IP Framework Study

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Executive Summary

The Culture and Creative Sector and Industries (CCSI) have been prioritised by EU policy makers as a rapidly growing sector that is essential to the EU economy’s resilience, sustainability, inclusion and innovation. The sector’s knowledge of culture, emerging markets and methods for achieving sustainable solutions has placed it at the forefront of EU’s ambitions towards the Green Deal. In an agile, fast-paced CCSI market, spending 5 years on average on onerous and expensive patent registration (Source: EPO) makes for very poor business. Patent registration processes are particularly prohibitive for CCSI micro-companies and creative entrepreneurs and therefore ineffective for leveraging their innovation capacity. IP registration must be brought into line with EU’s ambitions for digital sovereignty and leverage data-driven systems to enable agile, inclusive, responsible and affordable IP data governance and attribution. The IP Framework Study aims to solve the IP sovereignty and exploitation bottlenecks and position the CCSI at the forefront of experimentation with novel data-driven business models with full accountability and control over their IP assets.

The study presents an IP Framework Blueprint that leverages elements of existing technological affordances and successful digital platform systems to strategically achieve several key outcomes, including:

(i) **scale the IP metadata standards method** that drives business for the entire music industry, **to work across all CCSI domains**;
(ii) **build a common system on a trusted decentralised network of CCSI partners**;
(iii) **create a sandbox space for experimentation** supported by the trusted IP system to enable accountable collaboration across all CCSI domains; and
(iv) **invite other industrial sectors to join the CCSI sandbox experimentation to innovate**, supported by the trusted system of IP governance.

To support the creation of the Blueprint, the study provides an overview of existing IP registration mechanisms, related bottlenecks, affordances and innovation opportunities, including the complexities of IP flow within contemporary media ecosystems, the mechanisms of IP protection (mandates and restrictions) as well as the digital rights management (DRM) technologies that have been deployed to enforce them. Intellectual Property Rights is a system of permissions, and lack of clarity as to whose permission must be sought is identified as a significant barrier to CCSI innovation.

The study examines the dominant technological paradigms that influence the need for IP registration as well as the implications for the digitalisation of all industries. Since all industry sectors now use digital tools and produce data with production systems and processes that frequently themselves have digital twins, the capacity for copying, distribution and registration are evenly distributed across sectors, opening up the capacity for innovation that builds on existing industry capabilities. A universally applicable technological platform that relies upon a trusted network of data keepers, coupled with an experimental testbed methodology that seeds innovation, has the potential to unlock both economic and societal value for all stakeholders. **Data interoperability** is identified as one of the major bottlenecks to creating common systems for data sharing and tracking of digital assets. Distributed Ledger Technologies (DLTs) maintained by trusted decentralised nodes in the network with “proof of authority”, are identified as a reliable option for the secure registration of data assets. Artificial Intelligence, Machine Learning, Knowledge Graphs and Ontologies are driving innovation in data management across a selection of industries, including in IP registrations. However, an extensive review of existing approaches to the intersection of IP and digital technologies reveals that most published research (70.5%) focuses on established patenting practices, while the remainder focuses primarily on AI authorship (including patent authorship), AI infringement detection, the incompatibility of current law with existing technology and the impact of IP on international trade. This leaves considerable room for innovation in digital IP registration processes.
Several **remaining gaps for IP management** in the digital environment are identified, some of which are addressed in this study’s Blueprint, while others may form the basis for future research.

**Best practice use cases** are derived from a pioneering CCSI domain, from ecosystemic approaches to digital IP management, and from registration of IP at the point of creation in cross-domain collaborative environments. The music industry is identified as an important domain use case in adaptation to the new digital environment. Despite struggling at first to cope with urgent digitisation imposed by market events around the turn of the Millennium, the industry was subsequently forced to evolve new paradigms for sustainability and growth. Over the past 10 years the music industry has developed **industry-wide platform alignment for IP metadata** and is currently in the process of adopting systems for rights registration at the point of creation to unlock hundreds of millions of euros in untapped value.

Use cases covering **ecosystemic enablers for rapid deployment of IP**, highlight successes in creating solid foundations for agile technology transfer and IP tracking, and the potential to scale it into a robust and effective framework. The Study identifies several cross-domain use cases where **novel IP management has shown to speed up time to market**, especially in the context of CCSI engagement with frontier technologies such as Artificial Intelligence, Neural Networks, Machine Learning, IoT and Distributed Ledger Technology.

The **IP Framework Blueprint** is presented in two parts:

(i) **IP Sandbox** – a hands-on enabling innovation ecosystem methodology for the collaborative creation of intellectual property; and

(ii) **IP Tracker** – a data-driven technological infrastructure for agile registration, tracking, innovation and exploitation of intellectual property.

The **IP Sandbox** represents a unique ambition to experiment across CCSI domains, enabling collaborative innovation and the creation of Innovation IP using assets brought in by industry and academic partners. Testbeds for knowledge transfer, incubation and early adoption are presented. The knowledge transfer methodology uses a Technology Transfer Toolkit (TTT) to lower the entry barrier to the results of R&I for creative innovators and support collaborative innovation, technology transfer, research and education. Incubation is supported by an “IP Stack” which allows for combinations of three types of IP in the collaborative environment: Background IP, Transfer IP and Innovation IP. Early adoption is evaluated using **Market Adoption Readiness Levels (MARLs)** – a value creation strategy.

The **IP Tracker** combines existing and well-proven tools and methods in a new way, starting with the evolution of IP metadata standards from the music industry. As a point of differentiation, the study highlights the need for an **agreed IP metadata standard across CCSI domains**, as opposed to a licensing system such as the Creative Commons, which provides a method to attach a licence to a digital artwork. The IP Tracker focuses on a machine-readable standard for capturing data about a product such as the information contained in a digital twin. **A detailed list of the first prototype for the IP Tracker metadata standard** is provided. This allows for the registration of newly generated IP as well as existing IP types (patents, copyright, designs, trademarks, etc.).

IP registrations are proposed to be recorded using a Distributed Ledger Technology (DLT) that leverages selected partners from the CCSI as trusted nodes for a ‘**proof of authority**’ valorisation mechanism. The data contained within the IP Tracker is **FAIR** (Findable, Accessible, Interoperable and Reusable) by design. The need for CCSI **ontology alignment** is identified, in order to manage different categories of intellectual property across domains of knowledge. The IP can be registered in real time at the point of creation. Pre-existing IP can be back-registered, and development iterations of a **registered IP can be tracked**. This allows for rightsholders, owners and authors to see how their Background IP has been used in conjunction with Innovation IP, track derivative works and **spot new**
market opportunities. It also allows authors, owners and users of IP to easily connect, seek permissions, collaborate and follow the progress of projects that use their IP.

The Study proposes a value creation strategy that includes: a) scaling the music industry exploitation methods built on standardised metadata, across the CCSI; b) support the creation of an ‘app store’ model for new IP data services, products and projects created on top of the IP Tracker platform using the metadata standards; c) generating value with the IP Stack for co-creative innovation; d) valorisation with Market Adoption Readiness Levels (MARLs) focusing on early adoption; and e) the Tetradic business proposition canvas for paradigm shift assessment. The proposed value creation methods incentivise cross-domain, collaborative and experimental innovation, and enable the CCSI to become a testbed for emerging market business models that build on the registration and tracking of linked and hybrid applications and create value networks in cross-domain CCSI innovation scenarios.

21 validation interviews have been completed with stakeholders from within the ICE Consortium and have been transcribed in full. They include TTOs, representatives of commercial CCSI, members of CCSI public bodies and heritage institutions, academic researchers, and stakeholders from existing IP technology providers. Stakeholder suggestions and feedback have been incorporated into the final blueprint version, including implementation in education environments, the inclusion of features such as collaboration opt-in for IP creators, and required metadata categories.

The proposed IP Framework is being aligned with European data marketplace initiatives such as the EOSC “FAIRification”, the European Innovation Council Innospace / EIC Marketplace to support the back-registration of IP from 25 years of publicly-funded research and innovation, and the Industry Commons track within DG RTD to contribute to the building of a legacy for cross-domain data interoperability across industrial sectors within Europe and beyond.

The Blueprint proposed in this IP Framework Study is the result of 10 years of development by the management team of the Industry Commons Foundation and has been validated with feedback by 21 ICE Consortium partners.
Part 1: The IP Study

This study investigates new opportunities for agile systems for IP registration enabled by novel digital technologies and responding to urgent needs by creative developers and innovators. The study builds on the centrality of the Culture and Creative Sector and Industries (CCSI) in the European policy constellation, prioritised by EU policy makers as a rapidly growing sector that is essential to the EU economy’s resilience, sustainability, inclusion and innovation. The sector’s knowledge of culture, emerging markets and methods for achieving sustainable solutions has placed it at the forefront of EU’s ambitions towards the Green Deal. Intellectual property is central to CCSI’s outputs. The changing technological environment has created new affordances and opportunities to amplify the CCSI’s potential for value creation and deepen its cross-innovation potential in collaboration with other sectors.

The IP Framework Study investigates ways in which intellectual property can foster innovation within the CCSI, contribute to sustainable cultural and economic value creation, and unlock the creative innovation potential latent within European industry. In an era of widespread industrial digitalisation, opportunities for cross-sectoral alignment and interoperability provide the context for new tools and technologies that capitalise on these new affordances. An agile technological environment can provide a solution for the many micro-companies and creative entrepreneurs who contribute considerably to the CCSI innovation capacity but who have historically been excluded from complex and expensive IP registration systems such as patenting. 10 years of experience with the highly inclusive global multidisciplinary collaborative innovation community of MTF Labs has demonstrated the need for a simple and agile framework for IP registration that bridges the gap between lack of innovation visibility and onerous IP registration systems. Widespread registration of IP boosts the potential for collaborative breakthroughs and successful scaleups of seed ideas, resembling an “Innovation IP Factory” that fuels a multiplier innovation ecosystem.

Based on the innovation multiplier environment created by MTF Labs, experimental prototyping yields best results when supported by a system of accountability and feedback loops for informed decision making. This approach has made it attractive to a series of industry domains in the past, who benefitted from the CCSI proximity to new and emerging markets, insights into cross-domain applications and novel business models. This well-managed value-creation space has turned the CCSI innovation multiplier environment into an experimentation sandbox for all domains, where each contributor is invited to build value in a clearly accountable way as part of collaborative value creation.

Accountability guarantees access to a range of expertise and technology transfer from cutting edge academic research which increases knowledge and innovation capacity. Systems which lower the entry barrier to excellence allow highly diverse creative entrepreneurs representing a variety of global markets to apply them to novel use cases, considerably increasing the potential to turn technology transfer from research into business models for global markets. With the rapid progress in digitisation of the results of European Research & Innovation, as in the most recent initiative to build the EIC Marketplace for IP, the CCSI innovation multiplier environment can serve as a business model testbed for the outputs of 25 years of European R&I.

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1 The MTF global innovation community has currently around 8000 contributors and counting.
1. Why the CCSI for Innovation?

The IP Framework Study builds on several aspects of the digitally-accelerated transition of the CCSI towards a more distributed, asynchronous, agile, rapid creation model, highlighted by the Green Paper “CCI Innovation to Lead Beyond the Pandemic” (Magas 2020) that was published at the 10th European Creative Industries Summit (ECIS2020). The paper outlines how models implemented by the CCSI in response to early digitisation challenges have become a universal template for digital transformations across other industries, and how the CCI approach to knowledge acquisition and methodologies for experimentation have proven to be the key ingredient of the processes required to manage complexities emerging from frontier technologies. It proposes a new anchoring of the CCSI as central facilitator of the data-driven cross-domain economy and its repositioning at the centre of cross-domain industry innovation. The Green Paper is provided as an Annex to this study and it is briefly summarised below.

Some CCSI domains were the first to migrate entirely to the digital. The release of Napster and introduction of peer to peer file sharing in 1999 was the catalyst for the digital reinvention of the music industry. It required rapid upskilling, the development of new tools and methodologies including big data management, machine learning, application programming interfaces (APIs), digital IP tracking and the adoption of streaming services. An alignment of the industry around these technologies can serve as a use case for other industries currently adjusting to the digital transition. Mining or chemical production has remained firmly anchored in real world processing of raw materials, and considered data-driven processes only as part of its supporting supply chain. It was not until SAP, in April 2019, published a whitepaper outlining their ability to manage the entire production process for the chemical industry – from start to finish – through data-driven systems, that the established CCSI model finally resonated with the chemical sector, resulting in the hypothetical question: “Wait, are we now just ‘content’”?

CCSI domains that digitised early were forced to reinvent their business models. Rapid digitisation in some of the CCSI sectors was driven by the need to reinvent the existing business models around the management, distribution and interaction with digital content. The sector now has 20 years of experience with data-and-communities-powered business models built on the affordances of the digital environment. During the past decade, creativity has been powering the greatest volume of communication-driven content. Online platforms for content creation and distribution have inspired even the most traditional creative outputs, such as those relying on hands-on practice, the opportunity to promote, distribute and create value in new ways, as seen most recently with the NFTs.

As the main driver of culture, the CCSI default positioning is close to emerging markets. By continuously inspiring and interacting with cultural trends the sector naturally operates close to emerging markets and drives new business opportunities. The rise of the digital content creators brought innovative ways to deliver communications and narratives. Novel technological affordances have enabled new modes of expression; novel languages of expression have evolved into new community (sub)cultures springing up in often diverse and distant global locations; with new (sub)cultures new values have arisen that drive emerging markets for both cultures and economies, such as e.g. the phenomenon of the Korean K-Pop. Further opportunities abound for culturally-driven economic success stories, but also require a rethink of their supporting data-driven systems and regulatory aspects which can effectively and sustainably manage emerging market scenarios. This

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2 A non-fungible token (NFT) is a blockchain entry permanently associated with a specific instance of a digital file (such as a photo, video or audio recording). It provides a certificate of authenticity and proof of ownership for that file, allowing artists to release ‘limited editions’ of digital works. It does not restrict copying of the digital file but rather asserts uniqueness or scarcity of the digital ‘original’.
becomes particularly relevant as other industries experience a similar transition influenced by the same communication technology drivers.

**The CCSI experiment more readily with hybrid cross-domain innovation and business models.** Demand from industry for experimental labs and prototyping testbeds facilitated by the CCSI responds to the needs of the industry 5.0 paradigm which emphasises the human aspect. Testing the effects of leading edge technologies in safe environments and with novel use case scenarios allows industry access to creative interaction and imagination that would otherwise not be possible. This places the CCSI at the centre of cross-domain industry innovation. CCSI experimentation extracts value from the intersection of cross-domain assets – with hybrid applications, novel use cases, imaginary scenarios, creative simulations, emerging market explorations and solutions to societal challenges.

**The CCSI lead on experimentation with novel affordances of frontier technologies.** The visual arts in particular have been at the frontier of testing the affordances of AI, neural networks, blockchain and DLTs. In creative experimentation that explores AI interaction with humans, results have been highly unpredictable. The real-time classification and extraction of meaning from big data has been impeded by the sheer volume and speed of outputs from deep learning with neural networks, resulting in unknown unknowns. These challenges occur perhaps most significantly in physical systems where the human is ‘in-the-loop’. No deductive or inductive scientific method that builds on prior art or statistical probability, has yet offered reliable solutions or predictable outcomes. In this context, creative approaches for complex conditions become a fundamental ingredient of the digital transition.

**The CCSI lower the entry barrier to technology transfer through the design of interfaces.** By operating close to emerging markets the CCSI are ideally placed as early adopters of novel technologies and uniquely positioned to actively connect industrial and knowledge domains into value ecosystems. As well as the traditional CCSI domain of the design of graphic user interfaces which are essential drivers of software platforms, the CCSI approach has proven very successful at addressing the functionality and applicability of APIs to novel use cases. More recently the CCSI have proven to be best placed to exploit the huge potential of tangible user interfaces (TUIs) which interact with ubiquitous IoT data in smart cities and regions. Skills such as human-centric design, system design, content design and curation, innovative applications of industrial tools and services, and creative innovation methodologies, based on best practice from a long tradition of design and innovation in the CCSI, have evolved with the latest technologies to become essential ingredients of the data-driven economy.

**The CCSI facilitate and speed up upskilling and lifelong learning of the existing workforce.** Problem-solving from as many perspectives as possible is now a requirement for the creation of new knowledge in a highly complex, rapidly changing data-driven landscape, full of challenging outcomes. Long term responses to the pandemic and the likelihood of further ‘black swan’ events need to factor in unpredictability (and therefore non-computability). Cross-domain collaborative prototyping and creative experimentation stimulate rapid upskilling by joining knowledge from different cultural and industry domains, including radically different views and considering ethical dimensions. This results in the ability to connect seemingly unrelated phenomena, generates new knowledge and facilitates the systemic change needed to manage complexity. Intellectual Property management is the key to unlocking the CCSI’s capacity for this form of rigorous experimentation. It allows for existing tools and technologies to be placed into the hands of those trained in making intuitive leaps and unforeseen connections in an accountable and responsible way.

**The CCSI drive new paradigms for inclusion, sustainability and responsible innovation.** Collaborative and experimental CCSI environments have proven to be conducive to rapid knowledge transfer between diverse participants from a variety of social, cultural and professional backgrounds. CCSI supporting mechanisms for learning have demonstrated the potential to empower people of all ages and abilities, and unlock new talents and capabilities. Regular considerations of inclusivity, gender equity and accessibility, enable all talent to contribute to innovation for the economy. Some sectors of the CCSI have demonstrated the ability to attract high percentages of female participants in
technology prototyping, through goal-oriented, creativity-driven, socially-responsible activities, which address major societal challenges and UN Goals. Creative experimentation with the latest technologies has completely reshaped the notion of human ability vs disability, the notion of skills and lifelong learning, and the ways in which we communicate and express ourselves. This is one of the key areas for societal transformation, and it is a domain directly impacted by (and upon) intellectual property in a new, digital environment.

The CCSI safeguard the social and ethical dimension of human-centric technology. The CCSI are particularly good at turning weak ties into strong ties. This makes the CCSI really useful early adopters of new technologies because it provides a critical and ethical environment to test the effects of frontier technologies. CCSI lead on experiments with humans-in-the-loop, where the technological impact of frontier technologies on human beings – such as AI, deep learning and brain-computer interfaces — can be tested in safe environments and challenges can be addressed before technologies are deployed at scale. While there is emancipatory social and cultural potential afforded by digital platforms, it is also open to bias, misinformation, unethical use of technology and irresponsible use of data. CCSI experiments test the extent to which the technology enables or obstructs human agency, decision making processes and accountability. It is directly linked to safeguarding health and wellbeing, including new data-and-media-driven issues of privacy, bias and discrimination, physical distancing and isolation, and social media impact on mental health. The resulting technological innovation must be “value bound to human dignity of the individual”, and “socially bound to resilience”.
2. What are the challenges we are trying to solve?

The aim of an IP Framework Blueprint is to solve grand challenges presented by current systems for IP registration and align approaches between academia and industry, across industrial and knowledge domains and among all of the European infrastructures that can benefit from such a solution.

2.1. EU digital sovereignty

As a result of ongoing concerns about the economic and social influence of non-EU technology companies, the threat to EU citizens’ control over their personal data, constraints on the growth of EU technology companies and the ability of both national and EU policymakers to enforce their laws, the concept of ‘digital sovereignty’ has emerged as a means of promoting the notion of European leadership and strategic autonomy in the digital field.

Digital sovereignty refers to Europe’s ability to act independently in the digital world and can be understood in terms of protective mechanisms and regulations that foster digital innovation (including in cooperation with non-EU companies). In this context, President von der Leyen has identified digital policy as one of the key political priorities of her 2019-2024 term in office and pledged that Europe must achieve ‘technological sovereignty’ in critical areas.

A recent Commission report highlighted that competition from global tech-driven players that do not always obey European rules and fundamental values, and put data appropriation and valuation at the heart of their strategy, constitutes a major policy challenge for Europe. The European Council has stressed that the EU needs to develop a competitive, secure, inclusive and ethical digital economy with world-class connectivity, and has called for special emphasis to be placed on data security and on artificial intelligence (AI) issues. In the context of this digital sovereignty discourse, Europe has the opportunity to establish a single technological framework for Intellectual Property that not only unlocks the potential for innovation IP but also embeds digital sovereignty and the priorities of Europe into that technological infrastructure by design.

2.2. Development of commercial applications

The IP Framework Study aims to solve IP registration challenges faced by innovators and developers of commercial applications:

- European patent grant procedure takes about three to five years from the date the application is filed (Source: EPO)
- Escalating costs of patenting result in startups having to choose carefully which aspects of their innovations are worth patenting
- Patents are too similar – large numbers of patents are rejected because they are framed too broadly or too narrowly

**Challenge 1: European patent grant procedure takes about three to five years from the date the application is filed.** For data-driven applications, the innovation is likely to be out of date by the time that the patent is granted. For this reason a growing trend among SMEs is to focus on being the first in the market rather than to wait for software patenting to be approved. Patenting funds invested in a marketing push are seen as a better investment and an opportunity to capitalize on the market readiness.

**Challenge 2: Escalating costs of patenting result in startups having to choose carefully which aspects of their innovations are worth patenting.** Startups could register more of their IP assets providing that they could do it cheaply and securely without disclosing everything. Automatised searches would allow startups to be part of a system which screens for instances of similar IP and notifies them about their IP’s competitiveness in the market.
**Challenge 3: Patents are too similar.** Large numbers of patents are rejected because they are framed too broadly and therefore close to another solution, or framed too narrowly and therefore too generic to be protectable. This risk can however be mitigated by adopting novel systems which use AI to screen for similarity in existing patents (e.g. IP Screener\(^3\)), or by registering all IP in a chain which carries information about provenance, background, timestamp, location and is fully traceable and attributable. The IP context in a chain distinguishes the IP from another and allows it to be more than the sum of its parts.

### 2.3. Technology Transfer from Research & Innovation

Several challenges have been identified for technology transfer from research and innovation:

- Peer-reviewed papers take an average of 4-6 months to publish (depending on the domain and journal in question)
- TTOs cannot anticipate all of the business scenarios where a research result may be used
- Lots of background IP is hidden in reporting and not evident even to the originators of those research results

**Challenge 1:** Peer-reviewed papers take an average of 4-6 months to publish (depending on the domain and journal in question). Research IP can however be registered immediately after it has been sent for review using Bloxberg\(^4\). This trusted decentralised network offers a secure system with over 30 global nodes maintained by reputable research organisations which have long-term funding to maintain their node in the blockchain.

**Challenge 2:** TTOs cannot anticipate all of the business scenarios where a research result may be used. It is possible however to register the research results without specifying the precise patenting use case, especially with digital outputs. Research results when presented in the form of data lend themselves to multiple types of exploitation, including as raw data, processed, extracted metrics, modelled according to parameters, simulated scenarios and business models etc. Metadata from one domain may result in a use case from another, for hybrid, cross-domain applications; as fungible data for testing solutions in the other domain (e.g. use of low-risk data sets for testing fintech solutions); or as IP which is necessary for that domain’s development (e.g. environmental data used in the programming of autonomous vehicles).

**Challenge 3:** Lots of background IP is hidden in reporting and not evident even to the originators of those research results. Screening content using e.g. Natural Language Processing however offers the possibility to uncover additional background IP Aside from collecting information on the results that authors have described, screening digitized reports can reveal workflows or efficiencies which weren’t previously highlighted. IP Screener utilizes a similar system to uncover IP in existing patents prior to deciding on the precise patenting registration area (an improvement to manual patenting searches).

