variations, based on dynamical/topological platform data, and execute these as a syntactically, semantically and pragmatically coherent written summary or other dataset. This is supported by;

**D5.3 - An Integrated NLP Layer (M19, updates in M23, M31):** This task is designed to ensure DecAI is able to identify human inputs/outputs by using an NLP layer. This will be achieved by integrating pre-NLP Syntax, Semantics and Pragmatics analysis functions, taking into account elements of Distributional Frame-Based, Theoretical, and Interactive Learning. This will ensure the NLP + Network analysis layer can perform modelling on an SNN at the level of the AI’s hidden layers in order that DecAI can model all possible variations of data that a human user could have employed in their reasoning to get from inputs to output. This includes the ability for DecAI to “choose” the strongest elements of the hidden layer variations, based on dynamical/topological platform (and API) data.

*This generative process will be further enhanced by:*

**D5.4 - An Open Internet API Function (M32):** This function will allow DecAI to improve its hidden layer variations by giving it access to selected open and private data bases, allowing it to further minimise any biases it may have learned at training phase and to develop further its ability to generate new content and interaction. The addition of this API will allow DecAI’s economic, security and compliance protocols to be tested as consistent with the AI behaviour.

WP NUMBER	6	START DATE	M8
WP TITLE	Complete Integrated Decentr Prototype/Pilot Programme		

OBJECTIVES	
<p>The overall objective of this WP is to fully integrate CTE 1, CTE 2, CTE 3 and CTE 4 to create a pilot programme -ready Decentr prototype. This will be undertaken in conjunction with bank/PSP partner feedback and closed back end testing in order to prepare the prototype for the pilot programme, which will be launched in conjunction with this WP and concluding communication and dissemination activities in WP 1 and WP7.</p>	
DESCRIPTION OF WORK	
<p><b>T6.1 – Fully Integrate Technologies Developed (CTE 1, CTE 2, CTE 3 and CTE 4) to Deliver Decentr platform:</b> This task will fully integrate Decentr CTEs, already tested for compatibility during individual CTE build (as a specified WP Task), to deliver a next-gen, PoE blockchain powered by users as devices (or “nodes”).</p> <p><b>T6.2 – Full-Stack Systems Testing:</b> This task is designed to ensure the whole system is working and ready for stakeholder validation. This will ensure key functions, tasks and algorithms across our tech stack are compatible and with reduced redundancy; specifically, our AI NLP + Network analysis layer (CTE 4) can perform modelling on an SNN at the level of the AI’s hidden layers in conjunction with consensus mechanism (CTE 2) n-dimensional chain and DPoS algorithms, all while performing in a way that ensures our native exchange (CTE 3) DCN is able to recognise these function and processes Research &amp; Claim (RC) requests for collecting useful knowledge, ensuring the Surennet protocol is incentivised by the value date is given on our platform.</p> <p><b>T6.3 – Implementation of Pilot Programme:</b> Implementation of medium-scale ID verification pilot programme in the Spanish/LAC market, which will be undertaken across three selected countries. This will be in conjunction with our bank/PSP partners and will conclude after 2 months (M33-M35).</p> <p><b>T6.4 – Analyse Results of Pilot Programme:</b> This task will assimilate all metadata recorded on our platform for the duration of the pilot programme, and form a report based on the outcomes of the pilot programme as compared against our specific and measurable KPIs: specifically, that our solution is on a global basis 60-80% faster than SCT Inst alternatives and is up to 35% more cost efficient.</p>	
DELIVERABLES	
<p><b>D6.1 - A Fully Integrated Decentr Prototype (M33, update in M34):</b> This will deliver a fully integrated CTE 1, CTE 2, CTE 3, and CTE 4 Decentr platform prototype with decentralised backend/ frontend communications/ fintech capability and will be interoperable with open and public APIs.</p> <p><b>D6.2 - Pilot Programme (M36):</b> 2-month pilot programme (M33-M35) with commercial partners/customers as well as SSH, IIRS, DEOR partners.</p> <p><b>D6.3 - Report on Pilot Programme (M36):</b> This will deliver a report that will be published on our website and disseminated to all partners, as well as the major findings reported on specialist, niche and mainstream news platforms via DDI and our media and industry partners.</p>	

