Big Data Value Creation by Example

Jean-Christophe Pazzaglia and Daniel Alonso

Abstract The Big Data Value contractual Public-Private Partnership between the European Commission and the Big Data Value Association (BDVA) was signed in October 2014. Since then, more than 50 projects and numerous BDVA members have explored how data can drive innovation across the data stack and how industries can transform business practices. Meanwhile, start-ups have been working at the confluence of new sources of data (e.g. IoT, DNA, HD pictures, satellite data) and new or revisited processing paradigms (e.g. Edge computing, blockchain, machine learning) to tackle new use cases and to provide disruptive solutions for known problems. This chapter details a collection of stories showing concrete examples of the value created thanks to a renewed usage of data.

Keywords Big data · Best practice · Data-driven innovation · Digital transformation · Success story

1 Introduction

Since the signing of the Big Data Value contractual Public-Private Partnership (PPP) in October 2014, more than 50 projects and numerous BDVA members have explored how data can drive innovation across the data stack and how industries can transform business practices. They are working at the confluence of new sources of data (e.g. IoT, DNA, HD pictures, satellite data) and new or revisited processing paradigms (e.g. Edge computing, blockchain, machine learning) to tackle new use cases and to provide disruptive solution for known problems (Zillner et al. 2017). The dimensions of big data value are multiple: they embrace data; skills; legal

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and policy issues; technology leadership through research and innovation; transforming applications into new business opportunities; the acceleration of business ecosystems and business models, with a particular focus on SMEs; and successful solutions for the major societal challenges Europe is facing in areas such as health, energy, transport and the environment (Cavanillas et al. 2016).

With an initial indicative budget from the European Union of €534 million for the period 2016–2020 and €201 million allocated in total by the end of 2018, the BDV PPP has already mobilised €1570 million of private investments since the launch of the PPP (€467.47 million for 2018). Forty-two projects were running at the beginning of 2019 and the BDV PPP in only 2 years developed 132 innovations of exploitable value (106 delivered in 2018, 35% of which are significant innovations) including technologies, platforms, services, products, methods, systems, components and/or modules, frameworks/architectures, processes, tools/toolkits, spin-offs, datasets, ontologies, patents and knowledge. Ninety-three per cent of the innovations delivered in 2018 had an economic impact, and 48% had a societal impact. In 2018 alone, the BDV PPP organised 323 events (including own events, seminars and conferences) outreaching over 630,000 participants; and taking into account mass media, the Monitoring Report 2018 (*Big Data Value PPP Monitoring Report 2018* 2019) estimated the number of people outreached and engaged in dissemination activities as 7.8 million.

But how to make these numbers tangible? How to explain what the BDV PPP actors achieved? To answer these questions, in Spring 2019 the BDVA and the BDVe project launched the Best Success Story Award to identify and give visibility to success stories based on impact, developed in a way that can be easily explained to a broad audience. The first edition of the award enabled the five finalists to present their stories on stage at the BDV PPP Summit 2019 in Riga (Fig. 1).

The first edition, won by the TransformingTransport project with DataBio/Wuudis as runner-up, had the chance to have Mrs. Dace Melbārde, Member of the European Parliament and former Minister for Culture for the Republic of Latvia, award the prize to Rodrigo Castiñeira González, the project coordinator. The 2020 edition introduced a new category – SMEs and start-ups – and the awards ceremony took place during EBDVF 2020 with the Data Pitch project and the start-up Orbem as winners in their respective categories, while Ubiwhere was distinguished for the quality of its promotional video (Table 1).

In this chapter, we decided to present a set of success stories representative of the BDV PPP activities amongst the 2019 and 2020 participants. Each section shows the collateral provided by the contenders, a summary of the story and contact details to enable the reader to investigate further.

Fig. 1 BDV PPP 2019 Best Success Story Awards Ceremony

Table 1 Main characteristics of the stories

Title	Participant	Industries	Societal impact	SME enablement
How Can Big Data Transform Everyday Mobility and Logistics?	TransformingTransport	Transport	Transformative	
Digitalizing Forestry by Harnessing the Power of Big Data	DataBio/Wuudis	Agriculture	Environment	Yes
GATE: First Big Data Centre of Excellence in Bulgaria	GATE	Research and innovation	Digital divide	Yes
Beyond Privacy: Ethical and Societal Implications of Data Science	e-SIDES		EU policy	
A Three-Year Journey to Insights and Investment	Data Pitch	Incubator Healthcare	Personalised medicine	Yes
Scaling Up Data-Centric Start-Ups	Data Market Services	Incubator		Yes
Campaign Booster	EW-Shopp JOT	Retail		
AI Technology Meets Animal Welfare to Sustainably Feed the World	EDI Orbem	Food	Environment	Yes
Creating the Next Generation of Smart Manufacturing with Federated Learning	Musketeer Comau	Industry 4.0		
Towards Open and Agile Big Data Analytics in Financial Sector	I-BiDaaS CaixaBank	Financial	Cybersecurity	
Electric Vehicles for Humans	Track & Know	Transport	Environment	
Enabling 5G in Europe	Ubiwhere	Telecom		Yes