### 2.4. Systemic inequality of established IP registration systems

In the US where married women were historically prevented to own property, female inventors were unable to make income from anything they had invented. Despite progress towards greater gender equality, Marcowitz-Bitton et al (2020) show there is evidence that disparity still persists:

> Women do not get a fair share when it comes to patenting and are far less likely to own patents. This disparity is in part because of not only the inherent biases in science and technology and in the patent system itself, but also because of the high costs of even applying for patents. This

\(^3\) [https://ipscreener.com/](https://ipscreener.com/)

\(^4\) [https://Bloxberg.org/](https://Bloxberg.org/)
article therefore proposes an unconventional new regime of unregistered patent rights to relieve women and other disadvantaged inventors of the costs of applying for registered patent rights and to help them gain greater access to patent protections. Patents are a glaring exception to the unregistered protections provided in other areas of intellectual property, which are more egalitarian in design.

**Inequality is prevalent particularly within the patenting system**, where the authors demonstrate an inherent bias. The patent system’s costly, complex, and frequently biased examination process disproportionately affects female and ethnic minority inventors. The article’s authors argue for limited automatic rights to capture all talent and create a more egalitarian playing field for inventors.

To meet the inclusivity ambitions of the EU, minorities, immigrants, startups, the less wealthy and particularly female inventors who make 50% of available European talent ought to be provided with alternative pathways to IP registration.

**2.5. The problem with proprietary industrial data**

The 2018 EC Study on data sharing between companies in Europe revealed that a significant proportion of companies already share or re-use data with their industry partners. The World Economic Forum’s *Unlocking Value in Manufacturing through Data Sharing* report acknowledges that “by collaborating in data ecosystems, manufacturers can address business needs that they cannot address alone”.

The potential for unlocking AI-driven economic growth, positive social change and advances toward the UN SDGs is predicated on the sharing and re-use of big data between all industry sectors. New IoT devices and connected systems have turned products, devices and systems into connected data factories, and a recent European Study on technological and economic analysis of industry agreements in current and future digital value chains (European Commission, 2020b) projects that the value could jump from €301 billion in 2018 to €829 billion by 2025.

However, because the lion’s share of industry data is proprietary and closely guarded intellectual property, much of the potential value is locked in closed systems. **Issues of interoperability as well as issues of trust mean that denial of access is a recurring barrier to companies re-using data.** Building systems that enable and engender trust, simplicity and viable business models is the key element needed to help companies successfully share data across business contexts – and for this, the creation of supporting infrastructures and data intermediaries that function as trusted vehicles are essential.
3. Why an IP Framework Study?

The IP Study allows for the investigation, proposal and validation of potential solutions to the challenges and new affordances that arise from intellectual property in the digital environment. It creates an opportunity to strategically align with EU policy missions. The New European Bauhaus High Level Round Table has recommended the use of testbeds for cross-domain solutions to grand challenges for people from diverse backgrounds – social, cultural and knowledge backgrounds. Best practice from grass roots activities can feed policy missions and these in turn can create mechanisms which support and incentivise activities on the ground. Mass-scale prototyping on the ground stimulates upskilling and new human virtuosities. Shaping the parameters of these activities are the affordances and restrictions of existing intellectual property policies, administrative structures and tools. It is critical at this moment to examine them, assess their fitness for the needed innovation landscape and propose new approaches that supplement what is already there and enables the full capacity of the CCSI to drive the change needed to achieve grand societal goals and to be international competitive.

The study positions the CCSI at the forefront of experimentation with novel data-driven business models. As a predominantly low-risk sector, the CCSI provides a suitable test ground for the implementation of new frontier technologies and new methods for combination and deployment of digital assets. In this way, the study and the resulting proposed IP Tracker technological framework and IP Sandbox methodology create an exploitation vehicle for micro-companies and creative entrepreneurs.

3.1. Objectives of the Study

The study set the following objectives:

- **Enable the Commons IP Sandbox** – a unique ambition to experiment with sharing of results within the CCSI, enabling IP to be built upon by members, benefiting all contributors;
- **Identify use case narratives** where novel IP management has shown to speed up time to market, especially in the context of CCSI engagement with frontier technologies such as Artificial Intelligence, Neural Networks, Machine Learning, Internet of Things and Distributed Ledger Technologies;
- Based on successful use cases, **provide a blueprint for the creation and development of a prototype for digital IP management**, including registration and tracking of linked and hybrid applications which create value networks in cross-innovation scenarios;
- **Validate methods** that can best support cross-domain, collaborative and experimental innovation in the CCSI.

3.2. IP Study Methodology

The study was designed to evolve the state of the art in:

- **Design of cross-domain innovation prototyping environments**
  The design methodology framework was updated based on 9 years of designing innovation prototyping events for a global MTF community currently approaching 8000 members.
- **Live tracking of IP at the point of creation**
  The methodology was updated based on experiments successfully completed in 2017 at MTF Labs Helsinki with metadata for live registration of IP.
- **Data marketplace interoperability and enabling systems**
  The methodology observed FAIR data standards and the latest data interoperability work currently conducted by the OntoCommons project.
• **Speeding up creative innovation to market**

The methodology built on the successful results of the #MusicBricks project which considerably reduced time to market through innovative IP management.

The study’s intention was also to strategically position the CCSI as an important domain for the EU common data spaces and data markets such as those built by EOSC, EIC and Industry Commons, and IP registration strategies by research and innovation partners such as CERN and Max Planck Institute.

### 3.3. Phases of the Study

The IP Framework Study followed five distinct but overlapping phases:

**Phase 1: Use case narratives and desk research documentation**

Phase 1 conducted a comprehensive review of the central issues under investigation, including a precis of basic categories of Intellectual Property, dominant explanations and critiques of technological shift and summaries of emerging technologies that are affecting CCSIs, policy, technology, culture and industry. A literature survey of academic publications concerning the intersection between technological change and intellectual property was performed (see Research focus on patents).

In addition, the study drew on use case narratives from nine years of the MTF creative innovation ecosystem. Those examples illustrate implications for intellectual property from collaborative innovation with technology transfer in CCSI-led testbed experimentation environments.

**Phase 2: Methodology framework**

Based on the findings in Phase 1, the research team compiled and coded the recurring themes and useful insights from the literature and experiences from the case studies and began to assemble a set of parameters for the IP Tracker blueprint. It became clear that three perspectives must be considered to create such a technological framework:

(a) The registrants (and owners) of IP data: what they need in order to participate and what might encourage or dissuade them from doing so.

(b) The users of IP data: consider the ways in which information about registered IP might be located, accessed, collected and used.

(c) The IP datasets themselves: aim to develop a single and universal set of metadata categories that can be applied to any kind of registration so as to enable interoperability across different types of IP.

**Phase 3: Blueprint**

Building on 9 years of experience, use cases and desk research, the authors evolved the framework for IP creation through creative experimentation and for intellectual property registration in data-driven systems. Details of the blueprint were updated iteratively following Phase 4: Validation and Feedback.

**Phase 4: Validation and feedback**

Interviews were conducted with 21 partner stakeholder groups to test the blueprint design against needs and use cases from the creative, academic and public sector represented within the consortium. Adoption of the IP Framework looked promising so the project methodology was to iterate and develop the blueprint further in response to the feedback received.

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For this reason, it is important to note that the final metadata categories, system design and proposed framework presented in this report are not the initial ‘Blueprint v0.1’ presented to stakeholders for feedback, but are the result of an iterative process informed, influenced and updated in response to feedback received during the interviews, all of which are summarised in Validation and Feedback. Full (automated) transcripts can be provided on request.

Phase 5: Final Report

The Final Report has includes use case narratives, methodology framework, feedback from partner validation and a revised blueprint, cross-referenced to all of the supporting elements of the study.

3.4. Deliverables

The study’s deliverables include, as planned:

1. A methodology framework for the creation of innovation IP:
   ▪ Evolved innovation multiplier methods successfully tested in pilots
   ▪ Experimental lab week turned into an engine for the seeding of CCSI Innovation IP
   ▪ Support for sandbox experimentation for CCI collaborations
2. Documentation of state of the art IP use case narratives:
   ▪ Known use cases from the CCI community turned into illustrated narratives
   ▪ Collection of the most recent scenarios which affect CCI IP through desk research
3. A blueprint for data-driven IP tracking and registration at the point of creation:
   ▪ Licence and IP registration formats, including how patenting, trademarks and copyright are supported by the method
   ▪ Supporting technology methods, including hashing, metadata, smart contracts and DLTs
   ▪ Workflows which support a robust user-driven contextual framework
4. Validation and feedback from 20 key stakeholders:
   ▪ Semi-structured interviews and transcriptions
   ▪ Feedback recommendations for the final output
5. A compiled report as a reference for CCSI stakeholders:
   ▪ including use case narratives, methodology framework, blueprint and validation
   ▪ a comprehensive framework for innovation IP creation and management
4. Intellectual Property

A comprehensive assessment of the current legal frameworks, policy environment, business application and social impacts of intellectual property in the digital age would require multiple written volumes and is beyond the scope of this study. However, it is useful to summarise the fundamental principles of IP, the main categories of IP registration and their use, as well as the limits of intellectual property protection and application.

While broadly understood as analogous to physical property but pertaining to (often intangible) products of the intellect, Intellectual Property is often thought of as being a self-evident and a natural right that is protected by law. **In practice, Intellectual Property is a term that serves as an umbrella for a diverse practices and policies that are specific to a particular geographic, political, technological and historical context.**

4.1. IP principles

Intellectual Property (IP) is neither a naturally occurring phenomenon nor a fixed idea. It is a discursive and a complex legal instrument by which a society protects, rewards, incentivises and grants ownership of creative and technical works emerging from a single author or group of authors. Ownership of that work may be transferred or sold, and authors are granted a monopoly right to use, distribute and licence. That monopoly right is subject to limitations of scope, duration and territory beyond which the work reverts to the public domain and commons ownership.

In his article about digital art on the blockchain, Martin Zeilinger (2018) outlines the prevailing theoretical bases for the creation and application of IP laws. These underline the fact that while different societies and perspectives can agree between themselves about the importance of intellectual property, and may create standards and bilateral agreements that support international trade, even the fundamental principles behind the reasons that we think intellectual property is important or valuable are not universally shared, and that there are no ‘first principles’ of IP that may be applied, from which broadly agreeable terms and regulations can be established.

Arguments in favour of intellectual property rights commonly emerge from one of three philosophical perspectives: a perspective modelled on Lockean labour theory of appropriation, which asserts that we gain legitimate ownership claims over intellectual property assets by ‘mixing’ our labour and effort with the works to be protected; a Hegelian perspective that views intellectual property as an extension of individual personhood and self-ownership and which justifies the subjection of creative expressions to ownership claims by insisting that IP assets externalise aspects of our selves that should rightfully be in our possession; and lastly a utilitarian perspective that legitimises intellectual property by foregrounding its positive impact on economic and social progress and which favours incentive-based systems to encourage protection of IP rights.

European IP law currently favours a mix of these three approaches, but with particular emphasis on the third. **There is however no single conception of ‘what we are trying to achieve’ with IP and therefore no standard measure by which agreement can be reached on when a society is doing IP well.** For this reason, the Intellectual Property regulatory framework is subject to positionality and ever shifting power relationships, with legal frameworks and regulation broadly following the interests of those with strong and well-funded lobbying positions tempered, where possible, by issues of public good.

It is neither in the remit nor the scope of this report to provide a comprehensive overview of the long, complex, and contested histories of intellectual property, and neither is this the place to catalogue current European regulation regarding ownership rights with respect to inventions, designs, ideas and their expression. **As a legal instrument constructed along similar lines to physical property law,**
Intellectual Property Rights (IPRs) are assigned within societal, economic, political, cultural and technological contexts, all of which are susceptible to radical change.

Aram Sinnreich’s The Essential Guide To Intellectual Property (2019) offers a broad overview that provides the necessary groundwork as well as a dispassionate assessment of the state and challenges of the laws, as they exist today, that have been developed and aligned across different parts of the world. Important ly, Sinnreich specifically situates Intellectual Property as an effect of IP law, and not the reason for that law to exist. That is to say, IP exists because we created laws; the laws were not created because IP exists. Rather than a set of a priori and self-evident rights based on social or cultural norms and expectations that are then reflected and reinforced in legislation, our understanding, discourse and practices of IP are fundamentally rooted in the legal framework from which they stem, devised and codified for political, commercial or ideological reasons, usually (though not always) to ensure monopoly rights for a creator or owner of a work’s expression, so that its exploitation may reward that creator’s work and incentivise more creation.

At the most basic level, IP is a set of legal rights, rooted in legislation, interpreted by the courts, and used for better and for worse by a range of different stakeholders, from individual authors to international conglomerates (Sinnreich, 2019).

As discussed above, there are strong power dynamics inherent in the creation of and advocacy for intellectual property law and these are primarily deployed at policy level with the intention of expanding or securing the interests of industry groups and large rights holders, particularly in the face of changes or threats to established practices and business models. However, both the nature of the power dynamics and the latent opportunities for those industries always shift with the changes to the technological environment. New affordances provide the ground for new approaches that do not simply challenge the status quo but provide significant scope for industry innovation that can benefit both society and those industries at the same time. This is most clearly demonstrated within the Culture and Creative Sector and Industries, and in particular the case of the music business. The advent of peer-to-peer filesharing brought the potentially disruptive effects of digitalisation to the door of the recording industry. That same P2P filesharing architecture later provided the backbone for the streaming technology that became the industry’s chosen solution to that challenge, and while Spotify has now restructured its offering so that it no longer uses P2P (Dillet, 2014), the adaptation provided the industry with the same kind of inversion of fortune that VHS and Betamax home video brought to the film industry which, rather than cannibalise cinema release revenues, saw home entertainment create its largest revenue streams (Greenberg, 2010).

For businesses, copyright – and IPRs in general – were established, historically, as a way for publishers to take control of the distribution and re-use of the published material that they owned, rather than the printers who at the time controlled the only means of mass production and distribution. In time, this process of publishing and distribution created incentives for authors to make their work available to new audiences. In the centuries that followed, mechanisms to assign rights and to claim compensation evolved, culminating, in the pre-digital world, in a sophisticated but manageable market in trading rights, production and mass distribution, as well as the distribution of royalties.

In the internet era, digital technology has reduced the cost of production and provides new distribution networks, leading to new business models and wide-scale availability of creative content, not always with the permission of rights holders. The lack of an effective way to control or leverage proprietary rights online potentially diminishes the business appetite to develop new routes to market and consequently hampers the potential of a real Digital Single Market. At the same time, the technology that facilitates creation has led to an explosion of copyright protected content circulating online that is unregistered and for which it is often difficult to attribute ownership or ask permission for its use. This has resulted in novel solutions for the use of creative content in the digital sphere, including the Creative Commons founded by Harvard Law Professor Lawrence Lessig, Open
Hardware Licences by CERN (used by creative developers of hardware), and the CERN and Innovate UK-supported Open Product Licenses created by MTF Labs for ‘design-by-attribution’.

The following brief outline of several major categories of intellectual property rights and registration, as well as the description of rights flows within industry contexts, illuminates ways in which the bottlenecks, challenges and complex ecosystems of intellectual property in Europe can be addressed, and meaningful progress can be made. The intention is not to ‘solve IP in the digital age’ nor to replace established registration methodologies and institutions, but rather to access the economic benefit, social good, educational value and innovation potential that an affordable, accessible and agile data framework for IP interoperability could unlock.

4.2. Mapping IP categories and licensing frameworks

On the 21st of October 2020 the European Commission published the open source software Strategy 2020-2023\(^6\) (Think Open, 21.10.2020, C(2020) 7149) encouraging the use of open source software by the Commission and its contribution to third-party open source projects. The Commission’s decision on the Rules on open source software C(2021) 8759 on 8th of December 2021\(^7\), highlights that Open source licensing has become an integral part of business models in the software industry and is largely used by public institutions in the EU and elsewhere.

The adoption of open source software by the public institutions continues on a steady trend which has been seen across industry verticals during the past decade, and which has dispelled the myth that industry will only consider working with intellectual property that is registered as a patent. The IP categories mapped here therefore include both the more traditional proprietary as well as open approaches. While detailed analysis of the impacts of each category and the interplay between more protected and open systems of IP registration is beyond the scope of this study, the Tetradic business proposition canvas section demonstrates the paradigm shift brought about by the novel, digitally-enabled open IP licensing systems.

4.2.1. Copyright

Copyright literally means the right to copy though it has come to refer to a body of exclusive rights granted by law to copyright owners for protection of their creative work. The creative work may be in a literary, artistic, educational, or musical form. Copyright is intended to protect the original expression of an idea in the form of creative work, but not the idea itself. It does not extend to any idea, procedure, process, system, title, principle, or discovery, but rather is said to subsist within a creative work at the point of its creation. Copyright is subject to limitations based on public interest considerations, such as the fair use doctrine in the United States or the list of explicitly-permitted use exceptions in British and European law. In most territories, the ownership of copyright does not require registration, although registration provides an element of evidentiary support when called upon to assert authenticity, ownership or originality in cases of infringement or dispute.

Most jurisdictions require that copyrighted works are ‘fixed’ in a tangible form. The ownership is transferable and can often be shared among multiple authors, licensed or assigned to a commercial organisation in exchange for exploitation of those rights in the market, and these owners or assignees are commonly referred to as rights holders. These rights frequently include reproduction, control over derivative works, distribution, public performance, and moral rights such as attribution or the ability to restrict use for political or religious causes.

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Copyrights can be granted by public law and are in that case considered “territorial rights”. This means that copyrights granted by the law of a certain state, do not extend beyond the territory of that specific jurisdiction. Copyrights of this type vary by country, many of which have bilateral agreements with other countries on procedures applicable when works “cross” national borders or national rights are inconsistent. Europe has largely developed a consistent framework for Copyright works, and duration, extent and registration is, for the most part, standard with some notable exceptions. When the copyright of a work expires, it enters the Error! Reference source not found.

4.2.2. Patents

A patent is an exclusive right to create, use, sell, or import an invention inside the country where the application is filed for a specified length of time (Barnett, 2014). Patents are given for new, innovative (non-obvious) inventions that have a practical use (useful). While they have long been important in the realm of industry, patents have become more significant over time in terms of innovation and economic performance, particularly with respect to R&D and technology transfer.

The continuously changing role of universities in technology research and ownership, the fast pace of innovation across many industries, and the explosive growth in specific fields such as biotechnology and software pose ongoing challenges to the global patent system (OECD 2014). Fortunately, one of the system’s assets is its ability to adapt to technological change, which has been particularly evident over the last two decades. However, to guarantee that it continues to function effectively, the patent system must be evaluated broadly and updated to meet changing situations (Van Pottelsberghe, Guellec, et al., 2007).

According to Ryan (2010), patents promote the growth of technology marketplaces. Patents help to make technology marketplaces more fluid and well–organised by allowing exchanges. They aid in the diffusion of knowledge by lowering transaction costs (for example, providing information about the value of technology and reducing partner search costs and informational asymmetries). Since 1980, a series of judicial, legislative, and administrative initiatives have expanded patenting to include new technologies (biotechnology) and technologies previously unprotected by other forms of intellectual property (Elnajjar et al., 2010). Despite these various advancements and the apparent importance of patents to the economy, there has been little comprehensive research on the patent system’s overall performance (Barnett, 2014). According to the Japanese Patent Office (JPO), licensing activity and willingness to license was at an all-time low in the previous decade (Ryan, 2010) and a frequently–given reason for this is the increase in complexity, cost and administrative burden associated with patent registration. In addition, the potential underestimation of the value of inventions and the lack of information about possible partners or investors and the embryonic and even speculative stage of technologies that must be patented in order to be considered ‘sufficiently protected’ for investment purposes, means that many innovators are reluctant to pursue registration, and so end up with no protection whatsoever (Elnajjar et al., 2010).

Viewed through the lens of innovation policy, the aim of patents is to encourage private sector innovation by allowing inventors to profit from their creations. The favourable influence of patents on innovation as an incentive mechanism has long been counterbalanced by their negative impact on competition and technological diffusion (OECD 2014). Patents effectively prevent the collaborative effort required to realise an idea’s full potential value by restricting access to individual ideas. Novel ideas and innovations tend to have limited shelf lives in a fast-paced, knowledge-driven, highly networked world.

4.2.3. Trademarks

A trademark is a “distinctive symbol that identifies certain goods or services as being provided by a particular person or organisation.” (World Intellectual Property Organization, 2004). The two functions of protection and spread in this formulation are nearly indistinguishable. A trademark, like
a patent, gives its owner legal protection by granting the exclusive right to use it to identify products or services, or by licensing its use to another firm for a charge. Patents and copyrights are granted at the national level, however trademarks can be renewed for a fee once they have been registered, unlike patents and copyrights. At its most fundamental level, copyright protects innovation, whereas trademark protects commerce.

The Paris Convention of 1883 was the first international trademark agreement, in which the parties agreed to provide overseas applicants with the same level of trademark protection as domestic applicants. Since the late 1930s, registration has been based on “intent-to-use”, creating an examination-based process, and an application publication system. The British Trademark Act of 1938, on which much European trademark law is based, contained other novel concepts such as “associated trademarks”, a consent to use the system, a defensive mark system, and a non-claiming rights system.

Only the largest corporations were globally present two decades ago, and international expansion took years. Today’s businesses are built to be global from the start; all they require is a website. The United States Patent and Trademark Office (USPTO) revealed in 2013 that trademark submissions increased at an average annual rate of 6.5 percent between 1985 and 2011, substantially surpassing GDP and creating a far more complex and uncertain environment for trademark specialists. With such rapid growth, trademark protection and infringement monitoring has become more complex.

Trademark analysis can capture the key characteristics of the industrial transformation process and the innovation phenomena. The role that technology can play in enabling brands to better manage these increasingly diverse concerns was a prominent theme at INTA 2017, and it demonstrated how organisations are leveraging technology to drive increased efficiencies, from web monitoring for brand infringements to the automation of global trademark renewals. The key challenge is ensuring that all relevant information is referenced and managed appropriately – using a single technology platform that can be used by a corporation, a law firm, or a global network of lawyers.

4.2.4. Creative Commons

Creative Commons (CC) is a licensing framework established to provide an alternative and complement to an ‘all rights reserved’ copyright system. As copyright is a permission-based system, Creative Commons licensing offers rightsholders the opportunity to pre-approve certain categories of use without the need for users to ask permission, for example in the case of non-commercial uses of the work that do not create derivatives.

The CC licences were established and are overseen by an American non-profit organization and international network devoted to educational access and expanding the range of creative works available for others to build upon legally and to share. The organization has released several forms of license free of charge to the public. These licenses allow authors of creative works to communicate which rights they reserve and which rights they waive for the benefit of recipients or other creators. An easy-to-understand one-page explanation of rights, with associated visual symbols, explains the specifics of each Creative Commons license. Content owners still maintain their copyright, but Creative Commons licenses give standard releases that replace the individual negotiations for specific rights between copyright owner (licensor) and licensee, that are necessary under an “all rights reserved” copyright management.

As of 2019, there were “nearly 2 billion” works licensed under the various Creative Commons licenses. As of May 2018, the photo-sharing platform Flickr alone hosted over 415 million Creative Commons-licensed photos.

4.2.5. Open Source Licences

Open source software (OSS) is computer software that is freely available without fees and distributed to users as source code. The software is open for end-users to modify under the restrictions of license
conditions of the original version (Corbly, 2014). Programmers have developed Open Source Licences (OSL) as a reaction to the distributor-driven model of copyright licensing. The open source licensing aims to prevent any individual from exclusively exploiting the work and protect the creators’ copyright to the entities (Laurent, 2004).

Under the open distribution principle, users can freely distribute copies of the software. They could also make changes to the work and the derivative works due to the open modification principle. Licensing derivative works from open source software may be subject to limitations of terms in the original license. These terms usually require the derivative works to “open” to the same degree as the original work.