<b>WP NUMBER</b>	<b>7</b>	<b>START DATE</b>	<b>M1</b>
<b>WP TITLE</b>	<b>Dissemination, Communication and Exploitation of Results</b>		

## OBJECTIVES

WP7 focuses on the elaboration and execution of regularly reviewed plans for the Decentr dissemination, communication and exploitation activities. It is the work package with the primary effort in achieving the impact envisioned in Decentr through its adoption by individual citizens, prosumers, media and social media, a robust dissemination and communication strategy and evolving, agile business plan for effective exploitation. WP7 spans the duration of the project and beyond: its objectives are summarised below:

- Concentrated dissemination and communication of Decentr results to all relevant stakeholders.
- Exploitation roadmap and business models emphasizing the rapid adoption of the Decentr approach as a whole and as individual technological component by users, services and product developers in the media and social media spaces.
- Interaction in clustering initiatives with other projects in ICT-13 and related programmes, to align through joint dissemination activities and identification of synergies.
- Enhance Decentr's long-term impact through a dedicated community building programme.

## DESCRIPTION OF WORK

**T7.1 Dissemination and communication (M1-M36):** This task encompasses all project activities related to dissemination and communication. A staged approach will be followed in that respect. First and by M3, the dissemination and communication plan will be further elaborated in cooperation among all partners, including both joint and individual initiatives, channels and targets. As an appendix, the deliverable will include a complete design of all graphical elements of the project (logo, stationery, brochure, leaflet, slide and deliverable templates etc.). Another appendix will include a social media dissemination plan, with a clear attribution of responsibilities for the management and periodic feeding of each newly created social media group. Then, until M12, Decentr in conjunction with our stakeholders will engage in awareness raising on the project and its goals, utilising all available channels, as predicted in the M3 plan and supervised by the dissemination officer. With the growing evidence from development and piloting activities, the quality and level of penetration of dissemination and communication actions will be evaluated and enhanced and the performance indicators established will be approached. While the progress reports will document the achievements gained to that date, the initial plan will be updated mid- way through the project's duration and at the end of the project. (Output: D7.1)

**T7.2 Innovation management and knowledge transfer (M5- M36):** Decentr significant impact may be jeopardised or reduced by a lack of planning for technology transfer. It is hence very important to manage, protect and transfer Decentr knowledge, in order to ensure its full use and exploitation. To maximise the overall strategic impact of the project, Decentr will define and implement a plan for knowledge management and exploitation. In order to safeguard the knowledge generated, ownership in accordance with Decentr and our stakeholders agreement will consist of:

- The protection of knowledge during the project.
- The management of resulting IPR.
- The granting of access rights between Decentr and our stakeholders.
- A workflow procedure for document standardisation, and access and use of project knowledge.

Furthermore, to ensure secure access to all project documentation and materials by the partners, WP6 will entail the creation of a shared knowledge management environment with document repository, email distribution lists, collaborative wiki, as well as knowledge map with a global view of the items in the knowledge management. T7.2 will be supervised by the Decentr innovation officer. (Output: D7.2)



**T7.3 Market analysis, business models, standardization and exploitation of results (M13-M36):** The production of a practical, high-performance and close-to-market system constitutes a main interest and in Decentr. This task will prepare the exploitation and technology use plan of the project and will establish an exploitation strategy of the project innovations based on business case development building on Decentr and our partners' proven market knowledge and extensive business contacts to maximise market adoption opportunities. The task will organise an initial marketing campaign targeting the prospective interested third parties, including private and public organisations (particularly in the segments of online journalism, news aggregation, digital content management) aligned with T7.4 and T7.5. The initial Decentr business plan (summarised in Section 2.2), will provide the basis for the production of the intermediate and final business plan of the project. In this framework, the business plan and the exploitation strategy of Decentr will provide details on both the horizontal (i.e., content producers) and vertical (i.e., news portals) markets addressed. An important aspect of this task is the exploration of and effort towards contribution to standards using as starting point the existing participation of partners' in related initiatives. (Output: 7.3)