2 How Can Big Data Transform Everyday Mobility and Logistics?

TransformingTransport (TT) is one of the first two lighthouse projects of the EU Big Data Value Public-Private Partnership. The project, coordinated by Indra, has involved 49 partners. During its 31 months of execution, TT has been able to demonstrate the transformation that big data could bring to the mobility and logistics industries, which represent 15% of the global GDP and employ over 11 million people in the EU-28 zone. TransformingTransport leverages big data to reinvent and optimise mobility and the transport value chain. Significant results from pilots

showed increased traffic observation of 70% in the city of Tampere (Finland), accurate traffic and accident predictions up to 2 h in advance on the AUSOL highway in Spain, reduced overall turnaround times and increased gate capacity of up to 10% at Malpensa Airport, reduced truck driving and handling process of 17% at a critical central EU Corridor (Amsterdam to Frankfurt), and reduced delivery vehicle usage at Valladolid (Spain) of 30% (Fig. 2).

3 Digitalizing Forestry by Harnessing the Power of Big Data

The importance of forests with carbon sink and wood as renewable materials to replace synthetic, oil-based materials is growing rapidly. For this, a digital forest management solution integrated with 'data to decisions' is essential as it makes the business value chain more efficient. The 'forestry pilot' implemented within the scope of the H2020 DataBio project introduced a new standard for a forest management plan to enable easy data sharing across the full range of forest stakeholders. Moving from the static paper-based forest management plan updated every 10 years, the Wuudis forest management platform was introduced to manage all of the forest business data in one place. The introduction of Laatumetsä ('quality forest' in English), a forestry-specific mobile solution for 'fieldwork quality monitoring' and 'forest threat data collection', enables both field workers and citizens to collect forest threat data leveraging AI for automatic image processing. This provides citizens with a unique e-tool to collect forest threat data, and it is the first ever tool in the EU where crowdsourced data has been utilised to control forest damage. Furthermore, the Wuudis platform standard interfaces are developed to integrate different forest data (e.g. data from drone monitoring, very high-resolution satellite data) to develop further services beneficial to the sector (Fig. 3).

Since March 2018, the available amount of open forest data has increased from 0.36 TB to 0.38 TB, the amount of downloaded data has exceeded 10.5 TB, and the service has been visited and data downloaded over 3.5 million times. It is worth noting that the innovations for better forestry developed in DataBio have been tested in the real business environment through customer pilots in Finland, Spain (Galicia), Belgium (Wallonia) and the Czech Republic. This confirms the industry's acceptance of the solutions (Fig. 3).

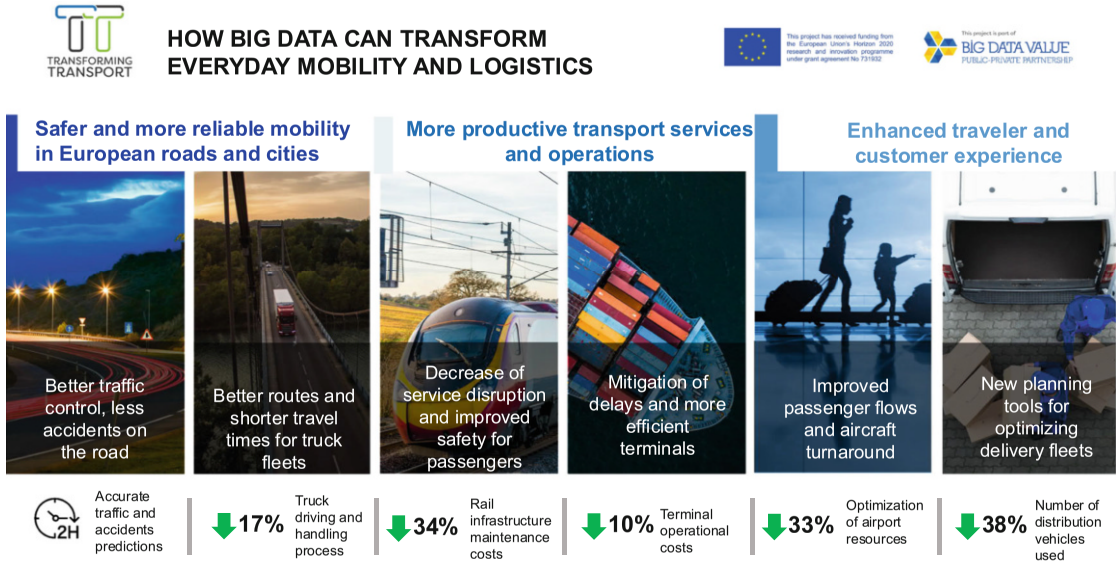
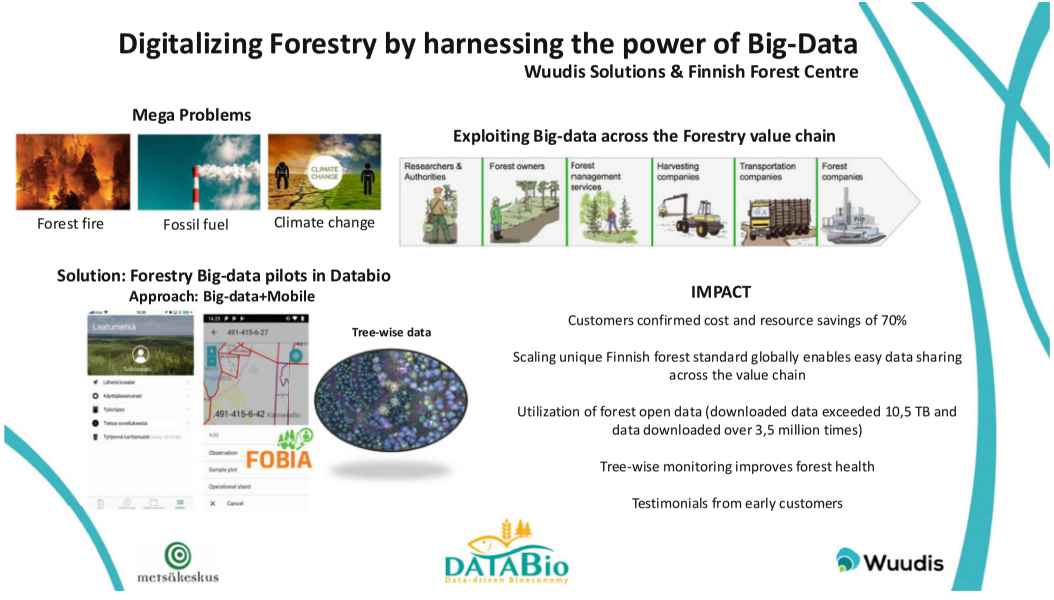