While originally avoided by industry for lack of traditional proprietary agreements and commercial assurances, Open Source Licences has since become ubiquitous as an agile component of the development of industrial data systems. By 2015 78% of companies were running on open source software and less than 3% did not use it at all⁸.

4.2.6. Open Hardware Licence

Just as with open source software, Open Hardware needs a solid legal framework for distribution. Having explored different options, CERN found that using an existing software or documentation licence was not sufficient to support the creation of a tangible product. This led to the creation of the CERN Open Hardware Licence. The licence governs the use, copying, modification and distribution of hardware design documentation and the manufacturing and distribution of products based thereon. Anyone can obtain these rights on condition that their developments of the licenced hardware are published under the same terms. The Open Hardware Licence ensures that any improvements made by the Open Hardware community are accessible to everyone.

The CERN–OHL is to hardware what the free and Open Source Licences are to software. It defines the conditions under which a licensee will be able to use or modify the licensed material. It shares the same principles as free software or Open Source: anyone should be able to see the source – the design documentation in the case of hardware – study it, modify it and share it. It can also be used by any designer wishing to share design information using a licence compliant with its definition criteria.

The Open Hardware Licence was originally written for CERN’s need for open experimentation with agile digitally-enabled innovation in the physical space, and have since grown in significance because of the expansion of industrial IoT development.

4.2.7. Open Product Licences

Created in 2011, the Open Product Licenses were developed in response to a growing problem:

Existing patenting laws have been developed for the protection of industrial tools which generate mass-produced clones. This system is becoming increasingly inadequate for the needs of designers and makers of rapid-prototyped, digitized and traceable tangible products. Within this new three-dimensional landscape of networked and co-created products only certain elements can be registered under existing licenses. The software components can be registered as Open Source for example, while digital on-screen artwork can be assigned one of the Creative Commons attribution licences. Tangible networked products however cannot be registered under any of the existing licensing systems⁹.

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⁹ http://www.openproduct.cc/
The Open Product Licences respond to a need of product designers to register their tangible innovations and assign an attribution license for others to build upon their work in an accountable way. Inspired by the Open Source and Creative Commons models, Open Product received endorsement from CERN to take their Open Hardware licensing model and develop it further in line with ideas of 'design by attribution'. One of the main goals of the project was therefore to set the standards for registration and attribution of products, and provide a platform for a community of product designers, developers, makers and thinkers to share ideas and collaborate on new products, regardless of background or provenance.

![Open Product Licences](image)

**Figure 1: The Open Product Licenses.**

The Open Product Licenses were developed by Stromatolite Design Innovation Lab (UK-based parent company of ICF) in collaboration with Radiant Law and Makersco, supported by the UK Technology Strategy Board (now Innovate UK), based on original research.10

### 4.2.8. Public Domain

The public domain consists of all creative works to which no exclusive intellectual property rights apply. Those rights may have expired, been forfeited, expressly waived, or may be inapplicable. As

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10 The research was conducted as part of piloting the course in Design Entrepreneurship at Goldsmiths, University of London, and as part of PhD research (see http://openproduct.blogspot.com)
examples, the works of William Shakespeare, Ludwig van Beethoven and Leonardo da Vinci are all in the public domain either by virtue of their having been created before copyright existed or by their copyright term having expired.

The term denotes public rather than private ownership of the works and contributes to a ‘Commons’ that is considered a public good. Some categories of work are not covered by a country’s copyright laws and are therefore in the public domain. Examples include cooking recipes, scientific and mathematical formulae and (in the USA) all computer software created before 1974. Other works are actively dedicated by their authors to the public domain, such as open-source software that is made freely available and editable by its users to encourage its dissemination and community-based improvement. As rights vary by country and jurisdiction, a work may be subject to rights in one country and be in the public domain in another.

4.3. Mechanisms of IP protection

The discourse of intellectual property often includes the notion of protection. A work, design or invention is said to be protected if it is recorded in a system such as a patent, trademark or copyright registry. However, there are two distinct kinds of protection, and these we refer to as mandates and restrictions. To protect one’s personal property, both legislation and cultural norms forbidding theft are mandates, while a padlock on one’s door is a restriction. Intellectual property law falls under the category of mandate. Patents and Copyrights do not actually prevent inventions from being replicated or works infringed other than by threat of legal action that may ensue.

However in a maximally digitalised technological environment, intellectual property protections can be designed to work differently. As Lawrence Lessig wrote in 1999, “Code is law” (Lessig, 1999). Intellectual Property is a system and network of legal regulations that exist within a cultural, technological and political context – but in the digital domain, that regulation may be encoded into the architecture of the systems and workflows designed for use by all actors. The extent to which behaviours such as attribution or infringement are required or possible are affordances of the technologies and their architectures. In this respect, they can operate as both mandate and restriction.

Advocates of Technical Protection Measures (TPMs) or Digital Rights Management (DRM), sometimes referred to as Digital Restriction Management, argue for the creation of systems that ensure both mandates and restrictions are applied to all of Intellectual Property as the technological affordances allow. Effectively, DRM imposes technological restrictions that control what users can do with digital media. For instance, DRM software is often designed in order to prevent unauthorised copying or sharing of a music file, reading an ebook on another device, watching a TV show in a territory other than that which it was licenced for, or playing a single-player game without an Internet connection.

In 2005, Sony BMG implemented protection measures on approximately 22 million CDs. When inserted into a computer, the CDs installed one of two pieces of software that provided a form of digital rights management (DRM) by modifying the operating system to interfere with machine’s ability to copy CDs. Neither program could easily be uninstalled, and they created vulnerabilities that were exploited by unrelated malware. Following public outcry, government investigations, and class-action lawsuits in 2005 and 2006, Sony BMG partially addressed the scandal with consumer settlements, a recall of about 10% of the affected CDs, and the suspension of CD copy protection efforts in early 2007.

In other words, DRM creates a limited or ‘damaged’ good and, in many instances, creates damage to a good that was not previously limited, thereby prioritising (corporate) Intellectual Property rights over other kinds of (private) property rights. It reinforces existing power asymmetries with respect to control over knowledge and the production and distribution of creative media, and it facilitates large scale surveillance. The extent to which a universal European IP registration platform can or should
seek to impose Technical Protection Measures is dependent on a range of political, social and economic factors involving matters of privacy, data security and commercial imperatives.

The design of the IP Tracker outlined in this study is agnostic to the application of additional layers that may later build upon its registration, attribution and rights assignation ambitions. Significantly, the IP Tracker is not intended to host nor distribute protected works, but to instead contain those works' registration details and descriptors ('metadata').

![Figure 2: The stakeholders involved in 'Uptown Funk' (image credit: Robert Clement, Songspace).](image)

### 4.4. IP as a complex system of permissions

Just as with physical property, intellectual property is a system of permissions. The right to use, distribute, alter or make derivatives is not prevented by ownership and nor does it necessarily require the exchange of money in order for those rights to be assigned, it merely stipulates whose permission must be sought and what the limitations are on that ability to grant or withhold permission.

One of the single greatest bottlenecks in the use of IP in innovation is the ability to discover whom to ask. Figure 2 shows the extent of the complexity of IP ownership of a single music track. It depicts the various stakeholders and their connections involved in the song 'Uptown Funk'. The flow of rights between stakeholders varies by context and category of Intellectual Property, and includes both how the actual rights flow (i.e. licensing information) and the information about where to go to apply for rights in a certain context (i.e. ‘for this usage, who do I contact for licensing?’).

This complexity can be further exacerbated by the problems of unevenly digitised systems, non-standardised metadata, disagreements between rightsholders about the nature of the ownership agreements, lost or non-existent contracts, deceased or missing authors and businesses that have ceased operation. In the Culture and Creative Sector and Industries this level of complexity is common, since creative outputs often involve groups of collaborators, and most of the contributors are registered as micro-companies. Creating a system of accountability for a sector that produces a great deal of collective value is a key challenge that this IP Framework study seeks to address and, at least in part, resolve.
5. The technological environment

The paradigm shift that society has recently experienced with frontier technologies has resulted in a disparity between the current technological affordances and the world in which the ideas of intellectual property registration, ownership and exploitation were originally conceived. The widespread digitisation of all industrial processes, tools and outputs across all sectors provides both challenges and opportunities for a new IP framework, and there are lessons to be drawn and extrapolated from within the CCSI that can now be applied across all sectors. **Existing IP frameworks lack the speed and agility required for both the registration of works and the ability for innovators to discover, access and seek permission for the use of registered ideas.** They also lack the cross-sectoral potential to unite all IP information about CCSI designs, processes, inventions and concepts.

While IP remains both complex and permission-based, the new technological environment allows for greatly accelerated innovation through fast access to diverse categories of IP, the capacity to build on top of that IP, and the means by which to both simplify the permission process and build trust through decentralised technologies.

5.1. Universal digitisation: all industries are data industries

For the past half century, with some asymmetries, European society has been undergoing a process of computerisation and, more significantly, radical digitalisation. This has changed the nature of administrative and financial aspects of industries as well as communications and media, but some of its more profound effects have been observed when core assets of manufacturing and industrial production started to become digitised. Through the creation of digital twins, physical objects have become subject to the affordances data-driven systems. As the process of digitisation of industrial assets accelerates and becomes more pervasive, there are few if any sectors that remain untouched by it and no industries that are not, today, data industries.

**Figure 3: SAP’s proposal for the end-to-end management of the Chemical Industry operations.**

In 2019, SAP published “Empower the Intelligent Chemical Enterprise with SAP and its Ecosystem” (see Figure 3) outlining their ability to manage the entire production process for the chemical industry through data-driven systems (SAP, 2019). As an IT company this implied that SAP may be claiming to be the owners of the tools of production, while the traditional chemical industry became its content...
By 2025, many chemical companies will have gone beyond the boundaries of their current product-based value chain. Together with a network of partners (for example, service providers, universities, research institutions, toll manufacturers, and technology providers), chemical producers will be able to work on customer-specific solutions and applications in consumer industries (for example, automotive, high tech, aerospace and defense, and consumer products) in a segment-of-one relationship, delivering outcome-oriented applications and services. (SAP, 2021)

The SAP example indicates that universal digitisation allows for collaborative innovation to take place across domains. The creation of a technological framework supported by data sets that are findable, accessible, interoperable and reusable (FAIR), such as a common directory, repository or network of industrial data assets, can provide a valuable resource for innovators, enabling them to build new layers of intellectual property on top of existing technologies, products and tools, provided by and in collaboration with a wide variety of actors. However to ensure sufficient trust and the correct level of attribution, cross-domain industrial collaboration requires a system for data governance and accountability. The provision of a trusted framework for attribution of intellectual property therefore has the potential to unlock considerable innovation and economic value.

### 5.2. Blockchain and Trusted DLT Networks

In 2016, MTF Labs conducted a week-long Blockchain IP Lab that brought together a diverse group including some of the world’s leading experts in blockchain technology, cryptography, metadata, CCSI and rights organisations, representing creative practitioners, technology companies and other interest groups. The experts experimented and debated exploring ways in which blockchain technologies could help improve the creative sector, with a particular emphasis on the music industries. It soon became apparent that before improvements could be attempted, there must first be agreement what would constitute an improvement.

After long discussions, ranging from the technical to the philosophical, the group arrived at a selection of more specific questions that required serious analysis, leading to a fuller and clearer picture of blockchain technology and its limitations, particularly with respect to how it might apply within the ecosystem of CCSI as both a cultural and economic force. The result was a whitepaper that maps out both the benefits and drawbacks of how an actual implementation might impact upon industry players and stakeholders – from artists to audiences and all the many intermediaries.

Blockchains are databases containing a growing list of records, called blocks, that are linked together using cryptography. Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data. The timestamp proves that the transaction data existed when the block was published. As each block contains information about the previous block, they form a chain with subsequent blocks reinforcing the ones before them. In this way, blockchains are resistant to modification of data because once recorded, the data in any given block cannot be altered retroactively without altering all subsequent blocks.

Blockchain technologies are a subset of distributed ledgers. In their original incarnation, a distributed ledger is simply a database wherein the data are stored as a sequence of events across the devices of the users. Distributed ledgers were invented to conserve power, enable transparency and solve the problem of a central point of failure. The storing and sharing of information take place in parallel.

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across all devices, so failure of one or more of those devices does not hinder the performance of the ledger. The risk of distributed ledgers was that there was no centralised and single trusted authority and therefore no localised responsibility. For this reason, it was difficult to verify which copy of a ledger is the right one, and the transparency of distribution does not help in this regard, since although everyone’s device has a copy of the ledger, it is unclear whether that copy is genuine or altered. To overcome this problem, the blockchain was developed.

**A blockchain guarantees a single consistent source of truth, a global view of all the things that have ever happened in the system.** There can only be one ledger, and it is shared by everybody. Blockchain enables the existence of cryptocurrency, a medium of exchange like the Euro or dollar, but which exists entirely in the digital domain, using encryption techniques and decentralised systems to control the creation of monetary units and to verify the transfer of funds without the intermediary of banks.

The first blockchain was created for the establishment of Bitcoin. It was developed in 2009 by an unknown developer called Satoshi Nakamoto and creates trust by a process known as ‘proof of work’, in which computers perform complex cryptographic mathematics to write transactions to the ledger. Anyone can verify the legitimacy of a transaction within seconds providing the person has the computing power. Blockchain removes many of the intermediaries that exist in payments, logistics and certification thereby speeding up processing and reducing costs. The technology allows for the establishment of trust in contexts where trust may be difficult to establish.

**A distributed ledger cannot itself add technical protection measures to a computer system to prevent unauthorised use or distribution of a work.** It provides protection in the sense of supporting a legal *mandate*, and not in the sense of creating a physical or technological *restriction*. According to the MTF Labs Blockchain whitepaper, “this is not a lack in the blockchain as much as it is a characteristic of any computer-based system.”

Moreover, given its distributed nature, a blockchain system is not suitable for storing large amounts of data. Anything submitted to and stored on a (traditional) blockchain will necessarily be replicated across all participant computers. Rather than submit and store large digital files, a *preferable approach is to use a distributed data store with the top-level metadata required to identify and trace an instance of IP, while referencing an associated digital file stored elsewhere from the registry record.* One recommended approach is to allow users to upload a digital file for analysis. The system can create a unique lightweight digital ‘fingerprint’ from the uploaded file, store the fingerprint and delete the file. When required, the system can match the fingerprint with the original for verification.

A common criticism of cryptocurrencies (and therefore blockchains) is the heavy ecological footprint of the ‘proof of work’ verification methodology. The electricity needed to run the mining hardware for these calculations is what generates the huge energy demand of Bitcoin. Most other major cryptocurrencies use a very similar mining/confirmation process and so generate similarly high energy consumption levels. However, a blockchain system without a huge environmental impact is nevertheless entirely possible. Alternatives include ‘proof of stake’, which requires the currency’s miners to hold an investment of the cryptocurrency in question, as proof of their good will and from which penalties could be taken if they act badly. The Bloxberg blockchain established by Max Planck Digital Library (see 0) uses *‘proof of authority’ which establishes a network of trusted nodes in a distributed ledger technology (DLT).* Only those institutions that are well-funded and likely to endure and maintain the node form the decentralised network.

### 5.3. AI-assisted search and data management

Artificial Intelligence (AI) refers to any system that perceives its environment (digital or physical) and takes actions that maximize its chance of achieving its goals. Some popular accounts use the term AI to describe machines that mimic ‘cognitive’ functions associated with the human mind, such as “learning” and “problem solving”, however, this definition is rejected by major AI researchers in favour of the more neutral behaviour of “acting rationally”.
AI and Machine Learning-assisted search have been reliably deployed in recommender and personalisation systems across several domains, including patenting searches. AI systems driven by latent semantic analysis (LSA) attempt to mimic the ways in which the human brain processes and connects meaning and concepts. **LSA has been a key driver in recent developments in AI accuracy and creativity**, as well as the central architecture behind Google’s search and auto-completion technologies. IP Screener\(^\text{12}\) utilises similar methods to allow startups and innovators to scan through patenting registrations and validate their patenting ideas, ensuring that their invention does not breach a registered patent, and at the same time avoiding expensive legal search fees.

**Neural networks have been deployed for the creation of generative and machine-created art.** Voice AI systems provide accessible user interfaces for digital creative products and services that can assist people with disabilities and provide a new medium for creative practitioners to develop voice AI games, artworks, interactive narratives and collaborative works. **Europe already leads in the development of third-generation AI ‘neuromorphic solutions’**\(^\text{13}\) that mimic neuro-biological architectures present in the nervous system. These leading-edge AI systems, in conjunction with emergent quantum computing developments, hold potential for autonomous creativity by intelligent algorithms and raise questions about the extent to which existing copyright legislation can accommodate new forms of creative production.

In addition to search and recommendation, copyright-protected works such as films, voice recordings, paintings and photographs have been used to train AI systems that recognise patterns for administrative or compliance purposes such as cataloguing and sorting. The potential for AI-assisted IP management is to enhance discovery and the suggestion of potential new connections that innovators may wish to consider; to suggest related intellectual property of interest; to enhance similarity search; to assist and automate registration; to detect and flag potential problems or areas of likely infringement; and to assist in the creation of new works.

### 5.4. What is the problem with the existing approaches?

In his book *Understanding Media* (McLuhan, 1988), Marshall McLuhan describes the phenomenon of technological shift as an adjustment of ratios. Some aspects of our media environment are favoured and expanded upon, while others are rendered obsolete. Still others are recalled from obscurity and given new relevance. These adjustments, to McLuhan, reconfigure how we understand, experience and impact upon the world, and thus shape our existential environment. **Changes in prevailing technologies change both how we perceive and our capacity to act – and thus who we are.**

McLuhan’s formulation of is that “the medium is the message” – which is to say, that far more than the content of media and technological systems, it is the form of that medium (or technology) that brings with it the greatest impact. By way of example, the medium of television has had a far more profound impact upon the shape and behaviours of society than have individual televised broadcasts, regardless of the iconic status of that particular broadcast event (e.g., the Moon landing, Live Aid, the footage of the 9-11 World Trade Centre attacks, etc.).

Likewise, the impact of digitisation on human society is far greater than the impact of digitisation within a particular industry, platform or sector, and the affordances of that digitisation inform how both institutions and society operate, and the ways in which individuals and systems can interact, as well as the nature and content of that communication. While new frontier technologies reveal unpredictable and surprising results that cannot always be analysed using linear, scientific methods of inquiry that rely on deduction and induction, the design field and the creative industries have tools

\(^\text{12}\) https://ipscreener.com

and methodologies that can help us uncover new knowledge about unpredictable emergent phenomena and allow us to address the major challenges we are currently facing.

For registration and record keeping (for instance, in the case of intellectual property), digitisation transforms traditional archives to online datasets. Digital libraries do not only provide accessible knowledge but also cultivate collaborations in communities across disciplines. The ability to distribute a digital dataset ensures that archives stored and transferred to multiple servers are protected from calamitous physical destruction and permanent loss.

Economic and administrative advantage are not the only drivers of rapid digitisation: the global coronavirus pandemic has increased the urgency with which processes and industries have been digitised and systems interconnected. The resulting increased drive to update the bureaucratic systems that underpin Intellectual Property in Europe is highlighted in the 2020 Annual Review of the European Patent Office:

With the pandemic pushing the EPO to go digital faster, goal 2 projects aiming at simplifying and modernising IT systems moved ahead at full steam in 2020. On top of rapidly rolling out laptops and homeworking hardware, the Office started developing software by delivering minimum viable products (MVPs) in rapid, frequent iterations with incremental improvements. This agile approach proved highly effective in driving digital transformation forward. Digital workflows and annotation tools were progressively integrated into the Patent Workbench, establishing it as the single interface for interactions between examiners and formalities officers. The EPO also started decommissioning its mainframe, enhancing cybersecurity and developing in-house AI-based models for pre-classification. In parallel, it developed an ambitious business change realisation plan, to reach out to staff and ensure that change management activities were fully aligned with the IT solutions delivered and operational needs.

The requirement to not simply digitise existing records and create databases but rather to develop and iterate minimum viable products using an agile approach mirrors innovation methodologies adopted by the creative and cultural sector using new digital tools. While this approach is to be welcomed, the nature of patents and the expense and duration of their registration will not be significantly affected by this technological shift in the institution of the EPO, and patent registration will remain outside the economic capability of small enterprises and individual innovators.

5.4.1. Research focus on patents

Despite conditions of radical technological change, a survey conducted by this study of the last 5-8 years of peer-reviewed publications reveals a dominant interest in traditional methods of IP registration, especially patents. The publications which examine issues at the intersection of intellectual property management, industry and new technologies, place emphasis on certain aspects of intellectual property that assume a continuity of IP forms, administrative frameworks and IP applications. In particular, the majority of these academic publication examine the impact or potential for frontier technologies in the service of patents with, in all but one case, an unspoken assumption that patents are both necessary and desirable tools of industry innovation and international trade. However, an analysis of the literature reveals some useful ideas that can be applied to a universal IP registration and tracking framework that can support CCSI innovation.

In recent years, researchers have started to focus on collaboration in innovation through mutual sharing of patent data analytics. This has been identified as a necessity in a connected world (Aristodemou et al., 2017). The study identified five problem themes and then developed a technology roadmap to tap into the vast potential of patent data and innovate accordingly. The five problem themes identified were patent data, database interconnectedness, data analysis, data visualisation, and patent quality. They also identified thirteen key technologies as the possible solutions to these problems. The included technologies were natural language generation, semantic analysis, domain
ontologies, network analysis, classification algorithms, blockchain technology, artificial neural networks analysis, and deep learning analytics.

Cho et al. (2015) stated that the hindrance in collaboration in innovation in light of IPR is a multi-variant problem. Stronger IPR favours larger firms that are R&D intensive and is detrimental to the operations and growth of SMEs. They suggest that a customised policy should be made that benefits everyone. A universal IPR policy does not support innovation and stunts the growth of industries. Contreras and Reichman (2015) have stated that obstacles of national security, intellectual property, and other legal policy obstacles must be overcome to share large-scale scientific data for the sake of innovation. They state that sharing data in the public domain is the most straightforward method of data sharing, such as through a creative commons licence. Such licences have already been used in creative arts, however, such frameworks may not be economically viable for the authors and inventors. An alternative methodology could be the sharing of the data in a common repository that is built and maintained by collective industry efforts (Contreras & Reichman, 2015).

Fatma and Abidi (2021) investigated the impact of Free Trade Agreement between the European Union and Tunisia on IPR and technology and economics. They analysed the data between 1991 and 2014 to state that FTA between Tunisia and EU will boost Tunisia’s imports due to the accompanying revised IPR of the FTA. This shows that technology exchange is conditional on and reliant upon strong IPR and even if technology exchange in the literal sense does not happen, stronger IPR facilitates economic exchange. An increase in available data provides better decision making and strategy opportunities for innovation that drives businesses through digital transformation (Aristodemou & Tietze, 2017). Abbas et al. (2014) distinguished between text mining and other approaches to patent analysis and the applicability of these approaches to structured and unstructured data. Aristodemou and Tietze (2017) compiled a list of approaches being used for analysing patent data due to the textual nature of the data. Park, Kim, et al. (2013) utilized SAO-based text mining technique to analyse patent big data automatically. They successfully tested the technique by applying it on floating wind turbine technologies.


Jokanovic et al. (2017) used artificial neural networks to analyse patent data and to predict economic growth in the form of GDP and linked the advancements in technology to economic development. J.-S. Lee and Hsiang (2020) became the first researchers to propose (J.-S. Lee, 2019), and utilise machine learning for patent claim generation. They used OpenAI GPT-2 (Generation Pre-Training-2) pre-trained model to generate patent claims. They concluded that OpenAI GPT-2 is exceptionally good at generating coherent texts for patent claims and it can be abused because of its exceptional ability of natural language generation.