**T7.4 Liaison and interaction with relevant stakeholders (M8- M36):** In tandem with task 7.1, this task will include the ongoing liaison with relevant stakeholders that are able to benefit from the Decentr solution. Decentr will contribute to this activity, specifically around the identification of relevant stakeholders to engage with. Decentr will coordinate and manage a stakeholder contact list using GDPR compliant software (e.g., MailChimp) enabling stakeholders to opt in/out of communications. For timely engagement with stakeholders will release regular newsletters and announcements, including invitations to related events (and the subsequent management of stakeholder involvement at such events), will regularly monitor and evaluate stakeholder engagement ensuring effort is taken to maximise opportunities for stakeholder engagement that is complementary to the expected objectives of the project. (Output: D7.4)

**T7.5 Community building (M4-M36):** The building of the Decentr community is a main goal of the dissemination campaign. It will consist of the aggregation of stakeholders in social media and traditional media, including freelance programmers and other individuals willing to support Decentr and decentralised social media. General users will also be involved, by engaging the Mastodon user base and requesting volunteers to join the Decentr community. The motivation is twofold: The community members will be involved in the validation of Decentr solutions (the involvement of real users in testing and validation is fundamental for innovative and successful tools); and, the community is the basis for the networking and dissemination activities that will support Decentr into the future. This network of organisations, experts and citizens, provides a critical mass of users that offers Decentr with valuable feedback and will be the basis of the community that will support Decentr beyond the project end. Target groups will be systematically invited to join the community. Members are encouraged to contribute to the project by communicating between stakeholders and decentralised teams through the functionality offered by the Decentr community channels (website, social networks, etc.), attending and advertising current relevant events, and generally keeping up to date with project initiatives and developments. The progress of the Decentr community not only generates interest in project results, but also provides insight regarding the future self-sustainability of the project. The advantages of the community will be mutual and reciprocal, as community members have a direct and clear impact on the development of Decentr solution and will be a significant part of its future. (Output: 7.5)

## DELIVERABLES

**D7.1: Dissemination and communication plan (M3, updates in M16, M36) [R, PU]:** This is a three-phase deliverable, where a first coordinated dissemination and communication plan is defined in by M3 (including also the graphics design package of logo, templates etc.) and updated twice throughout the project (M16 and M36). In the form of a report, its primary aim will be to serve as guide to key stakeholders, including the dissemination and communication goals, strategy, individual activities involved, and corresponding evaluation against the indicators specified.