Fig. 2 "How can big data transform everyday mobility and logistics?" Entry



DATABio Data-driven Bioeconomy	Wuudis by DataBio URL: https://www.wuudis.com/en/ Project: https://www.databio.eu/en/ Contact: Seppo Huurinainen seppo. huurinainen@wuudis.com	Industry: Agriculture Runner-up Award 2019

Fig. 3 "Digitalizing forestry by harnessing the power of big data" Entry

4 GATE: First Big Data Centre of Excellence in Bulgaria

The first Centre of Excellence (CoE) in Big Data and AI for Eastern Europe has been launched as 'Big Data for Smart Society' – GATE in Sofia, Bulgaria. The Centre is led by Sofia University 'St Kliment Ohridski', in partnership with Sweden's Chalmers University of Technologies and Chalmers Industrial Technologies (Fig. 4).

Catching the momentum within the booming data and AI-driven EU economy, and supported by the EU's Horizon 2020 Widespread programme, Regional Development Funds and industry, GATE creates a unique research environment and a globally competitive digital hub for big data and AI innovations in future cities, intelligent government, smart industry and digital health. The CoE also accumulates significant expertise and inspires and cultivates the next generation of AI and data scientists and professionals. Providing advanced infrastructure – platform, data, services, and testing and experimentation facilities – GATE City Living Lab, Digital Twin Lab and Visualisation Lab are the heart of a vibrant ecosystem where innovative ideas are generated, developed in projects and applied in effective collaboration with stakeholders. GATE pioneered the usage of the BDVe's best practice guide for big data CoEs, leveraging the collective experience of 31 EU centres on strategy, governance, structure, funding, culture, research-industry collaboration and outreach practice. GATE succeeded in a severe competition, created trust in EC and in the Bulgarian government and industry, and attracted more than €30 million in public and private funding for its operation in the next 7 years.

GATE boosts Bulgarian organisations in target sectors to become, and remain, competitive, thus increasing research capacity and reducing innovation gaps with other EU regions, and also creating confidence amongst citizens and businesses that Bulgaria can efficiently contribute to their needs for a data-driven society and economy (Fig. 4).

5 Beyond Privacy: Ethical and Societal Implications of Data Science

Everywhere we go, from our homes and workplaces to holiday destinations and shopping trips, we generate huge amounts of data which are stored, analysed and used by companies, authorities and organisations. Big data is a feature of our everyday lives (Fig. 5).

Data-driven innovation is deeply transforming society and the economy. Although there are potentially enormous economic and social benefits, this innovation also brings new challenges for individual and collective privacy, security, and democracy and participation. Within this framework, the EU-funded e-SIDES project has provided legal, ethical and economic guidance for big data and AI projects. e-SIDES has shown how these issues can be addressed through the use of privacy-preserving technologies leveraged and implemented in their research and

How can a best practice guide of the Network of National Big Data Value Centres of Excellence facilitate the first Big Data Centre of Excellence in Bulgaria?