Zhang et al. (2018) have pointed out to the problem of deep neural network models being plagiarised. Production-level deep learning models are hard to build and hold great promise of market success, therefore, there is great incentive in plagiarising working models. The proposed method of protection is the embedding of a DNN-applicable watermark with the help of DNN applicable watermark generating algorithms. Their study found 100% success in verification of ownership of remotely deployed deep learning models without compromising the model accuracy for normal data input. The embedded watermarks in DNN are also extremely difficult to bypass by model inversion attacks.

Gervais (2020) explored intellectual property laws in the age of artificial intelligence and investigated whether AI programmes capable of producing artistic work should be given autonomous ownership and intellectual property protection in the same way it is given to the artistic products produced by humans. The article states that AI is regularly being used to analyse patent applications and grant patents. This question is particularly relevant as powerful AI systems have also filed their own patent applications. The moral complexity of the question led the author to conclude that AI should not be
given the authorship of artistic and inventive products and that courts, rather than patent offices, should be charged with accepting or rejecting such patents and authorship of such works.

Similarly, De Costa and Carrano (2017) evaluated AI authorship, though from an economic perspective. They acknowledged the potential of AI and noted that many businesses have already incorporated or are incorporating AI in their businesses in one way or another. Many companies also have a direct monetary stake in AI. There is still a lack of legislation regarding patent law for AI-invented products. The current patent laws only acknowledge humans as inventors. There is significant potential for financial loss among investors of AI if and when their AI invents something and the authors argue that therefore appropriate legislation should be put in place to secure the monetary model of AI funding and investments.

Chandekar (2021) has also shown concerns regarding the state of current patent laws and their incompatibility with emerging technology. She emphasises the point that current intellectual property laws and systems need to be revitalised and upgraded to make sure that they remain compatible with current and the future technological innovations. AI and blockchain are two of the most recent advancements that the author notes, particularly in the field of patent law analysis.

Gurkaynak et al. (2018) discussed some of the proposed advantages and uses of blockchain technology in intellectual property law while outlining some of the possible legal problems of the technology that have not yet been fully resolved. They note that the technology offers a secure and cheap method of storing records, which will be beneficial for IP officers, governmental organisations and courts. They also highlight other potential alternative technologies such as a mobile blockchain application that may emerge and replace traditional institutions. Blockchain technology also holds great promise in management and enforcement of Intellectual Property law due to its secure and decentralised nature. They also highlight the potential for reducing costs and making the system more transparent. Because of blockchain's potential to offer secure storage and management of intellectual property rights, it can significantly lower the costs of managing IP data.

Holland et al. describe the protection of 3D printing technology hardware with the help of blockchain technology. Infringement of such emerging technologies is a real possibility, as the incentive to sell counterfeit products is quite high. Furthermore, counterfeits can damage highly sophisticated and expensive machinery. An example of a blockchain solution by the name of SAMPL, developed specifically for the protection of such hardware, is currently being developed by 8-partner.

Jafery et al. (2019) elucidate the use of text mining and machine learning for data analysis for Industry 4.0. The huge amount of patent data expected to be generated can be readily processed with the use of AI. They classify MyIPO patent data using five classifiers. Their results show that Support Vector Machine (SVM) was the most accurate in classifying the datasets. Lupu (2017) has summarised some of the key contributions in the field of intellectual property using computer science. He observes that patent law has received the majority of the attention of computer scientists, where other fields of intellectual property such as trademarks have not received as much interest.

Eom et al. (2021) use an ensemble learning methodology to estimate the value of patents filed in the electricity sector in the US. Such evaluation methodologies are potentially useful in the assessment of patent applications as this evaluation process has traditionally been extremely challenging. They demonstrate that their ensemble model’s estimates were accurate with statistical significance of 95%. Such estimation methodology will further improve innovation by accelerating and standardising the process of patent evaluation.

Sharing of data and collaboration certainly accelerates and multiplies innovation activity. Moser et al. (2019) demonstrate that international collaboration in the pharmaceutical industry has increased the portfolio of the industry to almost double since 2000. Active pharmaceutical patent families tripled in size during the same period. The data show that the highest number of high quality patents come from teams of multinational researchers located in separate regions of the world. However, such collaboration is far from ubiquitous. Many companies keep a close eye on the IP portfolio of their key competitors. Such a strategy may be intended to increase the rate of in-house innovation, but such individual efforts cannot be of the same efficacy as a collective effort of an entire industry to innovate.
through mutual data sharing (Prokhorenkov & Panfilov, 2018). The use of machine learning and blockchain technology applied to large data sets from different domains benefit overall innovation if a collaborative rather than competitive approach is adopted.

### 5.4.2. Narrow focus of technological solutions for IP

As seen in IP as a complex system of permissions, new IP registration, search, licensing and management solutions that use frontier digital technologies typically focus on a specific use case or domain-specific problem. Examples include:

- **Muzeum**: Blockchain-based open platform for copyright registration for the CCSI. Aimed at collaboration and licensing of copyright works, the platform provides smart contracts built on the Ethereum platform, with files stored in the IPFS distributed file system.
- **Aalbun**: an online service based in the UK and Finland that offers intellectual property management services to individual organisations. Aalbun uses technologies for patent search and registration and provides a technology landscaping tools to help businesses understand the innovation environment for their vertical.
- **Creative Commons Meta Search**: built on top of a catalogue that indexes CC-licensed and public domain content, the platform retrieves images based on semantic search criteria and allows users to easily licence that content for use in their creative projects and publications.
- **IBM IPwe**: AI and blockchain powered patent registration and analysis tool that is designed to tokenise patents and provide opportunities for investment.
- **IPRally**: AI platform for prior art search on patents.

These and many other services and platforms bring together frontier technologies and address specific issues and needs for individual use cases for intellectual property use. Some endeavour to set a consistent protocol within their sector and seek to standardise IP management within a particular domain or use case. They do not, however, lend themselves to interoperability with other systems. **They consider new technologies as a means to enhance existing intellectual property management practice, rather than innovating within the technological environment in a way that exploits its novel affordances.** In McLuhan’s formulation, they view IP through a ‘rear-view mirror’ (McLuhan, 1964) and understand the new technological context in terms of its predecessor.

The affordances of a context in which all industries are digitised include the possibility for accelerated cross-sector collaborative innovation that brings together different categories of IP and provides a platform for the establishment of new market categories.

### 5.5. Potential for innovation

The research conducted for this IP study has revealed a series of enabling technologies and best practice technological frameworks that address related issues in their own domains, including new platform choices for the registration and search of specific types of IP. Greater potential for CCSI-led innovation is possible if metadata can be searched and tracked across different IP categories, allowing for broader cross-domain collaboration. Accessible data is an enabler of shoestring innovation, allowing for the participation of smaller and more agile players. Allowing access to the data stored within a universal IP registration and tracking system allows for developers to create value by building creative applications on top of the existing registered works, and create new additional services for other users of the registration platform.

To enable collaborative innovation across CCSI domains and development of added value applications, an IP framework should address several **remaining gaps for CCSI innovation IP management**:

- **Facilitate technology transfer** of research and innovation Background IP for the creation of innovation;
b) Be able to demonstrate provenance and track Background IP in derivative and additive innovation;

c) Cater equally for the registration of every type of IP;

d) Discover IP through serendipitous results of intelligent search;

e) Enable users to easily identify and connect via a single point of contact for each IP registration instance;

f) Distinguish between author, IP owner and access rights holder;

g) Ensure governance over layers of confidentiality, access or visibility for Background IP owners;

h) Create a digital fingerprint of a source file for verification of originality;

i) Provide the option to select a licence for the derivative use of the IP;

j) Allow for morally and ethically driven restrictions of potential uses of IP;

k) Implement FAIR data (findable, accessible, interoperable, reusable);

l) Incentivise by design JUST researcher/innovator annotations, aiming for judicious, unbiased, safe, and transparent data practice;

m) Organise personal collections of Background IP metadata, for innovation projects or investment portfolios;

n) Encourage collaboration with the creators of Background IP for further development.

Some of the above gaps for IP management in the digital environment are addressed in Part 2: The IP Framework Blueprint, while others may form the basis for future research.
6. Best practice use cases for IP-led innovation

6.1. Domain-specific: A pioneering CCSI domain

The music industry was the first CCSI domain to migrate entirely to the digital realm. When Napster was launched in 1999, the record industry initially resisted the change, attempting to shut down unauthorised digital distribution (‘piracy’ and ‘theft’) and launching public campaigns and high-profile lawsuits to dissuade filesharing. As one of the most high-profile IP-led industries, copyright infringement and the efforts to prevent it, led to widespread public awareness of intellectual property that had not previously existed. However, while public awareness of IP rights and what it meant to infringe them increased, so did the cultural practice of ‘illegally’ sharing and downloading music files. The ‘you wouldn’t download a car’ campaign was, anecdotally, even less successful than their ‘home taping is killing music’ slogan of the 1980s at dissuading unauthorised copying of music recordings for personal use.

However, despite being dangerously slow to adapt and respond to emergent cultural norms around digital music convenience and portability, the industry eventually began to accept the transition from physical product to digital forms of distribution. This ultimately resulted in the licensed streaming platforms that are ubiquitous today, and which provide the industry not only with increased revenues year on year, but also a wealth of customer data and trend analysis as well as new forms of promotion and marketing.

In addition, smaller independent creative entities have been able to capitalise on the digital transition and, although there is ongoing debate about the fairness and exploitative nature of some of the platform services available, the long tail of music has allowed for a significant middle tier of sustainable CCSI micro businesses to operate with a mix of digital tools that extend their reach and direct audience connection through streaming (e.g.: Spotify, Deezer, Tidal, Qobuz), video distribution (YouTube, TikTok, Vimeo), download sales (Bandcamp, Amazon, iTunes), merchandise (Shopify, WooCommerce) and marketing (Facebook, Twitter, Instagram). The recorded music sector, and particularly the independent music businesses that make up the majority of the music business ecosystem’s activity (though not the majority of its economic value), operates close to emerging markets, in particular through its observation of and participation in cultural trends.

As a whole, the music industry was forced early into new, digital business models and so has attained a degree of market maturity as a result. The sector has aligned around a consistent metadata and format standard that allows for digital distributors to simultaneously release to dozens of consumer platforms and for those platforms to report plays and purchases at a national and international level. This has enabled rights organisations, publishers and musicians near-instant and granular data that feeds back into business models and new offerings. Today, the music sector is recognised as a pioneering domain in digital business model experimentation, with new innovation in gaming, immersive 3D experiences, distribution platforms, consumer offerings and B2B deals enabled by full digitisation of content with standardised metadata.

6.2. Ecosystemic: IP-led collaborative multiplier innovation

An ecosystemic approach to IP innovation reveals several best practice use cases that illustrate the potential for intellectual property in the digital environment. Beyond simply providing new business models for individual sectors, collaborative and cross-disciplinary innovation can leverage new technologies and tools to exploit new markets, develop new platforms and imagine new services that make use of the affordances of the digital realm.
6.2.1. Use case: #MusicBricks – a fast track to innovation

#MusicBricks was an H2020 Innovation Action that placed technology transfer in the hands of creative innovators and supported new ideas to commercial prototype.

At kick-off, partners planned to deploy 8 tools to the #MusicBricks Creative Testbeds. One of these tools was an innovative new TUI (Tangible User Interface) for gesture-driven low-latency applications, and 7 were APIs (Application Programming Interfaces) which wrapped existing tools and technologies together from within the world of music technology research in order to create specific ‘bricks’ that could be deployed in combination with others to make new hybrid applications. The first set of 8 tools was deployed by Month 5 of the project in time for the first Creative Testbed.

By Month 9 of the project, following the rising popularity of the #MusicBricks toolkit among developers and innovators, 2 further APIs were added by industry partners who contributed their IP stating that #MusicBricks added value to integration and deployment of their tools. A further industry IP – a data-driven Graphic User Interface – was released under MIT licence and embedded into the toolkit by Month 10. Several industry requests for addition of their tools were rejected due to their restrictive licences, however by the end of the project a further 7 industry tools were added to the original 8, making the total 15 tools in the #MusicBricks toolkit. Several original tools were amplified with further features in response to the requests from developers and innovators, and an official cloud platform has been accepted for #MusicBricks driven innovations.

In order to encourage the creation of new IP on top of Research IP provided by the research partners, the Consortium Agreement was re-written to include a new area of Innovation IP, and so enabled the innovators to take ownership of their IP. In one case this resulted in a patent search conducted just 4 months after the innovation seed idea. 

During the course of the project, partner Fraunhofer relaxed their existing licensing policy and agreed on licensing their IP in ways that supported Open Innovation using MIT licences, with commercial licences offered under fair and reasonable conditions. Fast knowledge transfer was incentivised through the organisation of testbeds and direct engagement from the project’s research engineers. This was combined with micro-funding to ensure further prototype development.

In 2016, building on the experience from the #MusicBricks pilot, this study’s author Michela Magas contributed a series of recommendations for the EU Connect Advisory Forum (CAF) that were adopted by the Innovation Recommendations Working Group for the European Commission Horizon 2020 Programme:

“CAF recommends the creation of a new layer of Innovation IP which complements Research IP but also incentivises the development of innovative product solutions for the market and new business models by developers and entrepreneurs. Following on from 2.2 above, use of ICT Research IP is conducted by means of APIs, GUIs and TUIs. Productisation ideas and new business models built using the Research IP Interfaces can be registered as Innovation IP. This enables entrepreneurs to register patents built on top of IP which has been released by EU Research Centres, and contributes to a fast-track to EU innovation.”

6.2.2. Use case: Bloxberg as an example of an IP registration mechanism

Bloxberg is a lightweight blockchain-based IP registration mechanism for scientific research data. Rather than randomised or full network distribution of all data, it uses trusted nodes for the network. Bloxberg is a global initiative by the Max Planck Institute, a major EU research organisation. The principal focus of Bloxberg is to empower researchers with robust, autonomous services that provide a transparent footprint and blockchain-authenticated certification of the provenance of their work and Intellectual Property, without revealing its content.
Bloxberg has already grown to over 30 global nodes of its limited distributed ledger blockchain system, each maintained by a reputable national research institution secured by long-term funding. It is grounded in European research community ethos and provides the “railway tracks” upon which other European value applications can be built. However Bloxberg does not have a strategy for the content of metadata, IP parameters, standards for registration or smart contracts.

Bloxberg allows for the timestamping and registration of IP (see Figure 4), and can act as a foundational technology upon which the IP Tracker can be built. **Bloxberg’s key strength is its network of trusted nodes – all of which are well-funded institutions that are reliably anticipated to be stable and long term stewards of their copy of the blockchain data repository.** The IP Tracker can adopt this model and deploy its own trusted network of CCSI partners, and can partner with Bloxberg to integrate it’s the two systems.

![Bloxberg Data Certificate](image)

**Figure 4: The Bloxberg IP registration certificate.**

### 6.2.3. Use case: GitHub as an collaborative IP platform

GitHub is a cloud-based service provider for software development and version control. Since it was first launched in 2008, GitHub has quickly grown into a major platform for collaborations between open-source communities as well as harbouring millions of public repositories. In order to make software redistributable by the users, developers can attach a license to their repositories which allows the rights of reuse and modification to be transferred.

According to the definition of open source provided by the Open Source Initiative (OSI), an open source license must: (1) **allow free redistribution**, that is to give users the right of selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources without charges; (2) **allow derived works**, along with being distributed under the same terms as the license; (3) **not restrict the program to be used in a specific field of endeavour**; (4) **apply the rights to all to whom the program is** redistributed without the need for execution of an additional license by those parties; (5) **not be specific to a product**; (6) **not restrict other software**; (7) **be technology-neutral**.
Even though the terms of the license specified in the OSI definition has covered the most common use of open source projects, it would be challenging for someone who does not have a legal education background to initiate a license. To simplify the licensing for developers, GitHub provides a list of existing open source licenses that can be chosen from. In 2013, GitHub launched choosealicense.com to further help users find suitable licenses for their projects. According to a recent survey, 128 million public repositories are currently hosted on GitHub, nearly half of them under an Open Source License (Open Weaver, 2020).

In all of the licensed projects, MIT License and Apache License 2.0 are the most common choices with shares of 54% and 13%. The simplicity and openness of the MIT License, consists in merely giving the rights to the consumers to use, modify, distribute, publish and sell the program. On top of the MIT License permission, Apache License also grants patent rights to the users. These licenses are often referred to as permissive Open Source Licences, and are usually the least restrictive. Another popular type of Open Source Licences are the “Copyleft” licences. Common types include GNU Public License (GPL), AGPL, LGPL, etc. This type of license requires the same rights to be preserved in derivative works created from the original work. For example, an open source software with a GPL license requires the derivative works to be distributed under compatible terms.

For the benefit of the Open Source community, GitHub created an API to help retrieve information about a particular project’s license. This makes it easy to trace the licensing chain from the latest derivative work to the original software program. For this reason Github provides a useful model for a platform that allows for registration, repository of works and the ability to suggest and select licences for a range of different categories of project.

### 6.2.4. Use case: e-Lucid as an online marketplace for IP

e-Lucid is an e-commerce platform that offers Intellectual Property licensing solutions. It is a part of UCL (Commercialisation Company of the University of London). It is a tool that enables technology transfer for universities and research centres via an e-commerce storefront. This enables a licensor to list their technologies (digital products, physical products, and services) and begin the licensing process. Over 10 universities sell IP using e-Lucid, including the University of Edinburgh. To date e-Lucid has processed over 11,500 licenses for research IP.

Marina Santilli, founder of e-Lucid, suspected that the issues encountered by UCL Business were similar to those confronted by universities around the world. This was readily confirmed when they contacted colleagues. At present they reach out to academics and re-evaluate economic potential with IP assets that were previously unprofitable due to the enormous administrative burden necessary to market and licence them, despite the fact that they had already been offered under academic licences. Similarly, having an automated system that worked around the clock meant that closing agreements with other organisations in various time zones could be done with a single press of a button, cutting transaction time frames from weeks to a few days. e-Lucid was made available to anyone in the spirit of collaboration and in accordance with UCL’s aim of benefitting society and the economy.

e-Lucid recently helped the University of London’s reverse engineered CPAP device achieve regulatory approval in just four days by customising the platform to manage the process of receiving and approving licence applications as well as delivering design files. They manufactured and delivered 10,000 devices to the NHS in less than a month during the peak of the pandemic. e-Lucid manages and automates multiple agreement types: Commercial licenses, Research and Evaluation licenses, MTAs, NDAs / CDAs, Consultancy agreements, End-user agreements, and research collaboration agreements. For instance, a Student at University owns the Intellectual Property of his creation, and e-Lucid permits collaboration with Industries and potentially works outside of the University.

The licensing process is executed as follows:

- The customers fill a licensing questionnaire.
• They sign the terms.
• Due diligence stage. The licensor and licensee review the terms. Licensee can ask any questions to the censor to agree on licensing according to a specific purpose.
• After all authorization on behalf of the licensor, Payment is operated directly into the system.
• The customers receive their product.

There is potential for further innovation in order to enable licensing, not only for universities and research centres but also to give accessibility, availability for other creators as well. e-Lucid is currently only used in the English-speaking world and intends to expand beyond that. There are also potential customer segments beyond the tech transfer market.

**Figure 5: Siren – a multidisciplinary collaborative project by 11 IP creators requires IP registration in real time.**

### 6.3. Cross-domain innovation use cases

#### 6.3.1. Siren: Creative application of bio feedback technologies in composition and performance

*The Siren project drew together existing technologies from academic research and the collaborative contributions of individual artists, creative SMEs and artisans from around the world, and is a clear use case for registration of intellectual property in real time at the point of creation (see Figure 5).*

**IP Contributors:**

• Anya Yermakova, PhD and Harvard Fellow: performance and composition
• Alexandra Antopoulou, Associate Professor, University of the Arts London: cinematography video art, costume and ritual, spoken word
• Mark-David Hosale, Associate Professor and Chair of Computational Arts in the School of the Arts, Media, Performance, and Design, at York University, Toronto (sound design and live electronic composition)
• Alan Macy, Research and Development Director and founder, BIOPAC System (interactive bio-sensing and sound design)
• Mónica Pedro, PhD researcher in New Media and pervasive systems, Project Manager H2020 initiatives (fish skin harvesting and processing and location scouting)
• Konstantinos Damianikis, Musician and sound artist, Goldsmiths University MMus in Sonic Arts (video art and design)
• Diana Vieira, PhD in Sciences and Environmental Engineering and project officer at JRC (poetry and environmental science)
• Cindy Macy, Environmental consultant and dance studio manager (breathing and spoken word)
• Surma – Débora Umbelino, recording artist and multi-instrumentalist (spoken word)
• Gonçalo Guiomar, astrophysicist and neuroscientist (vocals)
• Scott Beibin, Open Source hardware designer (data collection assistance)

Created in a broad collaborative performance piece as part of the MTF Labs in Aveiro, Siren is a ritualised performance inspired by the Aveiro para-hydromorphic Regosal – the constantly changing boundary between land and water. Breathing, voluntary and involuntary muscle movements and dual heartbeats compose the sound. The performance is accompanied by an interactive video-art piece edited from a film taken from a site-specific performance at the Aveiro wetlands. The mask and costume are an invocation of past rituals as well as a commentary on Covid. The performance is punctuated by a poem inspired by the hydromorphic soil of Aveiro and recited in English, Greek and Portuguese.

It includes interactive bio-sensing technological methodologies from research, craft skills in new materials manufacturing, oceanographic science, electronic music composition and choreography. The bio-sensing technology employs Biopac Systems MP40 physiological signal amplifiers that communicate to a maxmsp patch developed by Mark-David Hosale (architect) and Alan Macy (signal processing). The maxmsp patch delivers a real-time audio track that is sourced from the electricity produced by the performers’ bodies during the performance. The data measured was simultaneous skeletal electromyogram and electrocardiogram.

6.3.2. Dance AI / AI Drummer: AI creating music and meaning in response to physical performance, aiding technology transfer from research and innovation

An AI application for the CCSI that requires a system like the IP Platform that disambiguates and clarifies authorship and collaboration. The research and experimentation feeds directly into tech transfer.

IP Contributors:

• Andreas Bergsland, Associate Professor in Music Technology, Norwegian University of Science and Technology.
• Kirsi Mustalahti, Accessibility Arts Coordinator, founder of ACCAC Global, and dancer
• Lilian Jap, PhD researcher, software developer and interaction designer, KTH Royal Institute of Technology, and dancer, Royal School of Ballet
• Joseph Wilk, researcher, computer programmer and artist
• Alessandro Saffioti, Professor of Computer Science, Örebro University

Started at MTF Stockholm in 2018, using a range of movement sensors and AI responses to gesture, the initial version of the Dance AI project interacted with language and accent databases using the motion of two dancers to explore embodied communication.
“The concept our group gathered round was para language, and para language modifies or adds nuance to verbal meanings or conveys emotion by using, for instance, tone of voice, volume, intonation. It’s interesting that these parameters are at the same time musical, and thus it brings a form of bridge between language and music. But para language is also interesting because those vocal parameters are strongly linked to our bodies. Where we can intuitively see corresponds to levels of energy, pitch and shape in body movements.

An important part of the concept of our performance came about when Joseph stumbled across this database, the speech accent archive. This is a linguistic research archive with thousands of users submitted entries in the form of the same spoken sentence in English. And then with accents from all around the world. With all the different speakers and accents, the database incorporates a lot of variation, richness and complexity in terms of sound sources, qualities, and paralinguistic meanings, which makes it also interesting from a musical standpoint.” – Andreas Bergsland

Dance AI explores how the opacity of technology affects human to human communication, touching upon assumptions of invisible technology that we think we are in control of, how it inserts its own agendas into our communication and how challenging the boundaries of visibility of the black box can empower our decisions and usage.