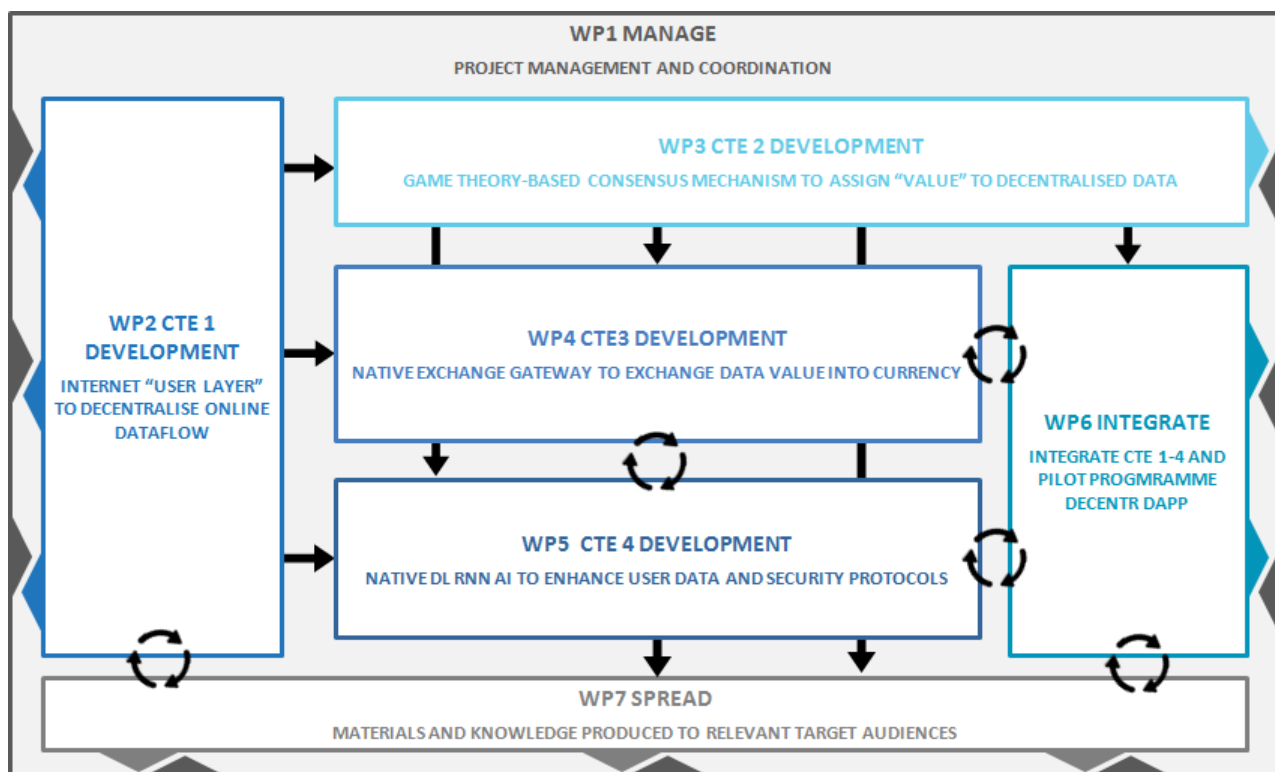
**D7.2: Innovation management and knowledge transfer activities (M36) [R, CO]:** This deliverable will consist of a report documenting the innovation management and knowledge transfer activities undertaken during the project, in line with the orientation led by the appointed innovation officer.

**D7.3: Exploitation and standardization strategy (M36) [R, CO]:** Report on the exploitation and business plan regarding Decentr innovations. This will include a technoeconomic analysis with the view of the adoption of the technologies, as well as a standardization strategy for analyzing the standardization potential of the exploitable innovations, monitoring relevant standards organizations and submitting contributions to relevant standardization forums.

**D7.4: Stakeholder engagement (M17 update in M36) [R, CO]:** D7.4 is a concise report evaluating stakeholder engagement activities and will be reported in two instances (Month 18 and 36). Lessons from the first period will feed into an inform subsequent actions in period 2.

**D7.5: Community building activities (M17 update in M36) [R, PU]:** This deliverable will consist of an intermediate and final report, documenting the community building activities during development, and a plan for the community's self-sustainability beyond the project end.

### 3.01.3 Work plan interdependencies



**Fig. 16 Work Package Interdependencies**

## 3.2 Management Structure, Milestones and Procedures

### 3.2.1 Organisational, administrative, financial and operational issues

The project management will deal with the organisational, administrative, financial and operational issues of the project and the decision-making procedures.

#### *Management structure and procedures*

Our management structure reflects the decentralised methodology and technology we are building: our management approach is based on **sensemaking theory**, which is a critical framework for **identifying and detecting** high risk situations while helping “*organisations address uncertain or ambiguous situations*”<sup>28</sup>. Sensemaking theory allows for a team to use agile methodology to solve developmental problems without needing to consult each department, improving overall operational efficiency on a project while streamlining workflow processes between team members. Sensemaking theory allows for maximum **flexibility and autonomy** of approach while fostering outcomes based on a robustly networked, collaborative process of creating shared awareness and understanding. This ensures **milestones** are met within each domain, supporting overall development aims and improved outcomes. Our approach, combined with ongoing **Cost-Benefits Analysis (CBA)**, is instrumental as part of our **risk mitigation** strategy, due to ongoing team and

<sup>28</sup> Garstka, J. and Alberts, D. (2004). *Network Centric Operations Conceptual Framework Version 2.0*. U.S. Office of Force Transformation and Office of the Assistant Secretary of Defense for Networks and Information.

partner input promoting the development of benchmarks to compare project approaches and outcomes.