It was with great enthusiasm, when we received the news about a recent attempt to create the first dedicated Big Data Centre of Excellence (CoE) in Bulgaria that would also make it the first one in Eastern Europe, according to our findings. This project, "GATE – Big Data for Smart Society", is funded by Horizon 2020 WIDESPREAD-2016-2017 TEAMING Phase 1 programme and involves partners from Sofia University (Bulgaria), Chalmers University of Technology (Sweden) and Chalmers Industriteknik (Sweden). Their goal is to create a sustainable plan for a Big Data Centre that will be evaluated by the European Commission to be given the green light and the necessary European and National funding for the establishment of the CoE.

This whole endeavour is received very positively from the Bulgarian government and industry, as the goal is to foster and develop a vivid data ecosystem not just within the country, but in the region as well, that will pave the way for significant scientific contributions, successful commercial collaborations with industry and high international visibility.

With innovation pillars such as Data Driven Government (public services enhancement and efficient decision making based on Open Data), Data Driven Industry (smart factories production optimization and sustainable precision agriculture), Data Driven Society (better living through smart and sustainable cities creation, advanced health care and improved environment) and Data Driven Science (cultivating new generation data scientists), the GATE project aspires to create a centre that produces responsible research and innovation relevant to the national priority sectors and of European high standards.

The Big Data Value Ecosystem (BDVe) project as part of the Big Data Value PPP is a Horizon 2020 project that aims to create a vibrant data-driven EU economy by supporting the development of a European Network of CoEs in Big Data, as well as the sustainability and acceleration of data-driven businesses and investments. BDVe is developing a best practice guide for Big Data CoEs to support the sharing of best practices for existing centres and to support the establishment of new CoEs such as GATE.

To create this guide, one of the first tasks was to conduct a survey on existing CoEs in Europe, as well as their challenges, successes and strategies. We found that 21 centres belong to Western Europe, 5 to Southern Europe, 5 to Northern Europe. Therefore, it was only natural to realise that GATE is trying to achieve a very important move that aspires to strengthen the research capacity in Big Data in Eastern Europe.

But how can a new Centre in Eastern Europe avail of the best practices of CoEs mostly in the region of Western Europe? Our best practice guide was conducted through extensive literature survey on successful CoEs and it is enhanced by detailed interviews with the key management people from successful CoEs across Europe. "Our goal is to help new centres of excellence to leverage the hard earned experiences and best practices from Europe's leading Big Data CoEs." Dr. Edward Curry from the Insight Centre of Data Analytics who leads the activity in BDVe, noted that "The focus of our best practice guide is on the strategy, governance, structure, funding, cultural, academic/research-industry collaboration and outreach practices for Big Data CoEs, in order to create a guide that could facilitate other centres, new or old. These best practices have been shared with the GATE project in a series of workshops to support them in the creation of their new centre and us validating our guide"

BIG DATA VALUE eCOSYSTEM PROJECT GATE

"The great interest towards GATE was demonstrated at the two days of workshops in Sofia last December that aimed to identify stakeholders' needs and where the project team met with representatives of over 100 organisations in Bulgaria from all sectors. The discussions have resulted in a wealth of ideas for projects that can contribute to the sustainability of cities, enable smarter decision making in administration, make industry more competitive and improve citizen's quality of life." ***Graham Kemp (Chalmers)***

"Our goal is to help new centres of excellence to leverage the hard earned experiences and best practices from Europe's leading Big Data CoEs. The focus of our best practice guide is on the strategy, governance, structure, funding, cultural, academic/research-industry collaboration and outreach practices for Big Data CoEs, in order to create a guide that could facilitate other centres, new or old. These best practices have been shared with the GATE project in a series of workshops to support them in the creation of their new centre and us validating our guide". ***Ed Curry (Insight Centre of Data Analytics, BDVe)***

"A growing ecosystem of digital and high-tech entrepreneurs has emerged in the past years in Bulgaria and many international companies have their IT offices in Bulgaria, in order to tap into the pool of highly qualified ICT specialists. In this process of most rapidly increasing innovation performance at EU, GATE aims to play a pivotal role in this dynamic innovation ecosystem. The project team sees a great opportunity to expand this local ecosystem and to integrate it within the European Big Data community". ***Sylvia Ilieva (GATE Coordinator)***

"The work of the team in BDVe, and Dr Curry in particular, has generously been shared with us in numerous valuable workshop sessions systematically addressing topic by topic. It allows us to build on the collective experience and best practice of Big Data centres in Europe, to draw on successes as well as mistakes, to specialise and be complementary regarding mission and focus, and to add value to Europe as a whole. We could not wish for a better and more efficient support". ***Patrik Carlsson (CIT)***

BIG DATA VALUE eCOSYSTEM PROJECT GATE

GATE big data for smart society	GATE Centre of Excellence URL: https://www.gate-coe.eu/ Contact: Sylvia Ilieva sylvia@acad.bg	Industry: Research and innovation Success Story 2019

Fig. 4 "GATE: First Big Data Centre of Excellence in Bulgaria" Entry

Fig. 5 "Beyond privacy: ethical and societal implications of data science" Entry

architectures at design time. In 3 years, e-SIDES involved more than 3500 stakeholders in 25 events and was selected as the Success Story Innovation Highlight for DG Connect (Fig. 5).