Two dancers move around the space exploring controlling audio through movement. They develop a form of communication through using their movements and proximity to speak to each other. There is a black box in the centre of the performance space which is a dead zone for all sensors, its the only place in the room where no sensors readings will exist. Within the black box two people control how the sensor data gets turned into sound, the hidden layer controlling the conversation. The dancers start to realize the presence and control of the black box in their communication. The dancers decide to enter the black box and take control of the technology generating their communication. At this point the entire audience is encourage into the space to move and explore the technology in the black box now controlled by the dancers.

The project was also connected to an AI Drummer research project by Professor Alessandro Saffioti. The drum accompaniment AI originally designed for piano jazz performance was used to play music in response to the dance, rather than the more common inverse. The results of these experiments are now being written up as academic research that will inform both creative sector tech transfer but also interaction across a wide range of industrial applications that involve gesture and movement. In addition, the project has now been connected with H2020 project EnTimeMent (ENtrainment & synchronization at multiple TIME scales in the MENTal foundations of expressive gesture) with an ongoing collaboration. At present, Andreas Bergsland is on research sabbatical at the Casa Paganini with Professor Antonio Camurri of the EnTimeMent project to extend the Dance AI project further.

6.3.3. Dolphin: Head-mounted gesture tracking system for hands-free digital menu navigation

Testing an application in an affordable CCSI environment that then becomes the equivalent of an iPhone for primary industry heavy vehicles. Project went from seed idea to prototype and patenting within just four months.

IP Contributors:

- Rojan Gharibpour, CTO Noor Digital, Software developer and interaction designer
- Marzieh Tangestanigholami, Graphic Designer, founder at Hiva.

Dolphin is a gestural interface developed as part of MTF Labs using the IRCAM-developed R-IoT microboard, which was submitted for inclusion in the EU H2020 funded #MusicBricks project. The project began in a testbed environment as an affordable CCSI application, intended as a control interface for music and gaming.
Dolphin however revealed to provide great potential to solve issues of communication and security for heavy vehicle applications within agriculture and forestry. Komatsu Forest realised this solution was much more cost-effective than previous systems which required installation of expensive equipment and smaller profit margins. As well enhancing the operator’s working experience, the system’s security aspects justified a higher investment for the vehicle buyer.

Ownership of the project was split into the Background IP layer owned by IRCAM and the Innovation IP Layer owned by Sojaner AB, the startup company formed by Rojan and Marzieh Tangestanigholami in 2016 to bring the project to market. As a result of the Komatsu Forest cross-domain industrial use case, the company filed Swedish Patent Application No. 1650637-0 “Headphone system” in May 2016.

### 6.3.4. Hi Note: Breath control interface for accessible music performance

**Technology transfer from academia used in an unanticipated way. Microboard designed for music applications deployed ‘cross-domain’ as an accessibility tool.**

**IP Contributors:**
- Vahakn Matossian, founder Human Instruments
- Pere Calopa Piedra, senior mobile developer, ProtoPixel

Hi Note is an accessible musical instrument created by Vahakn Matossian (Human Instruments) and Pere Calopa Piedra as part of MTF Labs. The project uses IRCAM’s R-IoT Sensor embedded in specially designed electronics, to monitor and map subtle movements and gestures in an expressive and intuitive way for the physically disabled. Hi Note uses breath control to create dynamics, movement and alter the speed of tones, and head movements to change notes and timbres.

**Hi Note encourages players to interact with music in different ways to open up new possibilities for both disabled and non-disabled musicians.** After their #MusicBricks incubation, the team were joined by professional musician and member of the British Paraorchestra, Clarence Adoo to test the current prototype. “This is the first time I do not feel disabled” was the Clarence’s feedback after using the device for the first time. The solution enabled the professional musician to perform with high quality in front of international audiences for the first time since his tragic accident.

### 6.3.5. GIRD: Gesture-based interactive remix dancefloor

**The inclusion of IP from industry that saw the potential for innovation at arms-length, building on top of an SDK & API.**

**IP Contributors:**
- Tracy Redhead, musician, composer, researcher, producer and lecturer in Electronic Music and Sound Design, University of Western Australia
- Jonathan Rutherford, Mechatronic Engineer at Ars Electronica Futurelab

GIRD is a gesture-based interactive audio and lighting system as part of MTF Labs, that allows audiences to remix, explore and interact with music and lights through dancing and movement. Developed by Tracy Redhead and Jonathan Rutherford at #MTFCentral, the project partnered with Philips to combine audio signal processing with data from lighting, and result in a generative lighting environment triggered by music and the performer’s movement.

The GIRD prototype consists of a glove containing IRCAM’s R-IOT sensor, a Max for Live patch controller and 5 neo-pixel LED lights provided by Philips Hue Lighting and using the Hue Lighting API and operating system. Using individually programmable LED “neo pixels” 5 individual lighting fixtures create the atmosphere for the music. Performers can gesturally control the lighting and are given interaction feedback to guide them based on the music that’s being interacted with. GIRD allows
musicians and producers to design dynamic and fluid music that can be explored using gesture and movement. Developer Tracy Redhead used GIRD and the gestural lighting interface as a central element of her PhD thesis.

6.3.6. LiveDrive – Beggars EPK: Conversion of promotional IP with no commercial value to product and additional service

*LiveDrive provided a methodology and potential business model for the unlocking of value from CCSI IP assets that are not ordinarily considered revenue-generating.*

**IP Contributors:**
- Tomas Grom, musician, sound artist, developer
- The Beggars Group record label

The Beggars Group record label tasked MTF’s innovation community with the invention of a technological vehicle and route to market for their Electronic Press Kit (EPK) source material. This material consists of a vast library of audiovisual and text material, including video and audio promotional interviews, press releases, song samples, graphic designs, photography and more.

The LiveDrive prototype is an application that enables fans to access an artist’s usually ‘press-only’ extra material and create content associated with the artist’s album release or online subscription. **The solution allowed for the label to convert marketing tools into a digital product, unlocking commercial value by way of a layer of innovation IP to create a new application that can be monetised.**

6.3.7. AI Polyphonic Trackathon: Music composition sprint building human creativity on top of AI-generated elements

*The creation of an IP stack through multiple complex contributions (including AI-generated creative input) that could currently only happen in a high-trust environment.*

**IP Contributors:**
- Graham Massey, musician, producer, 808 State, Biting Tongues
- CJ Carr, Neural network programmer, musician, Dadabots
- Polina Proutskova, Senior Research Engineer, BBC; Postdoctoral computer scientist and ethnomusicologist at Queen Mary University of London, traditional folk singer
- Students of Örebro University, Popular Music Production, School of Music

The MTF Trackathon is a music production contest for young producers and musicians. At MTF Örebrö a challenge was set by Graham Massey of 808 State to create a rhythmically complex pop song that uses AI-generated audio samples of polyphonic group singing. The samples were the creations of a neural network AI system trained by CJ Carr of Dadabots. The neural net was given a series of recordings of traditional polyphonic group singing by Polina Proutskova. Polina also sang along with the AI-generated works in order to create the samples used by the producers.

**The new songs that were created were then licensed by MTF Labs to upload to online marketplace and distribution platforms such as Amazon, Bandcamp, iTunes, Deezer, etc. and all proceeds from the sale and streaming of the tracks were donated to a charity nominated by the winning entrants.**

The challenge of such an endeavour was to locate the layers of authorship, original recordings, AI training, samples, composition, recording and release. An IP Tracker platform could potentially allow for a great deal more of these sorts of collaborative and generative mixes that do not emanate from a context where sufficient mutual trust and goodwill exists for there to be a reasonable expectation of fair use of the material created and fair dealing for the revenue received.
Part 2: The IP Framework Blueprint

The IP Framework Blueprint leverages elements of existing technological affordances and successful digital platform systems to solve the existing IP sovereignty and exploitation bottlenecks and position the CCSI at the forefront of experimentation with novel data-driven business models with full accountability and control over their IP assets.

The strategy follows a series of steps:

(i) scale the IP metadata standards method that drives business for the entire music industry, to work across all CCSI domains;
(ii) build a common system on a trusted decentralised network of CCSI partners;
(iii) create a sandbox space for experimentation supported by the trusted IP system to enable accountable collaboration across all CCSI domains; and
(iv) invite other industrial sectors to join the CCSI sandbox experimentation to innovate, supported by the trusted system of IP governance.

The IP Framework Blueprint is presented in two parts:

(i) IP Sandbox – a hands-on enabling innovation ecosystem methodology for the collaborative creation of intellectual property; and
(ii) IP Tracker – a data-driven technological infrastructure for agile registration, tracking, innovation and exploitation of intellectual property.

7. IP Sandbox

The IP Sandbox combines three existing models of “communities of practice”:

- Creative experimental labs (for innovation): Creative experimentation has been endorsed by President von der Leyen at the launch of the New European Bauhaus initiative, and Creative Labs have been endorsed by Commissioner Gabriel as a new category of outputs for the Creative Europe Programme. This approach to engaging communities of practice with
creativity is at the core of CCSI competencies that facilitate technology transfer from research. The extent of its impact is described in Error! Reference source not found.

- **Industry incubators (for scaling):** This model has been used extensively by industry to support the business development of startups and entrepreneurial ideas. Within the European funding programme, it is extensively used by the EIT Knowledge and Innovation Communities.

- **Living Labs (for validation):** Initiated originally by the MIT Media Lab, the Living Labs model is now omnipresent thanks to the global spread of the European Network of Living Labs. Living Labs are mainly used for validation of results of R&I by industry sectors, though the IP Sandbox applies this approach particularly to Early Adoption of novel business models.

The combined model represents a unique ambition to experiment across domains, enabling collaborative innovation and the creation of Innovation IP using assets brought in by industry and academic partners. Testbeds for knowledge transfer, incubation and early adoption are presented in Figure 6. The knowledge transfer methodology uses a Technology Transfer Toolkit (TTT) to lower the entry barrier to the results of R&I for creative innovators and support collaborative innovation, technology transfer, research and education. Incubation is supported by an “IP Stack” which allows for combinations of three types of IP in the collaborative environment: Background IP, Transfer IP and Innovation IP. Early adoption is evaluated using a value creation strategy called Market Adoption Readiness Levels (MARLs) which takes account of several parameters in addition to the Technology Readiness Levels (TRLs).

The IP Sandbox is a methodology evolved from 9 years of running creative innovation labs, and builds on the Error! Reference source not found. developed as an H2020 Innovation Action (see figure 7). The pilot created a system for technology transfer and innovative tracking of IP from seed idea to commercial prototype that considerably reduced time to market\(^\text{14}\).

7.1. Knowledge transfer with the Technology Transfer Toolkit

Placing powerful new data and tools into the hands of creatives has proven to multiply opportunities for innovation as seen in this study’s Error! Reference source not found.. A Technology Transfer Toolkit (TTT) lowers the entry barrier to cutting edge knowledge and technologies from various domains, and makes them accessible to those who operate close to emerging markets to seed ideas and scale innovations, as well as for innovation and entrepreneurship education and upskilling contexts.

The most agile way to create a TTT is with a series of interfaces: Application Programming Interfaces (APIs) Graphic User Interfaces (GUIs) and Tangible User Interfaces (TUIs) as described in the Error! Reference source not found.. They mediate between various Background IPs and the innovation much like an electricity adapter which mediates between the source of electricity and the electrical product. Being able to create them ad-hoc and plug-and-play makes them an agile solution for experimental labs that wish to interoperate with proprietary Background IP. They however require regular updates every time the product is updated, turning them into expensive “toll roads” when it comes to business development.

A sturdier interoperating option between two sets of data, digital products or systems, is through Application Protocols (APs). These are custom-written translation mechanisms for specific localised use cases which allow the two sides to connect on a more permanent basis, much like an electricity transformer which enables a continuous power supply between two different power systems. APs however are reliant on agreements between parties and are also subject to changes on either side. The also have to be custom-written for every use case scenario.

Development of systems which allow standardised interoperability between research, industry and innovation, is however progressing. As part of the Industry Commons track within European Commission’s DG RTD, the Ontology Commons EcoSystem (OCES) is the first step towards achieving powerful semantic cross-domain interoperability. This is equivalent to being permanently plugged into the electricity grid and is a major global ambition which has galvanised all industry. Once implemented, the ecosystem will provide new conditions for breakthrough innovation, which will be fully trackable and traceable across domains (see Magas and Kiritsis 2021).

![Figure 8: The IP Stack – combinations of Background IP and Transfer IP support the creation of Innovation IP](image)

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15 Tangible User Interfaces (see Ishii and Ullmer 1997; Holmquist et al, 2019)
7.2. Incubation: building the IP Stack

In an interoperable and interconnected data-driven system it is possible to combine assets from various sources of Background IP into a breakthrough innovation. It is also often necessary to invent an interface to Background IP to fully access its functionality. In experimentation scenarios we refer to this as “Transfer IP”. The breakthrough innovation built by combining these assets provides the added value in an innovation ecosystem and uncovers new use cases and business models. We refer to this as “Innovation IP”.

Adding a layer of Innovation IP to the value ecosystem incentivises and stimulates the engagement of innovators and entrepreneurs to experiment with Background IP, create breakthrough ideas for novel hybrid applications, model novel use case scenarios in the living labs, position outcomes close to emerging markets and validate them with influencers and early adopters.

During the incubation phase of the innovation development, the owner of the Innovation IP can solidify or substitute certain Background IP components depending on their latest functionality or pricing requirements. The Innovation IP also provides additional exposure and can substantially increase the level of interest for a Background IP provider.

We refer to the full stack of combined layers of Background, Transfer and Innovation IP that comprise a breakthrough innovation, as the IP Stack (see Figure 8). In the negotiation chain of an IP Stack, the Background IP owner is often positioned as a supplier, while the owner of the Innovation IP is able to act as distributor by testing Background IP in emerging market scenarios.

For Background IP proprietors this allows them to embed IP into new business models (analogous to “Intel Inside”) and cost-effectively open routes to new markets. By pooling resources for product testing, market research, business development, HR and Corporate Social Responsibility, together with technology transfer from research and innovation by early adopter communities, Background IP owners are able to channel their resources simultaneously towards several potential markets and spread the risk of their investments (see Figure 9).

![Figure 9: Combined value for corporate budgets (Source: Industry Commons).](image-url)
In a data-enabled system, each step of the process of scaling the seed idea through creative, incubation and early adopter testbeds is fully trackable and traceable for Background IP proprietors. Continuous feedback loops allow for informed and timely decision-making control over their assets (see Figure 10).

**Figure 10: Feedback loops from all testbeds to the Background IP owner (Source: Industry Commons).**

### 7.3. Early adoption with Market Adoption Readiness Levels

Market Adoption Readiness Levels (MARLs) were developed by this study’s author Michela Magas in collaboration with the CAF (CONNECT Advisory Forum) and adopted as the top 3 recommendations in the Innovation Recommendations for the European Commission’s H2020 Programme 2018-2020:

“CAF particularly recommends the creation of MARLs – Market Adoption Readiness Levels – to enable fast deployment of innovation to Early Adopters for a maximum impact on European economy. Current guidelines focus only on TRLs – Technology Readiness Levels. New guidelines amplify TRLs with guidelines that assess risk, data yield and early adoption.”

User engagement with new technologies is a priority for the successful deployment of innovations. In most cases however, it is assumed that technologies need to be at least at the level of system prototype for demonstration in operational environments before they can be user-tested. This assumption largely relies on the concept of Technology Readiness Levels (TRLs), a system originally developed by NASA in the 1980s, suitable for their high-risk technology deployment operations. With minor adjustments to the definitions of the 9 TRL levels, this system has become an essential component of the European R&I funding programmes.
The data-driven economy, especially in the CCSI domain, is not primarily driven by rocket ships, but by digital applications that are comparatively low-risk, cheap to deploy, engage early adopters and generate data from users at the early stages of deployment (see Figure 11). Such applications require development that considers early adoption by emerging market communities and business models which can be evolved through adopter engagement.

For these reasons, the Market Adoption Readiness Levels (MARLs) model proposes an addition to the TRLs with the assessment of three further value parameters:

1) Potential number of early adopters;
2) Potential data yield from early adoption and value of data generated by early adopter interactions;
3) Level of risk of a novel use case, application or business model, and assessment of benefits or potential adverse impacts of the technology’s deployment for early adopters;
4) Technology Readiness Levels (TRLs).

The MARLs model takes into consideration the agile, iterative nature of technological innovation in the digital space. It is particularly appropriate for disruptive applications with unpredictable economic outcomes, and where traditional economic projections cannot quantify a Return-on-Investment. The level of risk and numbers of potential users, as well as the numbers of early adopters, affect considerably the final yield and the potential for investment in a product or application.

The Early Adopter Testbed uses the MARLs assessment with members from the innovation community who operate close to emerging markets. This allows for the adaptation of the prototypes to make them more flexible and robust in emerging market scenarios. For example, in the creative applications domain a data-driven application such as the SoundCloud audio platform may become a market success even when initially deployed at TRL3. It is extremely low risk, cheap to run, easy to understand and can get millions of early adopters, even as an experimental proof-of-concept. For a potential investor, a large number of early adopters, and the related substantial datasets they generate through the use of the product, can prove to be sufficient incentives for further investment and acquisition in the early stages of development (TRL3 to TRL7). In the creative applications sector therefore, the market is extremely agile, with the development of applications being cheap and typically low risk, with a great potential for investor support in the early stages through demonstrable social and economic benefits.

The agile nature of the digital market and the relatively cheap deployment of competitive applications require ongoing active development and evolution of technologies via constant innovation and new iterations of products and systems. For this reason, it is a risk to consider a high TRL of 8 or 9 to be the final step of an application’s development. Rather, the product must constantly evolve and iterate, or it will lose out to the competition. It is important therefore to focus primarily on deployment through stages of TRL4-TRL7 to maximise the creative engagement with the tools by early adopter creative content maker communities. This ensures the potential for growth through feedback loops and iterative stages of active development and capitalises on collaboration with agile, adaptive innovation for maximum market competitiveness.
8. IP Tracker

The IP Tracker combines existing and well-proven tools and methods in a new way, starting with the evolution of IP metadata standards from the music industry. As a point of differentiation from a system such as the Creative Commons, which provides a method to attach a licence to a digital artwork, the study highlights the need for an agreed metadata standard across CCSI domains. The IP Tracker focuses on a machine-readable standard for capturing data about a product such as the information contained in a digital twin. A detailed list of the first prototype for the IP Tracker metadata standard is provided. This allows for the registration of newly generated IP as well as existing IP types (patents, copyright, designs, trademarks, etc.).

IP registrations are proposed to be recorded using a Distributed Ledger Technology (DLT) that leverages selected partners from the CCSI as trusted nodes for a ‘proof of authority’ valorisation mechanism. The data contained within the IP Tracker is FAIR (Findable, Accessible, Interoperable and Reusable) by design. The need for a top level ontology is identified, in order to manage different categories of intellectual property across domains of knowledge. The IP can be registered in real time at the point of creation. Pre-existing IP can be back-registered, and development iterations of a registered IP can be tracked. This allows for rightholders, owners and authors to see how their Background IP has been used in conjunction with Innovation IP, track derivative works and new projects. It also allows authors, owners and users of IP to easily connect, seek permissions, collaborate and follow the progress of projects that use their IP.

For the majority of CCSI actors who are micro-enterprises, the cost of legal registration, patent search and maintenance is prohibitive. The IP Tracker does not seek to replace traditional and established forms of IP registration such as patenting and trademark registration, but rather supports the findability of registered IP within these systems and offers an affordable entry-level registration alternative that bridges the gap between, for instance, full patent registration and no protection whatsoever. Providing a range of IP to be easily accessed also creates a wealth of sandbox use cases and examples for education and practice-based research, particularly in the realms of innovation, creative practice, entrepreneurship and business management.

8.1. What is there already?

The IP Tracker combines systems that have been established and proven over time. It includes the hashing of records stored within the database, the digital fingerprinting of media files, a broadly interoperable ontology and metadata framework, and the use of a Error! Reference source not found. The following is a non-exhaustive list of existing formats.

- **Wikidata models**: The Wikidata format allows contributors to enter standardised sets of information that can be used to describe any person, place, thing or concept (see Figure 12).

![Wikidata for Douglas Adams](image)

**Figure 12: Wikidata for Douglas Adams.**
• **Data tracking:** Activities in the network related to a specific innovation can be tracked as a sequence, including the timestamp and the contributor (see Figure 13).

![Figure 13: A sequence of transgressive activities on Wikipedia.](image)

• **Data linking:** Structured data can be linked to other data to bring together information from different sources in order to generate more complex meaning and create more comprehensive datasets (see Figure 14).

![Figure 14: Wikidata in the Linked Open Data Cloud. Databases indicated as circles (with wikidata indicated as "WD"), with grey lines linking databases in the network if their data is aligned.](image)

• **IP registration in the blockchain:** A very good example of a trusted network for IP registration of early research results is the [Error! Reference source not found.](image).

• **Data classification:** Organisation of data into categories helps to understand which types of data are available, how to access them, are they protected by regulated aspects (e.g. data privacy, GDPR), are they organised according to time or geographical location, do they have a layer of metadata to facilitate classification, can the content lend itself to algorithmic processing with e.g. NLP (Natural Language Processing), and any other characteristics which allow for improved data management.

• **Data mining:** Data management combines with machine learning and statistical probability to discover patterns in Big Data. Data mining is used particularly to extract meaning from complex data and support decision-making processes (see Figure 15).

![Figure 15: Data mining used to identify chemical components at the University of Cambridge.](image)
• **Data search**: Search engines use algorithms for data mining of large information database repositories (see Figure 16).

![Wikidata Query Service](image)

```sql
1 #diterpenes
2 SELECT ?item ?itemLabel
3 WHERE
4 {
5 ?item wdt:P31 wd:Q59447. # diterpenes
6 SERVICE wikibase:label { bd:serviceParam wikibase:language "[AUTO_LANGUAGE],en". 
7 }
```

Figure 16: Wikidata Query Service.

• **IP metadata standards**: The International Organisation for Standardisation (ISO) provides a definition of a metadata standard as “a requirement which is intended to establish a common understanding of the meaning or semantics of the data, to ensure correct and proper use and interpretation of the data by its owners and users. To achieve this common understanding, a number of characteristics, or attributes of the data have to be defined, also known as metadata.[1]” One of the most successful uses of metadata standards is the International Standard Recording Code (ISRC) for registering intellectual property related to music recordings, which is powering the entire music industry through a common digital communication system called DDEX (Digital Data Exchange). The ISRC IP metadata categories include: author, title, version, duration, type (audio or video format), and date of first publication. THE ISRC standard provides a unique IP identifier, unrelated from the product ID or distribution tracking code.

• **Digital Twins**: A Digital Twin is a virtual counterpart of a physical object which allows to capture data about the object and to model its possible states. The concept was created by Michael Grieves in 2002 and was first used in NASA experiments by John Vickers (see Figure 17). Digital Twins allow for all physical objects to be part of data-driven systems.

![Digital Twins](image)

Figure 17: Early digital twin concepts were tested by NASA’s John Vickers.
8.2. Strategic alignment

The IP Tracker infrastructure is built upon a trusted network that administers the Distributed Ledger Technology (DLT). The network is initially intended to be made up of core CCSI partners, each hosting a copy of the blockchain ledger. Verification of records and transactions takes place via “proof of authority”, rather than “proof of work”, thereby mitigating environmental impact, as described in Blockchain and Trusted DLT Networks.

Additional node partners can be added at a later stage to add further system redundancy and robustness. The system allows for registration and tracking of CCSI IP as it is created, or by back-registering of existing assets. As the system grows and disparate components become interconnected, the critical aspect becomes the preservation of a common data standard, ensuring that all data assets are part of the same “railway network” (see Figure 18).