### ***Decentr innovation management strategy***

The execution of Decentr development, as part of our continued risk mitigation activities, is based on a finely-honed **innovation management framework**. This framework is underpinned by our wide-ranging **domain expertise and combined commercial acumen**: as a result of this framework, we have a clearly identified primary **market insertion point** for our prototype, which we will exploit as part of our **Go-to-Market (GTM)** strategy, in conjunction with our external partners. This framework is based on an appreciation of how our core technology is foundational technology that creates a horizontal solution for multiple commercial verticals, which is typical of the **efficiency and resource-effective** development that our innovation management affords this project; specifically; we are building an integrated **horizontal solution** as a **primary project input**, which subsequently promotes the development of unlimited, efficiently replicated **vertical outputs**. To clarify this **critical component** of our innovation management model, these vertical outputs comprise **commercial and other** platforms built **on top of** our solution by **third party** SMEs, multinationals, public bodies, and the like, all of which increase the value of our digital assets. This fulfils our long-term **sustainable funding goals** as it means we will be able to **reinvest** in our technology, as well as **global education and research** initiatives, all of which will cumulatively allow us to **indefinitely maintain** our industry-leading R&D position across multiple industry domains in which we specialise.

Our industry-leading innovation management strategy is the result of us carefully **delineating the interrelationship** between our horizontal and vertical solution by identifying the “problem” and a viable “solution” in **each dimension**. Vertical solutions can on our platform be tailored to **specific industry verticals** on a case by case basis; for example, we are committed during and after the lifetime of the project to developing various case studies that the company feels may **benefit PSPs, banks** and other financial institutions as well as our **customers and other stakeholders**. These case studies take the format of **relational analysis of Decentr horizontal and vertical solutions** (Table 10), which is a process that clearly identifies applicable vertical solutions both across and within industries. The near-limitless opportunities for SMEs and others to build vertical solutions will allow us, **in the first instance**, to **rapidly exploit** our horizontal technology in a key industry across a statistically significant cross-section of the mainstream public who we have identified in conjunction with **our internal research** are **1) specifically** looking for a more secure way to **cheaply and conveniently** exchange money and **2) generally** concerned about the **use of their personal details** online and are looking for **more secure ways** to store and share data as part of their current online experience:

Having identified these twin **horizontal and vertical dimensions**, which demonstrate both commercial and non-commercial applications, our R&D continues to cross-compare **methods and outcomes** in each dimension in order to identify any unforeseen **issues or opportunities** that arise as regards development and commercial and other applications. In line with our formal design methodology (the **Design Science Research methodology [DSR]**), we are subsequently able to identify the appropriate team or partner(s) to remedy or pursue these **issues or opportunities** with a view to improving our overall approach as regards continuing R&D to achieve our S&T, SSH and broader commercial outcomes, greatly mitigating risks in order to meet stated milestones.