6 A Three-Year Journey to Insights and Investment

At Data Pitch, we understand that data has the potential to create huge value for businesses, that start-ups and entrepreneurs have the initiative and ideas to create solutions to sector challenges, and that large organisations can unlock hidden potential in their businesses by sharing data and collaborating with start-ups. We set a range of Data Pitch challenges relating to the industries that are identified in the SRIA as having shown or predicted significant gains from data innovation. As an example, the aim of the 'Health and Wellness' Challenge – featured in the 2019 Best Success Story – was to identify and analyse patterns in patients' clinical pathways. This first cohort showed the importance for start-ups of working closely with medical data providers in order to manage the challenges surrounding sharing medical data. The result was an increase in client base and pilots' outreach, securing more than €7 million worth of new funding. By end 2019 – the official closure of Data Pitch – we supported 47 data-driven start-ups from 13 different EU countries. Collectively to date, the start-ups have amassed a total of €22.4 million worth of impact through further investment, sales and efficiencies. Not only have we seen great success in terms of impact, but the programme is also estimated to see just a mere 6% (3) death rate of companies over the same period (2022). Data Pitch has not only helped businesses and public sector organisations to unlock value from data, but the partners have also enabled early-stage companies to create viable long-term solutions. By working closely with the Big Data Value Public-Private Partnership (BDV PPP), we aim to share these insights and learnings to support other EU-funded programmes to achieve similar success in helping to drive a positive impact within the European data economy (Fig. 6).

7 Scaling Up Data-Centric Start-Ups

Data Market Services is a consortium of accelerators, investors, consultants, lawyers, universities and corporations created in 2019 under the European Union's Horizon 2020 research and innovation programme (Fig. 7).

Its objective is to serve as a gateway for data-centric SMEs and start-ups in Europe to overcome market barriers through the provision of free services. The list of services provided includes a data science academy, entrepreneurial training, IP and GDPR awareness, standardisation and data workshops, storytelling packages, trust-building, fund-raising packages, and mentoring and venture match-making activities that are tailor-made to the needs and characteristics of their product and

Data Pitch: A three year journey to insights and investment

At Data Pitch, we understand that data has the potential to create huge value for businesses, that startups and entrepreneurs have the initiative and ideas to create solutions to sector challenges, and that large organisations can unlock hidden potential in their businesses by sharing data and collaborating with startups.

As the three-year programme came to a close, we commissioned a study to explore the impact of the programme on its participants, interviewing startups and data providers about their experiences over the course of their participation.

The study, which used both qualitative and quantitative data, evaluates the short and long-term impacts of the Data Pitch programme and puts forward recommendations for future open innovation and data sharing programmes.

Lessons and Insights

Below we highlight our key learnings and takeaways from the assessment, as well as sharing our insights on how other European accelerators might benefit from the findings:

- Data Pitch enabled data-driven innovation that would have not otherwise occurred. In providing a platform for data providers to try out open innovation in a low-risk setting, the programme addressed a gap in the innovation support landscape. Data Pitch also succeeded in laying the groundwork for a sustainable European data innovation ecosystem.
- A clearer focus on startups at 'acceleration-stage' maturity could increase overall performance. To support fairness and competition across the EU, the programme accepted applications from companies that were not considered an SME under the EU classification. The programme worked particularly well for startups who already had a product or service that could be developed further
- Data Pitch's pan-European approach was a huge bonus. Startups who were based outside of traditional innovation hubs, such as London and Berlin, found that the cross-national setup afforded them more opportunities than they would usually have access to. While it made "serendipitous interactions" less likely, the virtual set-up gave them access to a much wider array of data.
- Access to data can affect startups' ability to attract funding. The study found that startups that could access data outside of the Data Pitch programme attracted, on average, €141,000 more in additional funding than startups that could not access other data. The data provided by the data providers was, therefore, an invaluable asset to many of the cohort's startups.

The full Assessment can be found here.

Investment and Long-term Impact

The Data Pitch programme officially ended in December 2019 following the Assessment detailed above. Over the duration of the three year programme, Data Pitch supported 47 data-driven startups from 13 different EU Countries. Collectively to date, the startups have amassed a total of €22,4M worth of Impact through further investment, sales and efficiencies.

The Data Pitch partners received a total of €7.1M worth of EU funding to deliver the programme, and it is estimated within the Assessment that a total of 459% Return on Investment (ROI) will be achieved by the end of 2022. This assumption correlates with the current impact/value we have witnessed the programme participants attain. Some of the highlights can be seen below:

- Danish Startup Vital beats secured a total of €1.7M worth of funding from the European Commission's Eurostars Programme. They will use it to launch their AI alarm in the Netherlands, which supports remote care to prevent and treat cardiac disease by enabling early intervention.
- Radiobotics, a Copenhagen-based company working on an AI-based software solution that is challenging the status quo of musculoskeletal radiology, closed a €1.3M investment round.
- Berlin-based startup IPlytics attempts to solve the problem of patent disputes with its market intelligence platform, which maps multiple data sources to allow companies to search and analyse technology, their competition, market landscapes, and patents. The startup has just raised several million euros in a financing round led by German investors eCAPITAL and Hightech-Gründerfonds (HTGF).
- French Fertility tech startup Mojo has announced a €1.7M seed round of funding led by Nordic seed fund Inventure. Mojo are aiming to make access to fertility treatment more affordable and accessible by using AI and robotics technology to assist in sperm and egg quality

Not only have we seen great success in terms of impact, but the programme is also estimated to see just a mere 6% (3) death rate of companies over the same period (2022). Data Pitch has not only helped businesses and public sector organisations to unlock value from data, but the partners have also enabled early stage companies to create long-term viable solutions.