Across a range of European initiatives there is growing awareness of a need for a common data standards that will allow systems to interoperate and valorise results from research and innovation. The IP Tracker can be used to register results of the European funding programmes and align across several EU marketplace initiatives:

- **EIC Innospace / EIC Marketplace** aims to make the IP results of the EIC Pathfinder and its predecessor, the Future and Emerging Technologies funding programme, digitised and findable, in order to unlock their potential for exploitation.
- **EOSC FAIRification**: The verification of FAIR data – Findable, Accessible, Interoperable and Reusable – is a key ambition of EOSC. FAIR principles apply to any standards generated for IP registrations.
- **Industry Commons** is building a legacy for cross-domain interoperability including a system for accountability of proprietary assets and IP tracking.
- **GAIA-X** aims to provide a secure, federated system that meets the highest standards of digital sovereignty while promoting innovation. Since IP in GAIA-X is industrial and heavily protected, systems for tracking proprietary IP for informed decision-making are highly desirable.
- **EuroHPC** is developing a pan-European supercomputing infrastructure that will permit the participating countries to share resources and create a competitive innovation ecosystem. The supercomputing infrastructure is necessary for processing of large-scale IP tracking.
8.3. How does it work?

MINIMAL VIABLE METADATA STANDARD

<table>
<thead>
<tr>
<th>INDUSTRIAL ASSETS (PATENTS, TMs, MODELS)</th>
<th>TRADE KNOW-HOW</th>
<th>REGISTERED INTANGIBLE ASSETS</th>
<th>COPYRIGHT</th>
<th>SOFTWARE (COPYRIGHT OR PATENTED EMBEDDED INTO HARDWARE)</th>
<th>IP DEPOT REGISTERED IPR</th>
<th>BLOCKCHAIN REGISTERED IPR</th>
<th>OPEN SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCESS RIGHT</td>
<td>LEVEL OF CONFIDENTIALITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 19: Regardless of their level of openness, all IP registration formats benefit from a minimal viable metadata standard.

The IP Tracker can be used to register, store, locate, retrieve and distribute records of intellectual property in digital form and caters for all levels of data registration openness (see Figure 19). It builds on a series of established technologies and combines them in a novel way enabling trust, accountability, decision-making, and the tracking of innovation. It is specifically designed to encourage further development of value-adding services, creation of content, and hybrid solutions, with contributions from across the CCSI domains.

8.3.1. Granular level: IP parameters, IP metadata, FAIR IP

How does this work?

Think of a music file. The file is accessed through metadata which makes the file findable and allows it to be categorized according to its key parameters (artist, genre etc). The metadata gives an indication about the music content, but the real value of the content cannot be assessed until the file is played.

Do we need to disclose everything about the innovation?

No. Metadata about the innovation can contain essential fields, while further fields that disclose greater details about the innovation are optional. Those fields will make the innovation more findable and appear in more searches, however they also expose more about any protected aspects of the IP. It is therefore up to the proprietor to assess the value of market access vs protection.

Which parameters are to be introduced at granular level?

This is the key value contribution of the CCSI to EU marketplaces. Developing and testing the IP data parameters, as well as agreeing on metadata fields, would create new standards for IP registration. Standards would need to be compliant with FAIR principles (see Strategic alignment).

8.3.2. Operational level: Improved workflows, improved IP conventions and guidelines, speeding up trade and access to emerging markets

How does it improve workflows at an operational level?

It allows for IP solutions to current and urgent (e.g. Covid-19) technological, scientific and business challenges to be immediately applied with minimal administrative burden of registration.

Why is it important for emerging market applications?

Because the IP which is ready for emerging market scenarios cannot afford to be locked for years in the patenting queue.

How does it speed up trade?

By opening access to a large pool of innovations.
8.3.3. **High level: Impact on society, unlocking IP, increase in technology transfer, IP data standardisation**

*What does it contribute to society at large?*
With a considerable contribution of IP assets and opportunities for technology transfer to valuable novel applications.

*How does it unlock IP?*
By making IP which is hidden in complex documents digitally findable and reusable.

*How does it contribute to an increase in technology transfer?*
By speeding up registration and deployment of IP, and by allowing the IP to be timely and fit for purpose.

*Do we need another platform?*
We are not building just another platform. We are specifying a system for IP that works across all CCSI and that can be developed further to the entire EU marketplaces currently being scaled or in development.

8.3.4. **Across domains: Innovation Modelling**

**BREAKTHROUGH INNOVATION**  
*(MODELLING OF CURRENT AND EMERGING MARKET POSSIBILITIES)*

**INTEROPERABILITY** *(INDUSTRY COMMONS / ONTOCOMMONS)*

**SYSTEMS OF AGREEMENTS** *(FROM INTERNATIONAL REGULATION TO PEER-TO-PEER CONTRACTS)*

**SYSTEMS OF RESILIENCE** *(ENVIRONMENTAL SUSTAINABILITY AND BLACK SWAN EVENT RESILIENCE)*

**SYSTEMS OF RESPONSIBILITY** *(CSR, RESPONSIBLE AI, WORK ETHICS)*

**SYSTEMS OF BELIEFS** *(SOCIETAL VALUES)*

*Figure 20: The IP Tracker is part of the horizontal enabling systems which support breakthrough innovation across domains.*

In Knowledge transfer with the Technology Transfer Toolkit we distinguish between ad-hoc, localised and permanent systems for interoperating between domains. The aim of the Industry Commons Ontology Commons EcoSystem (OCES) is to create a standardised permanent ecosystem of translation between domains that can provide a constant trackable pipeline for breakthrough innovation to be built on top of existing capabilities.

The Industry Commons sees cross-domain interoperability and common data standards as essential for establishing a **system built on common values**. Systems of agreements, including accountability for IP ownership, need to be built simultaneously to systems of resilience (including environmental sustainability), responsibility (ethics, Corporate Social Responsibility and responsible AI) and those that support societal values, for a cross-domain ecosystem that supports responsible breakthrough innovation (see Figure 20). An ecosystemic approach which has in-built responsibility and accountability, represents a particularly European approach to generating value, and for the first time allows for breakthrough innovation to be fully integrated into the value network with trackable modelling of current and emerging market possibilities.
8.4. Top-level IP metadata schema

The following assumes that a PID has been established on the system and the user is logged in prior to creating a new IP registration and submitting IP metadata.

Prerequisites:
1. The user must have a PID (Personal ID).
2. The IP owner must also have a PID.
3. IP ownership must be explicit and not implied.

8.4.1. Layer 1: Primary attributes

Proposal for primary IP attributes†
†developed in parallel with the EIC and Industry Commons

- IPID (automatic)
- Fingerprint (automatic)
- Title (mandatory)
- Subtitle (mandatory when used for disambiguation)
- Author (mandatory)
- Author role (optional)
- IP Owner (mandatory)
- Contact Person (mandatory)
- Timestamp (automatic)
- Keywords (optional)
- Collaboration (optional)
- Data certification (optional)

Figure 21: Example of a prototype IP Tracker system workflow chart (Source: Industry Commons)
The user can decide if the entire record of this IP registration is publicly available and searchable, privately shared within a limited user group, or entirely confidential. A record can be listed, for instance, only within a specific organisation. If the record is public (the default setting and the vast majority of cases), then these ‘Layer 1’ primary attributes will be accessible to all users of the system.

IPID (Automatic) Unique ID for an IP record, automatically generated by the system. A unique string series that can be used to identify the registered IP. In the proposed framework, this will be a hash code that is automatically generated by the system at the point of registration.

Fingerprint (Automatic) Digital summary of the IP record. Every registered IP has a unique fingerprint generated by the IP Tracker system. It involves the extraction of unique characteristics of the submitted digital content and associated metadata. This is a unique identifier that is significantly smaller than the original file that it describes (document, image, audio file, video, etc.) A significant difference between the digital fingerprint and the unique IPID is that fingerprints can be compared to each other to assess similarity and establish authenticity.

Title (Mandatory) A mandatory field for the user to complete during IP registration. This field can be non-unique in the system. The main purpose of the IP Title is to allow the registered IP to be easily referred to.

Subtitle (Mandatory when used for disambiguation) A field intended to fulfil a more descriptive purpose, disambiguate from other similarly-titled projects, and provide greater search optimisation. Subtitles are frequently rich in keywords and contribute to an invention’s findability.

Author (Mandatory) The name(s) of contributors to the work. An author’s name is mandatory and this can be pre-filled with the registrant’s details from their login information. Additional authors can be added and these need not necessarily be members of the IP Tracker system, though it is recommended.

Author role (Optional) Associated with each author field, describing the contribution of each named author. The addition of an author automatically prompts an ‘author role’ field associated with that entry.

IP Owner (Mandatory) – The individual, group, organisation or institution that owns the intellectual property. A tick box will be available that will automatically copy the PID of the author(s) into this field. Otherwise, this is a searchable field that enables the registrant to locate and select other registered PIDs (e.g.: organisation).

Access (Optional) Individuals, groups, organisations or groups that have been granted full access to the information contained within this IP registration.

Contact Person (Mandatory) This field links to the registration information of the corresponding inventor/manager who is responsible for legal issues of the IP. It is pre-filled with the link to the login of the person entering the data, but can be assigned to another registered user at any point and will usually be one of the named authors. Contact person must be a registered member of the Framework system.

Timestamp (Automatic) Automatically generated by the system once registration is completed. This attribute cannot be changed or modified.

Creation Date (Optional) if the origination is in the past and differs from the Timestamp.

Keywords (Optional) Terms (words and phrases) that can be used to further describe and assist with indexing and locating the IP record. These words can be automatically generated from the description field as well as manually added by the user. Keywords make the IP reachable and cross-indexable within the search engine.

Collaboration (Optional) A checkbox that can be selected or deselected at any time by the author of the work to indicate whether they are open to exploring collaboration with licensees or IP users to
develop the work further (i.e.: for the user not simply to take and use the work, but to actively collaborate with the work’s original author on a new iteration of the project).

Data certification (optional) A field which will capture any applicable data certification assurances, such as FAIR, JUST, CARE etc.

8.4.2. Layer 2: Primary optional attributes (either open or secure)

Proposal for optional IP attributes†
†developed in parallel with the EIC and Industry Commons

- Description
- File
- Registration number
- Restrictions
- Licence
- Jurisdiction
- Background IP
- Citations & Registrations

If Layer 1 of the IP registration is publicly accessible, the user can then further decide if any of the following fields are open and visible on the system, privately shared within a limited user group, or confidential. An additional technology layer may later be added to the IP Tracker that allows for an automatised Non-Disclosure Agreement (NDA) smart contract system.

Description This field is format-free. Generally, the description is a short piece of text describing the IP and explaining how it should work.

File Optional file upload containing an example, demo, video introduction, product image, sample data set, document or audio recording. The file is not retained within the database system but is used (along with the metadata) in the creation of a ‘digital fingerprint’ that uniquely identifies the work.

Registration number This optional field allows the user to input an existing registration number such as a patent application number, ISRC code or other registration reference for a work that has been included in another formal registration system.

Restrictions Optional open text field that allows the registrant to add specific instances in which permission would not be granted if sought (e.g.: for use in far right political messaging, promotion of tobacco, military applications, etc.). This can be set either within the IP record registration or set as a universal setting on all IP records registered by a specific user.

Licence Optionally, a standard licence can be attached to the IP. Common licences such as Creative Commons, Open Source, Open Hardware or Open Product licences can be chosen from a provided list, and others can be added and customised by the user. Licensing allows the right of using the IP to be redistributed by users other than the IP owners under specific terms. If no licence is added, the Licence condition for the use and/or distribution of the registered IP defaults to All Rights Reserved and so specific permission must be sought.

Jurisdiction Automatically assigned according to registrant’s login settings, but editable at the point of registration. Registration of the location of the IP authorship allows the work to align with local IP law and for territorial assignation or restrictions on licensing.

Background IP If the registered IP is a work based on pre-existing IP, the original IP record should be indicated in the new registration. The IP Tracker will provide a search-and-select mechanism to link directly to previously registered IP records, as well as a button or link to create a new IP record that builds upon and links to the current IP registration document shown.
**Citations and Registrations** A list and count of other registered users who have licensed or referenced this IP within their work.

### 8.4.3. User workflow

**Proposal for user workflows†**

†developed in parallel with the EIC and Industry Commons

- Collection (a list of ‘saved’ IP records)
- Projects (group IP records within project folders)
- Use (use this IP and agree to its terms)
- Annotation (private notes added by any user)
- Comments (private comments added by any user)
- Message (private direct message to the IP contact person)
- Tags (for personal use for ease of search)

The IP Tracker acts as a simple interface and dashboard not only for the registration of IP, but also as a search, enquiry, licensing, and cataloguing system for the user.

**Collection** A list of ‘saved’ IP records that users can easily locate and refer to at any future point. These do not have to be licensed – the collection is just for the user to be able to gather a series of IP records for their own perusal.

**Projects** IP Tracker users are able to group IP records within project folders so that they can easily refer to connected IP records within larger organisation projects. This does not affect the data stored within the IP record itself or show up in public search, but is specific to the individual user for their own management.

**Use This IP** Where permitted by the licence conditions selected, a user may simply click a button to say they have decided to use this IP and agree to its terms. In instances where permission must be sought by the registered contact person, the button initiates a request and marks the licence as pending. Only the authorised contact person may assign rights to the user.

**Annotation** Private notes can be added to an IP record by any user. Again, these notes are for personal use by the user and are only visible by that user.

**Comments** Public comments can be added to the IP record by a registered user and are attached to the publicly visible content of the IP record. These can be moderated by the registrant.

**Message** A private direct message to the identified contact person for this IP record, or to a registered user who has licensed the IP. Messages can be replied to or blocked by the recipient.

**Tags** Similar to keywords above, but for personal use by the IP user for ease of search. This adds to Collection and Projects as a means by which users can locate and group IP records by interest or personally meaningful terminology.
9. Value creation strategy

The potential value of data sharing across industrial domains, particularly in view of optimising manufacturing processes, is estimated at over $100 billion. Innovation from data sharing is expected in asset optimisation, end-to-end visibility, tracking process conditions, optimisation of production processes, and provenance verification (World Economic Forum, 2020).

The IP Tracker provides the core framework and data collection functions of the IP system, which can be amplified with additional software functionality to support the creation of proprietary applications that can be sold, licensed or made available by subscription. Access to an IP management tool with registration, licensing, discovery and a mechanism for collaborative innovation, unlocks value for the CCSI IP. While it is possible to add an e-commerce layer to the platform or provide services that can be charged for via subscription, there are other models that the platform can learn from and emulate, and that have been demonstrated to leverage both the technological infrastructure and the innovation ecosystem to maximise economic and societal value.

As part of the stakeholder feedback and validation phase of this research, intellectual property lawyer and IP advisor to EU initiatives, Robert Harrison was interviewed by the authors of this study. Harrison raised the issue of restrictions on financial sustainability strategies for a publicly-funded IP Tracker that collects data from users. Because of the regulations surrounding public funding of data repositories, it is not possible (nor likely ethical) to simply sell the data nor to create a subscription service for the use of the platform.

Harrison observes:

You need to look at what you can charge for: So I can provide my raw data out there. The moment I start curating it, I can then start charging. Obviously, you’ve got to have this data format out there and whether it’s an XML structure, some ontology or relational database, you know, I’ve just provided that. That’s the requirement. But you can always think of added-value services to put on top of that, which would make it actually valuable. Now, the classic example of that is the Linux system. You and I can download a Linux implementation, and we can install it on our Intel-based computers. And I don’t know how good you are at technology, but it will take you probably a day or two to do that. Sure. Or you go to Red Hat. And you know, my first Linux installation was 10 CDs from Red Hat. Took me maybe a couple of hours and I had a decent implementation, and I paid Red Hat for doing that. I paid them you know, 100 euros and I’d saved myself a whole day because basically they put a nice implementation in place. (Harrison, 2021)

The creation of an additional value layer on top of the key functionality of an IP Tracker database would be necessary in order to create long term economic sustainability for the technological platform. AI search and smart contract capabilities provide premium features that can be built on top of the core operation of the framework. Registration services for owners of large catalogues can lighten the workload of back-registering and valorising intellectual property data.

The following approaches are mutually compatible and provide a broad scope for the establishment of sustainability routes for the IP Tracker.

9.1. Scaling the music industry value creation model across the CCSI

Up until very recently, the economic power of the music industry was framed too narrowly. The authors estimated that by the narrow definition of its stakeholders, in 2016 the music industry produced 0,07% of global GDP. However a quick scan of global corporations that used music for generating product sales revealed that the broader impact included organisations such as Apple, Google, Amazon and Disney.
As the first CCS domain to migrate entirely to the digital environment, and positioned close to emerging markets through a close observation of cultural trends, the music industry provides a useful model and best practice example for an IP registration (see Domain-specific: A pioneering CCSI domain), having evolved industry-wide alignment and standardisation for IP metadata registration, tracking and reporting.

At the macro level, the value created by the music industry has grown substantially in recent years, although that value has been subject to a significant shifting of ratios within the sector. Value creation both from and within the music sector has been realised in different ways by different industry groups and the profound technological shift has created opportunities for newcomers to the sector. As a proportion of global GDP, the music industry is estimated to make just 0.07%, however following digitisation, many of the biggest companies in the world have experienced significant growth as a result of including music among their assets (see Figure 22). In terms of economic value created through the exploitation of music IP, Google, Amazon, Disney and Apple have as much claim to be ‘the music industry’ as do Universal, Warner, and Sony Music. Discourse surrounding exploitative practices by large technology companies that do not fairly compensate artists (Spotify and YouTube feature heavily in these discussions) are valid critiques, though they also
mask some interesting phenomena. First, that value is not only realised by large aggregators and corporations but also within the long tail of the music industries; new technologies have enabled individual creators to have direct access to markets through platforms such as Bandcamp which has, at time of writing paid $XXXM to artists and independent record labels, of which $XXXM was in the last 30 days alone.

An ambition to standardise metadata across all IP categories and support CCSI innovation in a framework model that follows that of the music industry allows for the unlocking of value beyond the CCSI, and also extends long tail economic potential to its many smaller and independent organisations, micro-entities and sole operators.

Although the music industries have collaborated and aligned on DDEX, the standardised metadata framework for music IP, there are still value gaps that new initiatives aim to address, and technological solutions that can be built on top of the standardised framework that can enhance correct attribution and payment.

Music producers Niclas Molinder, Max Martin and ABBA’s Björn Ulvaeus formed technology startup Session (formerly Auddly) to address a significant gap they identified in the accuracy of both attribution and payment of songwriting royalties. While music companies and large rightsholders routinely register their catalogue and releases via DDEX so that attribution is automatically assigned across all streaming, downloading and listening platforms, many individual artists are not aware of their IP ownership rights and fail to capture or document accurate information about the creation process. Rights organisations are frequently unable to identify authors and rightsholders in order to correctly allocate payments, particularly to smaller organisations and independent artists. Users of music (such as for film, television and games) are unable to seek permission for works that have no registered or reliable ownership or authorship information and so works that may have generated significant commercial value remain under-utilised.

Session allows for registration of works at the point of creation by providing a simple database interface that can be embedded within the tools of studio production.
9.2. Adapting the app store value creation model

An App Store is a developer ecosystem that enables third parties to build new digital applications on top of the core technological framework through a collection of software development tools assembled into a Software Development Kit (SDK). Small businesses and independent developers can use the App Store as an innovation platform and marketplace for new products, and many startups have been founded specifically to innovate in that space.

After its launch in 2008 the Apple App Store created a marketplace for developers to sell their applications initially for a standardised commission, but later evolved to allow for the inclusion of in-app purchases that also require a percentage share of those revenues. This business model innovation, combined with the effect of the pandemic (more time spent using media applications, more products and services ordered via mobile) sent income spiralling upwards. During the pandemic in 2020, Apple published a study detailing how small businesses innovate on the App Store to reach customers around the world. iOS developers grew total sales in the App Store ecosystem by 24 percent to $643 billion, and the cumulative payout to developers amounted to 155 billion U.S. dollars.

In January 2021, Apple had paid a total of over 200 billion U.S. dollars to iOS app developers selling goods and services through the App Store. At Q3 of 2021, the closed ecosystem of the iPhone and iPad has generated $230bn for developers since launch, of which $41.5B was in the first half of 2021 alone. Global App Revenue Climbed 15% Year-Over-Year in Q3 2021 to nearly $34 Billion.

Development of APIs (Application Programming Interfaces) for the IP Tracker by external developers would enable the creation of a marketplace for third party applications that can be sold and subscribed to on the equivalent of an App Store. It would allow developers to sell content and added functionality, e.g. search, curation, business analysis, use case modelling, smart contracts compiling, valorisation estimates, compatibility search, best match recommendation, and open up opportunities for a series of business model innovations.

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18 https://www.gamesindustry.biz/amp/2021-06-08-apple-app-store-has-generated-usd230bn-for-developers-since-launch
19 https://www.macrumors.com/2021/06/29/app-store-revenue-h1-2021-42-billion/
20 https://sensortower.com/blog/app-revenue-and-downloads-q3-2021
9.3. Generating value with the IP Stack

Valorisation of co-creative innovation builds on the evolved innovation multiplier methods as described in the IP Sandbox using the experimental lab week as an engine for seeding ideas with support for sandbox experimentation between contributors from across disciplines, and supported by a data-driven IP Tracker.

The IP Tracker allows for new business models for data use and added data value to be uncovered based on principles derived from open source, commons and open innovation, and catering particularly for emerging business cases enabled by AI and cross-domain applications within Common European Data Spaces. The IP Stack covered in Incubation: building the IP Stack, allows for additive value building backed by a value-adding pricing system. The following figure illustrates a pricing example for a cross-domain value-adding application:

Figure 24: The IP Stack value adding model.

9.4. Valorisation with Market Adoption Readiness Levels (MARLs)

The MARLs model introduced in Early adoption with Market Adoption Readiness Levels is motivated by the disruptive nature of the digital economy and the Internet of Things (IoT). For digital and IoT content, greater adopter engagement can increase the value of the product through a network effect: as the number of nodes in the network increases, so does the value. Enabled by data-driven applications and supported by business models that prioritise data transparency (clarity of information about availability and cost), choice (options of how and when to contribute) and trust (e.g. the platform generates value by creating an even greater value for its adopters), increased participation turns adopters into service providers, product makers and creators, contributing to both business and the community.

The focus on early adoption can help to evaluate the likelihood of cultural impact and economic potential to scale, creating valuable data for early investors:

1. Examine the level of risk implicit in the technology
   Is the creative innovation placing the user at risk at high risk, or can it be at an experimental stage? Is the technology being developed by a large organisation with sufficient funds to mitigate risk, or a start-up with low resources?

2. Analyse the target stakeholders and their potential for early adoption
   What is the potential for the innovation to add value to communities? What are the expected number of early adopters? If early adopters are reduced to small numbers (e.g. high-risk life-saving applications) what is the level of urgency and importance of this application? (An investor may justify investing in a technology that is high risk and requires TRL9 if the expected impact on adopters is significant.)

3. Assess the potential for early gathering of valuable data
   What is the potential of gathering data from early adoption? What is the quality of information within the data that the project can produce for ongoing iterations of the innovation? If the
project involves content creators can it rely on feedback loops? To what extent can the data gathered be used as evidence of value for further investment?

4. **Technology readiness**

Is the technology at an early or advanced prototype level at the start of the ecosystem-building process? How quickly can the technology be deployed? If the technology can be deployed quickly, does it already have an emerging market? What is the potential of the technology to create a new market (e.g. “problems we didn’t know we had”)?

As well as assessing potential for investment in a cultural project or commercial application, the MARLs model supports iterative development and IP registration at each iteration.