**Table 10: Relationship of Decentr Horizontal Solution with PSP Vertical Solution**

<b>CORE UNDERLYING HORIZONTAL PROBLEM: LACK OF FOUNDATIONAL DATA ECONOMY</b>		
<b>Horizontal Problem</b>	<b>Horizontal Solution</b>	<b>Horizontal Benefits</b>
Data is difficult to <b>value and difficult to trade</b> : until these twin dimensions are somehow <b>reconciled</b> , a true data economy cannot be created due to the fact data will remain <b>locked up and largely unavailable</b> to individuals and industry.	Network effects created by <b>aligning safe and secure data storage with data exchange</b> are critical in order to <i>maximise</i> the benefits of data exchange and re-use – giving data <b>measurable and hence a tradable value</b> whilst structuring and refining data <i>by default of</i> the valuation process.	By giving data <b>measurable and hence a tradable value</b> , this assigns to all data the “value store” capabilities necessary to <b>repurpose data</b> as a legitimate “currency” for paying and trading online.
<b>CORE COMMERCIAL VERTICAL PROBLEM: LACK OF DECENTRALISED DATAFLOW</b>		
<b>Vertical Problem for PSPs: slow and expensive cross-border transfers</b>	<b>Vertical Solution for PSPs: align decentralised data storage with data sharing</b>	<b>Vertical Benefits for PSPs</b>
PSP and bank customers (and PSPs and banks themselves) are sick of <b>unnecessarily slow, complicated and expensive</b> cross-border transfers. The EU PSD2 Directive 2015/2366 and the SCT Inst (and similar global) scheme(s) have tried to solve this problem but only partially succeeded due to lack of <b>API interoperability</b> (as SCT Inst has admitted, by leaving the issue “open”).	DECENTR decentralises data flow in the same way blockchain decentralises digital trades, eliminating <b>money-as-a-medium-of-exchange</b> in favour of <b>data-as-a-medium-of-exchange</b> .	By eliminating <b>money-as-a-medium-of-exchange</b> in favour of <b>data-as-a-medium-of-exchange</b> this removes nearly <b>all friction</b> from online transfers and hence nearly <b>all associated fees</b> as part of a true data economy.

### 3.2.2 Critical Risk Implementation

Decentr has instigated a stringent work programme and allocated tasks and responsibilities with great precision. Nevertheless, within a project runtime of **36 months** *[with 10 months remaining as of V2.1 April 2020]* some expected and unexpected situations (see significant risks and associated contingency plans) may *[and have as of V2.1 April 2020]* occur<sup>[ed]</sup>, that may have major influence on the successful outcome of the project. To reduce the overall risk to the project the following major steps have been taken: **1)** A strong management organisation has been established; **2)** the appointed coordinator will continuously monitor the project's progress, achievements of milestones and task efforts to identify possible upcoming risks and problems in line with our risk mitigation strategy. This will enable the team to react accordingly. The following table gives an overview of possible risks, involved work packages and proposed mitigation measures. Once risks have been identified and assessed, all techniques to manage risk fall into one or more of four major categories: **Avoidance, Reduction, Sharing, Retention.**

**Table 2: Critical Risks for Implementation**

DESCRIPTION OF RISK	LIKELIHOOD	WP INVOLVED	PROPOSED RISK-MITIGATION MEASURES
Defaulting partner	Low	1 – 7	<b>Sharing:</b> Alternative distribution of missing partners' tasks or involvement of substitute partner.
Communication problems between stakeholders and decentralised teams	Low	1 – 7	<b>Avoidance and Sharing:</b> Clear communication rules and support by modern communication technologies.
Disputes and conflicts among team or partners	Low	1 – 7	<b>Avoidance and Reduction:</b> Effective and professional conflict management involving all conflict parties equally.
Lack of internal work capacity	Medium	1 – 7	<b>Sharing:</b> Outsourcing workload or coordinating with partners.
Possible deliverable or milestone delays during the project	Medium	1 – 7	<b>Avoidance:</b> Efficient project management will keep this risk to minimum by using strict internal schedules.
CTE 1 Communications Layer/browser add-on lacks interoperability with CTEs	Low	2 – 6	<b>Reduction and Sharing:</b> Adjust technical requirements in line with other CTEs.
CTE 2 Consensus Mechanism ineffective/incompatible	Low	2, 3, 6	<b>Reduction and Sharing:</b> Adjust technical requirements in line with cooperative-game theory.
CTE 3 Native Exchange ineffective/incompatible	Low	4, 6	<b>Reduction:</b> Adjust technical requirements in line with Consensus Mechanism/other CTEs.
CTE 4 AI layer ineffective/incompatible	Low	5, 6	<b>Reduction:</b> Adjust technical requirements in line with Consensus Mechanism/other CTEs.