By working closely with the Big Data Value Public Private Partnership (BDVPPP), we aim to share these insights and learnings to support other EU funded programmes to achieve a similar success in helping to drive a positive impact within the European Data Economy.

data-pitch INNOVATION PROGRAMME	Data Pitch URL: https://datapitch.eu/ Contact: Ryan Goodman ryan.goodman@theodi.org	Industry: Incubator/ healthcare Award winner 2020

Fig. 6 "A three-year journey to insights and investment" Entry

DMS Accelerator	Data Market Services URL: https://www.datamarketservices.eu/ Contact: Alberto Sierra asierra@zabala.es	Industry: Incubator Success Story 2020

Fig. 7 "Scaling up data-centric start-ups" Entry

the company lifecycle. The selection of the portfolio of start-ups is based on a three-step scouting method. First, the businesses are shortlisted from EC-backed and private incubators and accelerators. Then, they are contacted, monitored and analysed to determine if they are an appropriate fit for the programme. Finally, they are categorised according to the lifecycle maturity of the company.

Over a year, Data Market Services recruited a portfolio of 50 start-ups, facilitated 40 meetings with investors and helped to secure €5 million in funding, with 60% of the start-ups increasing their teams (Fig. 7).

8 Campaign Booster

Digital marketing is evolving towards a content and message personalisation, adapting the services and products offered to the user's likes and needs. This trend is also influenced by external factors like weather and events, which strongly affect user digital behaviour (interests) (Fig. 8).

In this scenario, JOT has combined internal predictive tools and the EW-Shopp toolkit aimed at deploying and hosting a platform to easily integrate multilingual consumer-related data with weather and event data to support analytics on top of the enriched data. The toolkit has processed 2 years of marketing data statistics from Spanish and German campaigns, which represents 100 Gb of data on weather and events. More than 3000 models per region were generated.

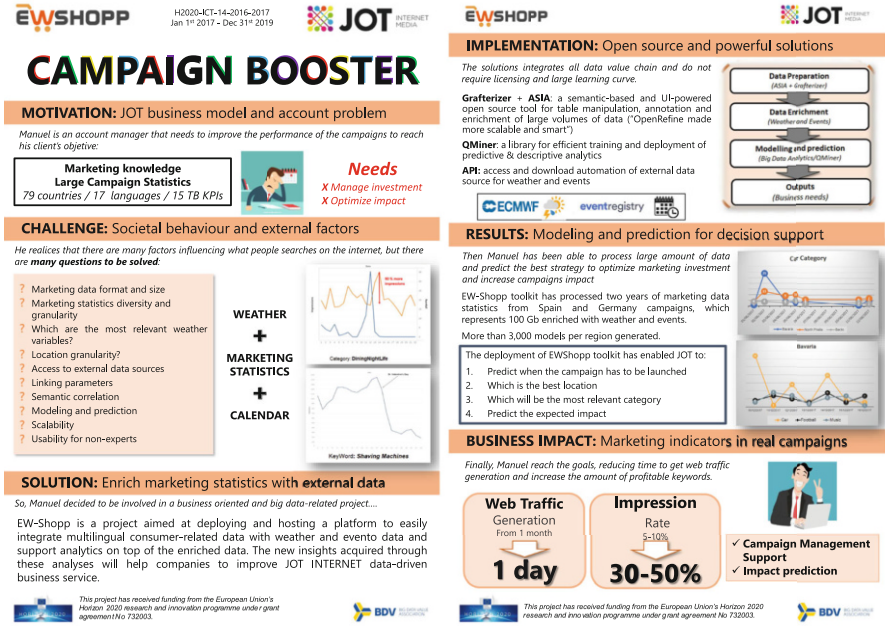
This has enabled JOT to predict (1)when the campaign has to be launched, (2) which is the best location, (3) which will be the most relevant category and (4) the expected impact.

Thanks to this new analytical system, by activating campaigns activated relevant keywords, JOT is now able to generate relevant traffic data in 1 day with 30–50% of impressions (Fig. 8).

9 AI Technology Meets Animal Welfare to Sustainably Feed the World

Every year, the global poultry industry wastes 9 billion edible infertile eggs and kills 7 billion 1-day-old male layers. This is unethical, unsustainable and very expensive. Orbem – a start-up that made it to the final stage of the European Data Incubator (EDI) – is developing AI-powered imaging technology to address these problems (Fig. 9).