![Figure 25: The media tetrad analysis approach](image)

**9.5. Tetradic business proposition canvas**

In addition to the familiar SWOT analysis for new inventions, the authors propose a tetradic business proposition canvas for the innovation developed within the co-creation innovation ecosystems using the IP Tracker. The Media Tetrad proposed by Marshall and Eric McLuhan (1980) provides not only a means of interrogating the effects of new media forms, but also an evaluation methodology that provides early insights about the potential for the new creation. The term ‘media’ is here applied more broadly to include technologies, artefacts, interfaces, legislation, and scientific theories. The method explores and reveals four key effects of the new medium: **Enhancement (or Amplification), Obsolescence, Retrieval and Reversal** (see Figure 25).

Complementary to the SWOT analysis, the four Tetrad parameters enhance further the business decision making processes, help build business value into the innovation, and assists developers to create a business or product development roadmap that mitigates potential negative impacts. The precise framing of these parameters is however able to capture cultural aspects that SWOT is not designed for, and uniquely allows to build valuable insight into the paradigm shift enabled by an innovation.

To capture the full effect of the Tetradic analysis, the following example examines a series of digital tools for licensing IP which are further described in *Error! Reference source not found.*:

<table>
<thead>
<tr>
<th>ENHANCES</th>
<th>OBSOLESCES</th>
<th>RETRIEVES</th>
<th>REVERSES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Creative Commons</strong></td>
<td>&gt; Sharing of digital artworks and pooling of creative resources.</td>
<td>&gt; Not knowing whom to ask for permission to use a digital artwork.</td>
<td>&gt; Access to large communities of makers and artisan creators.</td>
</tr>
<tr>
<td>ENHANCES</td>
<td>OBSOLESCES</td>
<td>RETRIEVES</td>
<td>REVERSES</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>&gt; Clarity of permissions for types of uses.</td>
<td>&gt; Barriers to the creation of derivative and additive works.</td>
<td>&gt; Talent spotting outside of the corporate commercial paradigm.</td>
<td>&gt; Exclusivity and scarcity of artistic works.</td>
</tr>
<tr>
<td><strong>Open Source licences</strong></td>
<td>&gt; Collaboration in software development.</td>
<td>&gt; Lack of skilled developers.</td>
<td>&gt; Software as a “Black Box”.</td>
</tr>
<tr>
<td><strong>Open Hardware licences</strong></td>
<td>&gt; Ability to study, modify and share documentation on hardware projects.</td>
<td>&gt; The need to build each hardware functionality from scratch.</td>
<td>&gt; Obscuring of technical workings in hardware.</td>
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<td></td>
<td>&gt; Additive hardware development.</td>
<td>&gt; Lack of transparency about liabilities.</td>
<td>&gt; Built-in obsolescence.</td>
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<tr>
<td><strong>Open Product licences</strong></td>
<td>&gt; The ability to customise or build on an existing design by attribution.</td>
<td>&gt; Long patenting processes.</td>
<td>&gt; Lead designer as the sole author.</td>
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<td></td>
<td>&gt; Product as a platform.</td>
<td>&gt; Inability to release product ideas into the market.</td>
<td>&gt; Unsustainable, disposable and single use products.</td>
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10. Validation and Feedback

20 interviews have been completed with stakeholders from across sectors and have been transcribed in full. The semi-structured nature of the interviews has allowed the feeding of recommendations from earlier interviews into later consultations with other CCSI stakeholders and members of the ICE Consortium to solicit feedback on proposed framework solutions. As planned, these consultations with stakeholders have resulted in an expanded ‘minimum viable product’ top-level metadata architecture, technological suggestions, feature requests and use case applications for the proposed IP Tracker. On the whole, feedback on the IP Tracker blueprint has been overwhelmingly positive with only one respondent saying that they would not use the system as it did not map onto the technical maintenance and deployment work that he performs using established technologies owned by others. Summaries of each interviews with indicative quotes from participants are included below.

10.1. Uppsala University – Andy Browning

“If it’s not going to cost us too much then we can make it a good selling point as part of the bid and I think we should absolutely go for it. If it is going to have a significant cost, then we need to think about creative ways of saying to the EIT, ‘we believe this is something that will work.’”

The most salient point of the feedback from Andy Browning was in the utilisation and integration of the IP Tracker system into educational and innovation entrepreneurship programs. Using the IP Tracker as a tool for students within education and entrepreneurship programs would enable them to look for ideas and technologies to develop and use as a basis, rather than starting with an idea from scratch. It could lead to the training of a generation of students and entrepreneurs to think about intellectual property in a way that is not simply binary (Can I use this or not?). This could be implemented not just as a testbed, but as a new way to train the next generation to consider the use of IP as building blocks with which to create new things. Andy also mentioned the idea of using wildcard companies or wildcard projects: to go out and speak with partners and ask ‘what are the biggest challenges you are facing?’ Focusing the responses from that into one specific area, to then go out as part of a bootcamp project to students and entrepreneurs and incentivise these responders to solve the problem with access to some funding and opportunities to create a team dedicated to solving that problem on a contractual basis.

“There’s a big focus on student entrepreneurship. So what you could say is like, we will use this as a basis for you know, the students that take part in our entrepreneurship programs. So basically looking for ideas and technologies to develop rather than having an idea themselves.”

“It means that you get the partners engaged in education programs in a way that may perhaps that might not afford before. It gives your entrepreneurs and your students something to get their teeth into, that they can build from.”

10.2. Fraunhofer – Johanna Leissner

“I think that when the KIC starts, you can ask all the partners that they should come up with a collection of their intellectual properties, and then you can you have already let’s say, a basis to work with and then we can work to better develop how it can be presented, how this information must be transcribed so that other disciplines understand it. And we can start making some workshops, where we are presented with the language we are speaking. Ask: ‘do you understand what kind of information and what kind of wording do you need? What kind of pictures, what kind of music do you need to better understand this?’ — and I think this is quite a time-consuming process.”
Johanna was very enthusiastic about the project and presented the idea of using tools and technologies that are used in one industry and putting it on the platform so that people from other industries could come and use the product or ask for a custom product based on the original product, suitable for that new industry. The example she gave was of a chemical preservative she had been involved in researching and creating specifically for the cultural heritage sector, but which has a very limited application within that domain – the total global demand of which, she estimated, was about ten litres. However, if the properties of the chemical could be registered in this IP Tracker, then they could be discovered through search on the IP Tracker system, adapted and deployed at scale across other domains. She was open to the idea of creating a platform that would bring people from different industries together. Such a platform would also need to be able to transpose ideas from one industry into language that could be understood by people who might not be familiar with that industry’s jargon. This would mean becoming an IP market place, essentially, for cooperation. Additionally, she was ready to ask her colleagues to contribute their own IP to the platform. She could see specific applications for her own research work which is currently limited to a very specialist field and was positive about the potential to take that work into other domains. She was hopeful to see the platform succeed and looking forward to help with the establishment of such a platform. Leissner also suggested the addition of a field or checkbox that would highlight an IP author’s willingness to collaborate on future development of that IP.

“Yes and how you present it is important. I mean, I always have the same problem when I look up for information. How do I find this kind of information, how is it presented so that it really can go beyond our normal bubble.”

10.3. Area Science Park – Alberto Soraci (and colleagues)

Alberto Soraci and his team from Area Science Park discussed the ways in which the IP Tracker could help them in running their research facilities as well as supporting startup companies that are affiliated with their organisation. The idea was suggested that there should be the involvement of patent offices and/or IP lawyers in the project as there is a possibility that legal issues may arise. There needs to be prior identifiable work that has used a similar idea and technology infrastructure as this would justify the creation of such an ambitious technological solution. This would also show the level of understanding of small to medium creators about the existence of such systems and whether it would benefit such creators at the anticipated scale.

“For us, as you know, we own many high level world level research facilities, where that can be useful for some of the components of the value chain and the cultural and creative sector. At least for my office for the department where I work, it’s an area where we think that is possible to create startups and support companies more than any other sector.”

“We think that being part of a community where we can support the enterprise development and enterprise creation, we can also fulfil – which is our mission at national European level – to increase the economic level, the innovation level of the territory. And as we discussed, I fully think that the cultural and creative sector is an enabler of innovation. It is a place where we can incorporate innovation. So being part of this mechanism will allow us to support the technology transfer process and to create cross-innovation in other sectors.”

10.4. Kaapeli – Kai Huotari

Kai’s primary interest in this interview was on the functionality of the platform in terms of networking capabilities for users; the potential to connect with other individual’s licenses of copyrighted work, to compare, and ascertain how to proceed with certain organisations and individuals in order to ensure
compatibility and co-operation. He was interested in how the IP Tracker could incentivise users to pitch in and contribute to the system to ensure that it gains momentum. One potential way that was put forward, to encourage and incentivise uptake, was to intensify the exclusivity of the system through targeted invitations. Kai gave use case examples from his work as a documentary film festival organiser who needed to license specific films, and was interested in the ability not only to source unusual works from a database like this, but also compare experiences with previous licensees as to how the IP owner might respond or what the associated costs might entail.

“It’s sort of a little bit like the Wikipedia of IP!”

“Networks are important because people don’t want to share this information with everyone. They share it with the people that they trust.”

“I think the basic problem is really incentivising the users. In order for it to really gain this reputation and to gain more and more momentum – how do you create that sort of a feedback loop? Where people want to pitch in their efforts and, and sort of contribute to the system? I think it’s very useful. It’s very ambitious. You need to attain a certain critical mass before it becomes useful, it should snowball.”

10.5. Uppsala University – Christer Gustafsson

The feedback from Christer Gustafsson was broad-ranging and focused on the relationship between the CCSI KIC and new conceptions of Cultural Heritage. He was also interested in more direct collaboration with the Industry Commons Foundation. Christer expressed enthusiasm about the development of the IP metadata platform and how it might be used in the industry and expressed his willingness to help in its development as well as experiment with it to see how he would use it once it is ready for deployment within the KIC consortium. He was particularly interested with the ways in which the philosophies behind the IP Tracker relate to European ideals of inclusion, creativity and culture at the centre and the notion of cross-sector collaboration. His view of the innovation that could be unlocked by a system like this went beyond potential economic value, but into different conceptions of society and cultural memory.

“So, my experience tells me that you have to, as you as you mentioned, work more cross-sectorally. You have to understand other sectors, aims and objectives. And see how you can coordinate them and fix them together for today, speaking about climate change, for instance, we cannot solve the climate change within one sector. Everybody has to be there or when you speak about sustainable development etc. So my focus today is to more or less completely change the mindset from starting with this ‘protection oriented’ idea, but instead let’s say contribute to something bigger, and that could lead to job creation, it could be the change from an industrial society to a post-industrial society.”

10.6. Microgiants – Gerin Trautenberger

Microgiants built a version of an “IP bank” about 15 years ago. There was a concern over the number of users that adopted the platform. While there had been significant adoption within their broader community, their expectation had been much higher and so the organisation considered it a failure. They identify the problem as being a marketing one. The platform was not identical to the proposed IP Tracker. It did not seek to capture registration of all IP categories and the data was not indexed to be machine readable. However as an early experiment in this domain it stands as a precedent that establishes the usefulness of such a system and despite it’s lower than expected uptake, it still proved useful to its early adopters. Gerin saw the potential for the IP Tracker to provide specific timestamps to the registrants of the intellectual property in case of a legal dispute that may arise in the future.
“And we were founded with one obligation or objective to help the creatives in Austria understand about their IP rights. And so 15 years ago we built what you could call now an IP bank – you know, very easy to use, step by step guide, ‘how to register your work’. You can of course register course text, pictures, sounds, videos. So, you have to register of course, upload your work, you and you get the timestamp. You know, like telling ‘Gerin at, say, the 29th of October at noon, uploaded this data’.”

10.7. In Place of War – Teresa Bean

Teresa identified the need to track IP systematically with a clear track record of the origins and sequences of ideas, with influences and prior art recognised. Although there have been systems in the past that recorded instances of IP, they are not good at keeping track of the genesis of those ideas. She believes there is a space in the market for such an IP indexer that could track the metadata that acknowledges the lineage of IP and is interested in deploying that in her community education projects and with the In Place of War partners. Her idea was use the platform to acknowledge the local cultural origins of methodologies for creative education – not to prevent distribution or redirect funds but to ensure attribution of the original source and to facilitate collaboration across diverse communities and locations.

“That’s kind of what we found within our network that’s happened organically by sharing this IP, then people started to then collaborate on other stuff as well.”

10.8. Film University Babelsberg – Jörn Krug

Jörn works directly with intellectual property registration and licensing. One use case he identified was within the film industry. He proposed utilising the framework with film students’ startups, also as a way of building on a piece of IP. He noted the relevance of the IP Tracker for the industry, and appreciated the idea of a ‘centralised’ IP system. He said that it’s important for there to be a lot of organisation within IP frameworks, because it can be such a vast area.

After some initial uncertainty, Jörn came to understand the system in some detail by asking many well-informed questions about the framework. One of key piece of feedback he offered regarded the tracking and tracing of the origin of an idea within the system, and furthermore, being able to build upon it. The creation of IP layers, with each layer referring back to the last, and in this way being able to see the genesis and iterations of an idea. The example he gave was of Mickey Mouse, which was a completely different piece of intellectual property at various stages of its development, but with a clear evolutionary path. This raised the possibility of a simple enough system that would enable easy registration of a single piece of IP at various points in its development.

Jörn also provided visual metaphors for the proposed system, explaining it as a ‘branching off’ system, where each layer of IP could be built upon independently, so that you could not only find the different iterations of something, but also build forks outward from a version that had a life entirely separately to other versions.

“Everybody thinks his or her project is very individual, so it’s very good to have done individual rights. The question is, how could you get the people to claim their rights on your site and to make it clear who to ask for permissions and so on. This would make it possible to claim rights at an early phase.”

10.9. Erasmus University, Rotterdam – Christian Handke

“We’re thinking along the same lines – you need metadata and you need to have standardised metadata that people don’t have to learn how to read and how to get that information, for work that they’re interested in. I am absolutely on board. I’ve been calling
for standardisation and also bundling of transactions to some extent in this area for quite some time, on a more theoretical level. So it’s lovely to hear that you’re that you actually try to put this into practice.”

Christian is a longstanding expert and published author on the topic of intellectual property in the digital age, and showed great interest in the proposed framework, immediately pointing out all of the many problem areas that the system could (at least) have a role in solving: in particular, the ability to locate the IP owner and actually being able to hold them to a response (a connected but separate issue, as he defined it). He offered to help in anyway he could, and to assist in the establishment of the framework.

Christian stated that a system that was designed to work across different types of copyright and IP was completely unique, but did suggest that there may be some confusion that arises as a result of including different categories of IP; such as trademarks. One of the primary things he wanted to raise was that anything that can be done with regard to such a new system will necessarily involve and/or encourage political discourse element to it. He went on to ask very useful and insightful questions, such as about the standardisation of contracts, as well on how to encourage uptake. He was also interested in encouraging the cross-utilisation of other platforms within the framework, and wanted to know how they could “come into the fold”.

He did raise a concern that if the database became a monolithic source of IP licensing it may have the unintended consequence of creating an obligation for people to check with the database before creating new things, and that could have a stifling effect on innovation. He also noted that there might be significant problems of governance if it was run through a for-profit business, which could make it vulnerable to manipulation.

However, Christian showed great interest in the proposed framework and was immediately enthusiastic about the project.

10.10. ETT Solutions Spa – Niccolo Caderni (and colleagues)

Niccolo was initially uncertain about the idea but gradually saw the potential with respect to their project of producing digital twins of festivals and other cultural venues and experiences. He said that it was difficult to imagine the development teams integrating the registration of IP into their workflows and thought that the development of the framework would benefit from shadowing and observing his team in order to develop that process and perhaps create automatised processes.

Niccolo said that he believed ETT Solutions employees don’t think about their work in these terms, they simply sell their service and haven’t considered their process as the creation of IP other than perhaps as an interesting intellectual exercise. He acknowledged that this potentially revealed some value still to be unlocked within the organisation, and was incredibly positive about the project ‘in theory’ while remaining unsure how this could be integrated.

“I would love to do that research project about how do you do what you do, what is easy, how to design the process. You know, you need to shadow some of these guys and try to understand what is it they do. It has to be a short and simple tale that tells us what would happen, otherwise we won’t be able to understand. My youngest son is in a band, you know, he’s a musician. And so to them it’s important to register things. For our guys, they don’t see it that way. I perceive it as an interesting intellectual exercise.”

10.11. Western Development Commission – Helena Deane and Jessica Fuller

Jessica was very interested and enthusiastic, and was very keen to help shape the IP Tracker within the context of the Western Irish region’s Creative Industries sector. She made multiple remarks about
the usefulness of having a centralised system for IP, with an emphasis placed on the ease of use, and expressed interest in making it easy to use and wanting to feed in examples to the system. She also specifically highlighted the Medtech industry in the west of Ireland as a significant use case, with a view to integrating it into universities.

Helena and Jessica both mentioned speaking directly to enterprise agencies, to encourage the conversation and in turn feed into a more robust IP system. Helena was also very enthusiastic, but noted that there were differences in her industry from Jessica’s. She mentioned that gaining traction with entrepreneurs was often difficult, and this in turn placed a large emphasis on ease of use of the platform, as well as the need for more advanced features. She mentioned keywords as an integrated way of tagging a piece of IP. Jessica agreed with this statement, and indicated that as long as it wasn’t cumbersome, and that it remains dynamic it is ultimately something that could be of use.

“You’re all running away from IP with regard to the creative industries and yet it’s at [the] epicentre of so much, not only for the CCSIs but also cross-sectorally.” (to local enterprise offices)

“Things have to be built a certain way to make sure people use it because they will not necessarily use it, even though it provides benefits x y and z; there is always an element of persuasion needed there.”

“In some cases, you still just have to send your padded envelope to yourself. And I mean, that is a ridiculous situation in the 21st century.”

“This is the digital padded envelope and but it also feeds in and out of, of other sectors and so into patents, into design.”

“So if you’re coming up with a system, the first thing I’d say is how can we get involved to help you shape it, beyond giving a narrative back?”

10.12. Université Côte d’Azur – Laura Clerissi

Laura Clerissi was joined by her colleague from the Technology Transfer Office. They showed strong interest in the platform, and were very curious about it. Laura indicated that they were involved in the creation of an IP system themselves, specifically for their university’s research and so had many questions about the different elements of the platform: whether it was open or not, who the target audience was, and whether the terms and conditions for use were the same for the different kinds of users. She also raised questions regarding as the financial aspects of engaging and utilising the system and whether this would be different for members of the consortium and for outsiders. They were both very interested in whether the system could respect GDPR and how it would deal with the storage of personal data. Laura mentioned that the visibility of the platform was a real benefit, and said that this made it very interesting to them as a potential alternative to an in-house IP system which they were developing and adopting.

Laura and her colleague were very keen to have a follow up presentation and wanted to share this idea with their colleagues so that the concept could be developed further and they could discuss ways in which it could be adopted by their TTO.

“It’s like an intellectual property social network.”


Ed Maughfling is Customer Support Manager for a software company that registers and manages intellectual property for university TTOs, and was interested in the extent to which the IP Tracker
potentially competed or integrated with their product. As he expressed it, one of the most obvious potential use cases could be Universities. While e-Lucid is more an e-Commerce platform than a rights registration database, there are some overlaps. Ed showed a keen interest in the platform, although initially noted that it may raise questions for his university, and TTO Customers: He explained that his company did not specifically get involved in the nature of the IP, who owns it, who it’s distributed to etc. However he went on to say that there was a real scope, and potential gap in the market for the platform, and an IP management system.

Ed mentioned that generally speaking, the metadata fields used in current IP registration systems are quite rudimentary and limited: a title, a subtitle and a unique ID. The idea was then explored that a potential gap in the system was having a secondary, potentially more detailed way of describing the content that has been put into the system. Further to this, the idea was explored that the subtitle could act as a more advanced filter, more directly and accurately pertaining to the content itself; if you ever needed to search for it.

Ed also noted that, there isn’t an automated way of collaborating, or comparing ideas within an IP system as such so this would be a benefit. A final key part of the feedback which emerged was the idea of automatically populating the IP Tracker into an e-commerce system – effectively an API for the database that could feed a third party IP shopping platform, providing the opportunity to feed back into and update the system in response to the transactions.

“There are producers that partly take the form of IP management, and they are also sort of customer relationship management tools so... there is obviously scope for a specific product description, there is scope for you know, further information to be recorded for each product but you know, we don’t get involved as such in the due diligence really. This has certainly made me think about a few things.”


“Just from a Human Resources point of view, to understand who is providing more value in the organisation and why and what are the processes how the innovation is produced inside the company, in the context of trade secret? I think that’s interesting. That’s something that I can see us with potential interest for.”

Initially cautious and curious, Alexandra showed a lot of interest in the system, she said it seemed very ambitious, but stated that she was somewhat sceptical of the aspect of building new layers of innovation on top of existing ones. She discussed a possible fine arts works use case, ensuring that it was open and accessible for people from non-technical backgrounds. Carles was sceptical of the system, and could not see a use-case from his perspective.

One of the key points for the IP System which Alexandra outlined was in making sure the system was more user friendly; specifically catering to users who are not in technical fields. An extension, and a very significant part of the feedback was in ensuring that the platform was engaged globally, and ensuring global, user-friendly access to a help desk to provide support for people, and in assessing the IP topics in question, as well as being able to connect with other organisations and users on parallel topics.

Alexandra identified that the tracking and tracing of IP was something which they are trying to do within Eurecat, and that it is ultimately very useful, but noted that from her perspective (having a fine arts background) the idea of building up innovation across different fields is difficult to enable people to understand and utilise the information within these kinds of systems.

Alexandra seemed very interested and invested in the idea of the system, if cautious about some aspects of it. Carlos remained very sceptical of the system as a whole, (from an engineering perspective), and ultimately settled on not seeing a use case for it. Alexandra also mentioned that some of her colleagues who were in the business of founding new ideas and bringing them to market,
would more likely find use cases that would have more value, and she could see it enabling an idea of theirs to be more commercially viable and interesting.

“As I hear it, it is very, very ambitious. It is kind of a hybridisation of all databases related to IP; going from patents to copyright and kind of connect them somehow so you can reach any of those.”

10.15. Mediapro – Pere Pérez Ninou

“I think as we move into this creative economy, it is something that we need to fully automate; that process of adding to an idea which is already there, and/or registered in an IP Tracker.”

Pere approached this topic as a seasoned expert in the relationship between intellectual property and technologies, particularly within a media entertainment context. As head of innovation for a digital media entertainment company, he immediately identified a that a use case could be found within live-streaming, with a particular focus on Sports and e-Sports, providing details on the ownership and distribution of a piece of IP, or any new creative content.

Pere was particularly interested in the potential for this system to support automated or assisted registration of creative works, for instance AI-directed sports footage. He discussed certain complexities arising from IP that is generated within digital spaces owned by other people, such as a person livestreaming a video game on Twitch or producing a system within a piece of digital land in a sandbox game. He discussed the idea of Mediapro collaborating in and testing the development of the system as a way of testing these edge case scenarios that operate at the cutting edge of technological systems that are themselves creative environments within which individuals can create their own content. To that end, the idea of the IP stack enabled by this framework has the potential to simplify, or at least somewhat entangle, the complex rights issues that are encountered on a daily basis with user-generated and AI created media content.

Another element of particular interest about the proposed framework was that of the co-ownership and registration of an IP. Pere said he was keen to be able to track how many people have a part of that IP, particularly as a project grows. He wanted to know how you could track that, and the categorisation of things, and not only that – but how do you validate the IP? He proposed the use of a flagging system within the IP use, from authorised users of an IP to the owner or creator of an IP, to ensure transparency, so that users are aware of who has use of, and/or a stake in an IP use instance. In addition, he showed great interest in the platform’s potential for use with pieces of IP content made up of multiple parts, with a particular focus on newly created digital content, stating its importance as we move into this “creative economy”, being able to give credit (attribution), increase traceability, as well as engage with other users, or individuals who are interested in, or use this kind of content.