Orbem's AI technology combines non-invasive sensor technology with AI algorithms to automatically screen eggs. Specifically, we are developing the Genus: AI-powered magnetic resonance imaging (MRI) technology that predicts the fertility status of eggs before incubation and the sex of embryos in ovo. Throughout the EDI,



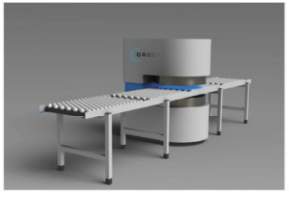
JOT INTERNET MEDIA	JOT by EW-Shopp URL: http://www.jot-im.com Project: www.ew-shopp.eu Contact: Perales Fernando Fernando.perales@jot-im.com	Industry: Retail Success Story 2020

Fig. 8 "Campaign booster" Entry

ORBEM

Orbem: AI technology meets animal welfare to sustainably feed the world

The industrialization of poultry production resulted in the growth of two separate breeds: broilers for meat and layers for eggs. Broilers are optimized to gain weight as quickly as possible, but they suffer from lower fertility rates. Incubating infertile eggs results in waste of time, energy, and resources, as these cannot be consumed once the incubation process has started. Layers are bred to lay as many eggs as possible, leaving males in an unfortunate situation: males don't lay eggs – obviously – but they are also too thin and have inferior meat quality in comparison to broiler meat, so they cannot compete with broilers in the meat market. Consequently, the modern poultry industry is driven to manually sex and then kill all newborn male layers.



Every year, the global poultry industry *wastes 9 billion edible infertile eggs* and *kills 7 billion 1-day-old male layers*. This is unethical, unsustainable, and very expensive. Orbem – a startup that made it to the final stage of the European Data Incubator (EDI) – is developing AI-powered imaging technology to address these problems, making a difference to the triple bottom line: people, planet, and profit.

Orbem's AI technology combines non-invasive sensor technology with AI algorithms to automatically screen eggs. Specifically, we are developing the Genus: AI-powered magnetic resonance imaging (MRI) technology that predicts the fertility status of eggs prior to incubation and the sex of embryos in ovo. Throughout the EDI, we adopted novel Big Data tools to improve AI model performance and to handle the large data streams demanded by the high-volume poultry industry. As a result, our technical solution evolved from proof of concept results to a minimal viable product operating on an industrial-scale computational unit. With these technical results at hand, we were able to confirm the impact of our technology across multiple dimensions.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 779790.

ORBEM

By scanning eggs, we are creating a positive impact for our customers and the society with a triple bottom line strategy:

1. *People* – we're feeding the world by introducing billions of eggs into the food market.
2. *Planet* – we're preventing the unnecessary killing of billions of 1-day-old male chicks, reducing food waste and energy consumption along the way.
3. *Profit* – We're creating new revenue streams, increasing hatchery productivity and efficiency, and dramatically reducing incubation costs.

Orbem's impact is not only significant, it can be fully quantified. The introduction of 9 billion infertile eggs into the food market would be the equivalent of one egg per day for 24.6 million people. This represents 49.7% of 49.5 million children under 5 malnourished due to wasting, according to UNICEF[1]. The prevention of the purposeless killing of 7 billion newborn male chicks is a measure of impact on its own. Moreover, impact towards this planet's species is also directly associated with impact to the planet. Specifically, we will enable sustainable production systems, reducing current hatchery waste by 94% (all infertiles and males) and – accounting for the energy required to power our system – we can reduce energy consumption by up to 40%. Finally, in collaboration with the EDI incubator and poultry producers, we were able to quantify the commercial impact of our solution: we are creating a €2.3 billion yearly market opportunity.

Orbem's end users are enthusiastic by the prospect of installing our solution in their hatcheries. They say that "your technology is the future, now" and "I can't see any reason why this machine wouldn't pay for itself"[2]. At Orbem, we share our customers' enthusiasm, and are looking forward to creating positive ripple effects across our society, our planet, and our economy.

Company information
Web: www.orbem.ai
EDI media material: EDI Experiment Video
EDI presentation: Orbem EDI pitch
Orbem Genus: Genus High Resolution
Founders: Dr. Maria Laparidou, Dr. Pedro Gómez, Dr. Miguel Molina

[1] Malnutrition in Children. UNICEF 2019.
[2] Names excluded intentionally for privacy reasons.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 779790.

ORBEM	Orbem by EDI URL: http://orbem.ai Project: http://edincubator.eu Contact: Gomez Pedro pedro.gomez@orbem.ai	Industry: Food SME Award Winner 2020

Fig. 9 "AI technology meets animal welfare to sustainably feed the world" Entry

Orbem adopted novel big data tools to improve AI model performance and to handle the large data streams demanded by the high-volume poultry industry. As a result, the technical solution evolved from proof of concept results to a minimal viable product operating on an industrial-scale computational unit. With these technical results at hand, they were able to confirm the impact of our technology across multiple dimensions, making a difference to the triple bottom line: people, planet and profit, creating a €2.3 billion yearly market opportunity and the introduction of 9 billion infertile eggs into the food market that would be the equivalent of one egg per day for 50% of 49.5 million children under 5 years of age who are malnourished (Fig. 9).