“There will come a point very soon, where all the (virtual world) land will be taken, you know, by speculators or whatever, you know, people will buy all of his plans. So if you want to create something, you will have to create it on someone else’s land.”

“The differences between registration issues and regulation issues, and how do NTFs fit into this framework? That is really valuable, because with game footage, looking at NFTs, we cannot sell that even if it’s been published on Twitch and it’s okay for Riot. You cannot sell that piece of content as an NFT if it shows any of the gameplay. So who owns the IP?”
10.16. Materahub – Paolo Montemurro (and colleagues)

Materahub expressed a strong interest not only in the platform but in collaborating in its creation and linking it strongly to education and in particular the registration of methodologies in Erasmus+ projects in order to unlock educational frameworks and pedagogical materials. They saw in the IP Tracker the potential to generate something new particularly in the context of the New European Bauhaus. Paolo and his team discussed the difference between the registration of services (intangibles) and products (tangibles) and highlighted the opportunity to use the platform at the centre of a hackathon or innovation sprint methodology to provide real challenges that introduce the consortium’s communities to novel methods of creation and codesign. They also imagined the IP Tracker as an engine for different use case applications that matched to different use case narratives specific to individual ecosystems so that it is easier to find something that is useful to them.

“If you need further input, other suggestions, please just talk with us about this – we are very available.”

10.17. Frankfurt Book Fair – Simone Lippold

“I love this because I think it’s a completely different approach and one that makes things easier. You’re really constructing a whole new idea of how to reach people and actually ignite innovation through this.”

Simone was interested in the potential use case for the IP platform of potentially making the creation of officially licensed fan-fiction much easier and the potential legal minefields in that domain much easier to navigate. She discussed the project’s relevance to fandoms, fan-fiction, and prosumers in books/publishing, and also talked about tagging and capturing as a route to discovery rather than genre and indicated that it might be possible to link to automatisation of sentiment analysis. She was enthusiastic and interested, seeing the potential for the IP Tracker to link directly into other forms of catalogues, reader and published tools and recommendation systems.

One issue that was raised was that of the retraction of permission after the creation of works that use previously licensed IP, though she saw a simple timestamp on changes of licensing categories on an IP record to be sufficiently robust: derivative works that were authorised before the change of licensing can be ‘grandfathered’ into legitimacy, but works that are created after the change of licence remain subject to the new rules and may infringe where an earlier work that is still available might not.

10.18. Aix-Marseille Université – Laurent Fournier

Laurent’s work raised an interesting use case for cultural and creative practices for which an IP system is not applicable: that of intangible cultural heritage such as rituals, festivals and dances. While it is possible to describe and capture salient features of an indigenous/communal cultural practice in a system such as this, there is often no single point of contact from whom consent can be obtained for licensing. A system for data collection can either be applied quantitatively or qualitatively, doing both well would be difficult not just in application but also in terms of seeking funding.

With that in mind, Laurent remained cautious and dubious as to the applicability of the system to communal cultural objects. He noted that the more you add flexibility in order to accommodate these limitations, the more it will cost and also the more it will be difficult to follow up. You have to have people behind the machines. Doing ethnology in this field has a lot to do with mediation.

Often you have several claims from different owners or potential owners. In some cases, the spectators of a song or the dance are also partially owners and part of the creative process.
One use case discussed was the opportunity for a creative technology business to create a VR experience of an indigenous festival. Laurent pointed out that while the idea had a lot of potentially positive impacts, it would be difficult to ensure that permission was sought from the right people, or even if it was possible to locate the source of that authority. However, while Laurent understood the value for the IP Tracker outside of his domain of intangible cultural heritage, Laurent also saw a potential diarising tool for ethnographers and agreed that while a system such as this might not be able to codify the IP within a practice in the same way as you might be able to in other domains, a specific and standardised metadata framework might act as a focusing tool for researchers to be able to keep a record of their own observations in a way that was comparable and contrastable across different contexts.

“Professionals in the modern life who are in marketing cultures, they look at the format more than the content. But for the for the traditional communities, they look at the content and the context, not so much at the format or at the thing itself.”


Robert Harrison is an expert in intellectual property law and is an adviser to other KICs on this topic. He said he is aware of the need for a platform that is able to retain broader information about intellectual property, such as the person to contact in case of a collaboration etc. He pointed out that companies and individuals can get lost in this process and sometimes they infringe on other people’s copyright data mistakenly or often one party would think that it is free of property rights but the other party would think that their IP rights have been violated. He agreed that the proposed IP Tracker offers a promising solution to problems such as these.

Robert pointed out that there are ways to create economic value from the IP Tracker in such a way that it becomes sustainable without making the platform a “paid” platform, particularly in order to avoid transgressing regulations about publicly funded data platforms. He also pointed out that the platform would need to research its own copyrights and patent strategy as it can be wasteful to register a patent for the platform across multiple geographic regions.

“I did a submission for the European Commission on the Artificial Intelligence proposal. They put out a request for comments on copyright registration. And one of the points that I actually made in that was exactly you do need to develop an ontology. I think I made the same point in my response to the Data Governance act. You know, we need to start thinking about ontologies if we’re going to get interoperability. And I think it was in the Data Governance Act, but the AI one didn’t talk about it at all. And, you know, it’s interesting you say that because there are real issues with this horribly EU term ‘valorisation’. Because probably the best way of doing it... Real issues about valorisation of technology projects in Horizon Europe, because of the competing interests of the consortium members, and we’re having real challenges. You know, somebody uses attorney A to write a patent in one country, but another attorney in a different country does the same, they own they both own the rights, but you can only actually value it if you come to a common agreement about it. And sometimes they don’t even talk to each other that they’re writing about the same thing. So you know, those are the things that we would need to link up within your proposal.”

10.20. ECBN / ICE Consortium – Bernd Fesel and Claudia Jericho

Michela reported about her IP work with the EIC and the person in charge there has offered to write a letter of support. EIC is also investing €8M in building something. Michela has put Bernd in touch.
The interview began with an overview of some of the feedback that has been gathered as part of this study, as well as the recent initiatives at WIPO linked with the music IP registration system Session. Bernd identified the Session example as being particularly useful because it uncovers €500M of untapped value in unclaimed black box royalties for the industry, and Claudia raised the example of the lack of transparency in metadata at YouTube. In discussion of the music industry, Bernd asked if Spotify might be an interesting partner for the consortium. In terms of a large player, it was decided that they were problematic but more an asset than a liability. Michela discussed the alignment between metadata standardisation measures at the IEEE, WIPO, EIC and others. There is also a lot of energy towards back registration of European funded initiatives such as the Pathfinder projects. Michela explained that although we are searching for a top level metadata MVP, the more we work on this, the more we understand that there are more metadata categories that need to be distinguished (e.g.: owners, authors, access rights).

Bernd suggested expanding the trusted node network for the Limited Distributed Ledger, starting with the competence centres, then every second year, we could put out a call to find more trusted nodes. It was agreed that feedback from Laszlo Bax would be important for shaping the executive summary of this document as a way to create usable content that can be repurposed for the KIC proposal. Bernd wondered about the other KICs already collecting IP information about their projects and how that might be integrated into this system. It was agreed that they almost certainly don’t collect and maintain that information. Claudia suggested an integration or conversation with the Culture Data Space because they do data integration for different fields, and Michela noted the collaboration with Gaia-X because they want all of the media files from around European media organisations. Bernd identified that the connection between Culture Data Space might align the IP Tracker with the IP Data services (including of public data) that they want to collect and make available and accessible.

In terms of the value creation system, and whether the IP Tracker would have an ecommerce layer, or whether that would be let out to third parties such as e-Lucid. The answer was that this is why you do the App Store model because it allows the benefit of both approaches and that this can be evaluated using Market Adoption Readiness Levels (MARLS) as the MVP would be very strong based on existing networks, early adopters and potential use cases.

Finally Bernd and Claudia raised the importance of Digital Sovereignty as a key issue in Europe, and that it was important that we demonstrate to the evaluators that we are not proposing a speculative and untested technology, but rather building on proven platforms.

“I mean, we would not go to Apple to say, please give us 10 million to build it. But maybe we need to go to an investor or maybe we don’t want to go to investor and say we create our own startup, 100% owned by our KIC. And this one then pitches to investors. You know, I’m just wondering in terms of monetisation, how we spin this off. Or do we create a pilot and say, you know, we have a strategic project needs X million euros for the first round, and we created on our own IP, and as soon as we have an MVP on that, you know, you probably can sell it much better.”

“If we create our own startup, we can still say it should be a non-profit business. An ecosystem, you know, and maybe even a unicorn could be a non-profit business, you know. I want to make this ecosystem friendly and to support the KIC and not follow the Silicon Valley approach, but that’s what they are worried about.”

“We have to give the jury clear use cases where we basically say we don’t reinvent the wheel, but there are things that are working already and we are using. Maybe we do some innovative stuff on top, but it’s not rocket science just because the other KICs have not applied it. Sorry. You know, that’s the threshold.”
10.21. Culture Data Space – Patrick Tomczak and Georgios Toubekis

Patrick and Georgios explained the Culture Data Space and the relationship between it and other Data Space initiatives (Patrick had migrated from the Mobility Data Space). At present, the Culture Data Space focuses on the provision of cloud services and the ability to exchange data via standardised connectors as a means to build a potential cooperation space – specifically for Cultural institutions, which do not have internal development and infrastructure capacity. There is an ambition to extend this focus to community-based culture, at first through conservatoires keen to develop digital services, though this outreach is limited by current resources.

The conversation covered the difficulties with aligning metadata across different domains and sectors. Georgios was keen that GAIA-X be drivers of standards for metadata, and that Fraunhofer FIT be considered as a blockchain infrastructure for the IP Tracker as they have a blockchain laboratory and would be very keen to have the IP Tracker as a use case for their technology and expertise. Georgios encouraged experimentation on a small scale to test the design and interface of the IP Tracker and to understand the physical interaction with it, so to assess the direction that the research and development needs to be directed from its initial blueprint proposal. Claudia agreed this was a good idea and that this was something that would need to happen after the KIC was funded.

Georgios also explained the new law in Germany that requires data that is available in the public sphere to be made available for use in by third parties in a machine-readable format. However, there are exemptions in place for cultural institutions because they are not yet capable to provide the digital data. There remains debate about publicly funded cultural institutions providing free digitisation services to large multinational commercial platforms. Culture Data Space may provide a usage environment within which to consider and create policy for ‘high quality’ or ‘high value’ digital data (artworks, etc), as opposed to ‘low quality’ data, such as local weather readings.

“You should know that at my institute, we have this blockchain laboratory. And it has some reputation within Germany. And, as I just said, the use case that you’re describing is really attractive, compared with the other use cases that the colleagues are dealing with so far, because it would be for the creative industries. I would say it would really go much beyond what is currently being presented – all these NFT things, which is a little bit of a hype this year. This here really has the potential to be disruptive.”
References


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Open Weaver. (2020). Beware: Over half of the github public repositories are not open source licensed!


ANNEX

The following Green Paper was presented on the 7th of October 2020 at the 10th European Creative Industries Summit (ECIS2020) under the patronage of the German Federal Ministry for Economic Affairs and Energy, as part of the German Presidency of the Council of the European Union.

CCI Innovation to Lead Beyond the Pandemic
Michela Magas

“No one can imagine a smart city of the future without cultural and creative sector, without the talent, without the value and without the richness of what you bring to us.” Mariya Gabriel

Abstract

The transition of Culture and the Creative Industries towards a more distributed, asynchronous, agile, geographically-independent, rapid creation model enabled by digital technologies, has accelerated exponentially during the Covid pandemic. The transformation of the sector had been gaining momentum before the current crisis and had been progressively speeding up ever since the advent of Napster on the 1st of June 1999, when the hacking subculture was the first to exploit affordances of Peer-to-Peer digital asset sharing to establish communities at a grand scale, and simultaneously precipitated the music sector into an overnight digital transition. Since then models implemented by the CCI in response to early challenges, which utilised emerging technological affordances, have become a universal template for digital transformations across other industries. The CCI approach to knowledge acquisition and methodologies for experimentation have proven to be the key ingredient of the processes required to manage complexities emerging from frontier technologies. With increased demand for collaboration to solve grand societal challenges highlighted by the recent crisis, a new anchoring of the CCI as central facilitator of the data-driven cross-domain economy is emerging with a horizontal function that bridges all domains. Within this paper we list the priorities for the repositioning of the CCI at the centre of cross-domain industry innovation.

A testbed for digital transition

The advent of Napster forced the music industry to migrate overnight from tangible product to the digital format, adopt the cloud as a warehouse, turn to the data spreadsheet as the album crate, and use music metadata to replace attractive album covers as means of identification. The entire sector
was suddenly in urgent need of reinvention, taking account of the spiralling losses, and the risk of sector collapse. The state of emergency required the adoption of fast learning methods to discover and exploit novel affordances of big data management, machine learning, application programming interfaces (APIs), intellectual property tracking, and streaming services, in hope that solutions may allow the sector to re-emerge with renewed market agility. Entire communities have sprung up to join forces in the attempt to address the challenges presented by this overwhelming shift in the way we create, record, communicate, exchange, and conduct business. It is perhaps no surprise that members of those communities have most recently acquired Napster, having accumulated 20 years of new knowledge and hindsight about possible data-and-communities-powered business models and creative communication affordances of technological drivers.

During the past decade, creativity has been powering the greatest volume of communication traffic. The rise and dominance of content creators and creative platforms which speed up communications and allow more agile ways to exchange information, have influenced even the more traditionally community-driven physical bookstores to consider new ways to deliver narratives. During the pandemic, when a trip to the local bookstore became a risk, digital communities of book lovers sprung up even from those physical places of personal exchanges of ideas, and survived thanks to novel modes of communication, following a trajectory that the music industry went through 15-20 years earlier.

The rise of digital content creation and innovative ways to deliver narratives has gradually affected the design of systems and processes. Novel technological affordances have enabled new modes of expression; novel languages of expression have evolved into new community (sub)cultures; with new (sub)cultures new values have arisen that drive emerging markets for both cultures and economies, requiring a rethink of their supporting systems and regulatory aspects. Cultural transformation was not only evident across Culture and the Creative Sector, but progressively across other industries and particularly service sectors, influenced by the same communication technology drivers.

Financial services quickly migrated to a more agile model using what became the central nervous system of the data-driven economy – the APIs – to establish robust horizontal mechanisms for data exchange. In Sweden, what happened to the music industry around the year 2000, happened to the financial services around 2015 – paper money disappeared as the most common means of exchange. Stock markets and banks moved finances as data long before then, but the cross-domain horizontal model required novel API-driven financial services to be linked to fully digitalized government UIDs and the taxation system for traceability and accountability, and ostensibly secure connection to IoT Tangible User Interfaces (in this case personal mobile phones) to be enabled as wallets. The same portable data device model as the iPod for the music industry, which was result of creative invention back in 2001, is now, with ubiquitous connectivity, the basis for faster and more secure financial exchanges, considerably speeding up the service economy.

Few believed that the transformation of the CCI would provide a model for all other industries. Mining or chemical production remained firmly anchored in real world processing of raw materials, and considered data-driven processes only as part of its supporting supply chain. It was not until SAP, in April 2019, published a whitepaper outlining their ability to manage the entire production process for the chemical industry – from start to finish – through data-driven systems, that the established CCI model finally resonated with the chemical sector, resulting in the hypothetical question: “Wait, are we now just ‘content’?”
Before Covid-19, but even more so during the recent pandemic, digital content has been accumulating exponentially, led by the need for active participation and creative expression. While the public discourse has been preoccupied with the means of distribution – screens and videoconferences – content is the digital value category which has kept us actively engaged with society during the era of quarantine. It is also the digital category which carries within it all of the transformational affordances on offer by digital communications to generate new meaning – from appropriating traditional cultural narratives to automatising generative outputs of big data frontier technologies. While this provides emancipatory social and cultural potential that may or may not be supported by the technological platforms, it also in turn carries all of the threats associated with narrative spin, bias, manipulation, unethical use of technology and irresponsible use of data.

The ambition of extracting meaning or value from big data has led to research and experiments across knowledge domains in deep learning with neural networks, and uncovered challenges of real-time classification – or algorithm-driven ‘meaning making’ – impeded by the sheer volume and speed of outputs resulting in unknown unknowns. The challenges of unknown unknowns are being reported across knowledge domains, though perhaps significantly in physiology and cyber-physical systems where the human is in-the-loop, and where solutions are particularly relevant for the current pandemic. In creative experimentation where innovative use cases utilise machine learning and artificial intelligence for interaction with humans, or utilise complex systems with the human-in-the-loop, the results have shown to be highly unpredictable. To date, no deductive or inductive scientific method, building on prior art or statistical probability, has offered a reliable solution for dealing with such surprising outcomes. In this context creative elicitation approaches and methods of meaning-making in complex conditions, become a fundamental ingredient of the digital shift.

Compared to the scientific method of deduction and induction leading to a conclusion, which appears highly rational, the creative practitioners’ brain training has always been perceived as far less linear and rather chaotic, opening up too many possibilities, or somewhat irrational and perhaps too reliant upon some kind of instinct. Recognition of the rigour of the creative practitioner, trained to observe and evaluate cultural phenomena on a 24/7 basis, and practice problem-solving by illuminating subject matter from as many perspectives as possible, is now a requirement for the creation of new knowledge in a highly complex, rapidly changing data-driven landscape, full of challenging outcomes.

The current pandemic is one of a series of black swan events regularly occurring to humanity, and acquisition of knowledge has proven to be the key concept for managing the associated risk. Methodologies and solutions for the current pandemic must be based on a long-term view of recurring scenarios which are unpredictable and hence non-computable in terms of statistical probability, or result in negative impact for society when combined with methods which are risk-averse and ill-equipped to face uncertainty, particularly those that lack agency. Creative experimentation offers agency in joining knowledge from across cultural and industry domains, inclusive of radically different views and ethical considerations. The creative practitioner’s rigorous methods of questioning the subject matter from various perspectives which result in the ability to make meaningful connections between seemingly unconnected phenomena are proving to be essential tools for generating new knowledge from unknown unknowns and mediating the systemic change required to manage complexity.
Positioning the CCI at the centre of cross-domain innovation

Intensified cross-domain collaboration and a new approach to the acquisition of knowledge is a requirement of the current multiple simultaneous humanitarian crises. Within this context, the CCI possess qualities which can spearhead the systemic change required for the reordering of knowledge, skills, supporting systems and future tools. The repositioning of the CCI as an essential driver and shaper of the new cross-domain data-driven landscape highlights a series of new roles for the sector:

- **The CCI as the engine of cross-domain industrial R&D**
  Recent cross-domain industry consultations have revealed requests from industry stakeholders for experimentation which would help them test unexpected outcomes of novel use cases which are emerging when implementing data-driven, and particularly AI-driven systems in e.g. manufacturing processes. The CCI are seen as the leading sector in experimental prototyping methodologies which translate thought into practice in order to uncover unforeseen scenarios in a safe environment, before technologies are fully deployed (e.g. design of brain-computer interfaces for interacting with machinery in order to increase safety at work). These environments for experimentation are typically goal-oriented, driven by societal challenges, and informed by best practice from the long experience of CCI sectors in digital transition. They include testing supporting systems of attribution and tracking of intellectual property in value networks, novel business and collaboration models, and methods which have been successful at motivating moonshots and have led to breakthrough innovation. This in turn provides the framework for testing more agile legislation and/or policy in order to reduce negative incentives and improve the evidence available for decision making, thus feeding policy recommendations directly from the grass roots or from working practice.

- **The CCI as key to innovation in the new cross-domain economy**
  The innovation of the new integrated data economy extracts value from the intersection of cross-domain assets – with hybrid applications, novel use cases, imaginary scenarios, creative simulations, emerging market explorations and solutions to societal challenges. One example is transfer of gesture and data-driven IoT for music playlisting into breakthrough innovation for communication and control systems in heavy duty vehicles for the primary industry. This results in "a new category of innovation, driven by cross-sectorial, cross-domain and cross-societal solutions". The CCI are ideally placed as early adopters of new technologies, by operating close to emerging markets and uniquely positioned to actively connect industrial and knowledge domains into value ecosystems.

- **The CCI as provider of key skills for radical shifts in society, markets and economies**
  Skills such as human-centric design, system design, content design and curation, innovative applications of industrial tools and services, and creative innovation methodologies, based on best practice from a long tradition of design and innovation in the CCI, have evolved with the latest technologies to become essential ingredients of the data-driven economy.

- **The CCI powering agile data exchanges through the design of interfaces**
  Digital interfaces are the most agile enabler of industrial data marketplaces. As well as the traditional CCI domain of the design of graphic user interfaces which are essential drivers of software platforms, the CCI approach has proven very successful at addressing the functionality and applicability of APIs to novel use cases. More recently the CCI have proven to be best placed to exploit the huge potential of tangible user interfaces (TUs) which interact with ubiquitous IoT data in smart cities and regions. An example of what could be considered a tangible user interface is the design of data-driven bike-sharing facilities.
- **The CCI contributing to digital narratives which amplify and stimulate the digital economy**
  As well as leading on audio-visual digital content creation, the CCI sector narrative potential now extends to continuously tracked IoT embedded in all physical spaces, and all objects, artifacts and products, with renewed potential for building culture and meaning in public spaces. In this sense, for example, the data-driven bike-sharing scheme mentioned above becomes the narrative interface between politicians and the civil society.

- **The CCI enabling rapid upskilling and lifelong learning**
  Collaborative and experimental CCI environments have proven to be conducive to rapid knowledge transfer between diverse participants from a variety of social, cultural and professional backgrounds. CCI supporting mechanisms for learning have demonstrated the potential to empower people of all ages and abilities, and unlock new talents and capabilities. Regular considerations of inclusivity, gender equity and accessibility, enable all talent to contribute to innovation for the economy. Some sectors of the CCI have demonstrated the ability to attract high percentages of female participants in technology prototyping, through goal-oriented, creativity-driven, socially-responsible activities, which address major societal challenges and UN Goals.

- **The CCI safeguarding the social and ethical dimension of human-centric technology**
  CCI lead on experiments with humans-in-the-loop, where the technological impact of frontier technologies on human beings – such as AI, deep learning and brain-computer interfaces – can be tested in safe environments, and challenges addressed before technologies are deployed at scale. These experiments test the extent to which the technology enables or obstructs human agency, decision making processes and accountability. This dimension is directly linked to safeguarding health and wellbeing, including new data-and-media-driven issues of privacy, bias and discrimination, physical distancing and isolation, and social media impact on mental health. The resulting technological innovation must be “value bound to human dignity of the individual”, and “socially bound to resilience”.

These observations and recommendations also raise important questions about the policy and industrial infrastructures that could best make use of the opportunities and affordances of the CCI as central to cross-industry innovation:

- What economic and policy mechanisms can more equitably reflect the respective value contributions of creative production and content distribution?
- How can industries participate in and maximise the new cross-domain knowledge and innovation led by the CCI?
- How can creative experimentation that builds new ideas on top of intellectual property from different domains safeguard, attribute and exploit that IP in a controlled and fair manner?
- How can knowledge from the emerging markets explored by the CCI feed back to other industry sectors?
- How can the CCI contribute to the design of a cross-domain ontology ecosystem and facilitate communication across industry sectors?
- How can we ensure sufficiently agile supporting infrastructures to enable the CCI to successfully deliver on the new role and responsibilities at the centre of cross-domain industry innovation?


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