10 Creating the Next Generation of Smart Manufacturing with Federated Learning

The emerging data economy holds the promise of bringing innovation and huge efficiency gains to many established industries. However, confidentiality and the proprietary nature of data are often barriers as companies are simply not ready to give up their sovereignty. Musketeer offers the capacity to tackle these two dimensions by bringing efficiency while respecting the sovereignty of data providers in industrial assembly lines. Welding quality assessment can be improved using machine learning algorithms, but a single factory might offer too little data to create such algorithms. This requires accessing larger datasets from robots (Comau) located in different places to boost the robustness and quality of the machine learning model. Collecting manual ultrasound testing data and combining it with the welding data from the robot enables the algorithm to be trained locally. In parallel, this machine learning model is trained on different datasets from other factories. Trained models are eventually merged on the Musketeer platform (in a different location) to provide a robust model. Once the model is trained and has a satisfactory accuracy, thanks to this federated approach it becomes possible to provide the classification of the welding spot directly from the welding data. Massimo Ippolito, Head of Digital Innovation and Infrastructure at Comau, states that ‘Using federated and collaborative Machine Learning techniques, Comau will be able to provide innovative maintenance services to their customers providing them more robust and more accurate predictive models, using data coming from different customers plants, while at the same time preserving privacy issues related to Company data’ (Fig. 10).

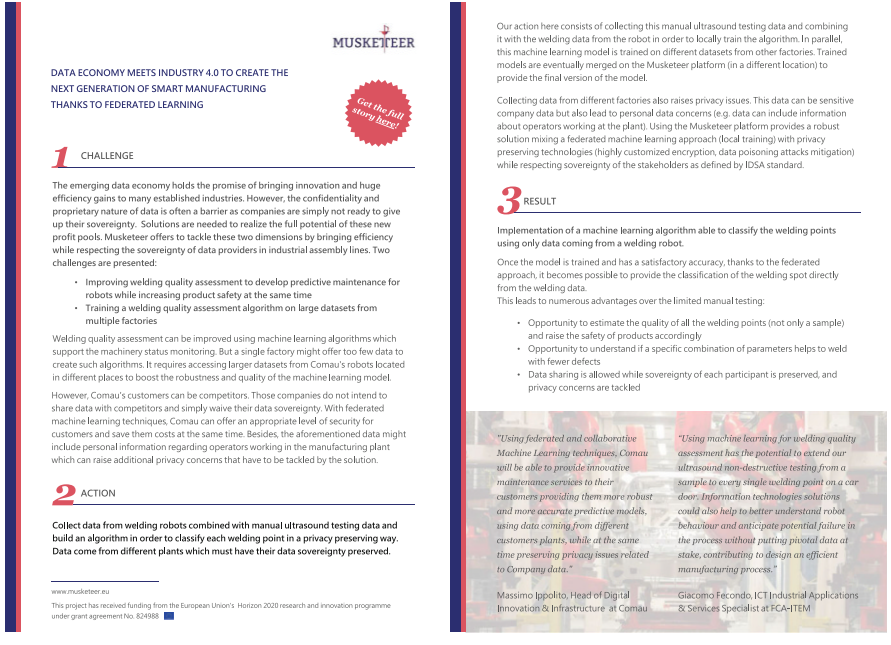


Fig. 10 "Creating the next generation of smart manufacturing with federated learning" Entry

11 Towards Open and Agile Big Data Analytics in Financial Sector

With more than 5000 branches, 40,000 employees and 14 million customers, CaixaBank is one of the largest financial institutions in Spain. Its consolidated big data models use more than 300 different data sources, and more than 700 internal and external active users are enriching its data every day, which is translated into a data warehouse with more than 4 petabytes that increases by 1 petabyte per year. Much of this information is already utilised by means of big data analytics techniques, for example to generate security alerts and prevent potential fraud. CaixaBank receives around 2000 attacks per month. Agility is key in this context, and CaixaBank needed to find ways to bypass rigid processes without compromising security or privacy. The GDPR limits the usage of customer data, even if used for fraud detection and prevention or for enhancing the security of customer accounts. The I-BiDaaS CaixaBank roadmap was a turning point for CaixaBank, and completely changed its approach from non-sharing real data at all positions to looking for the best possible way to share real data and perform big data analytics outside its facilities. I-BiDaaS helped to push for internal changes in policies and procedures and evaluate tokenisation processes as an enterprise standard to extract data outside their premises, breaking both internal and external data silos. This enabled a reduction of 75% of the time to access data by external stakeholders thanks to the use of synthetic data, breaking of data silos, external processing in a compliant way, and evaluation of external big data analytics tools in a much more agile manner (Fig. 11).

12 Electric Vehicles for Humans

Are electric vehicles (EVs) a viable solution for everybody? Within the Track & Know H2020 project, solutions are being developed and tested that, through a mix of mobility data analytics, trip planning and simulation, can analyse the current fuel-based mobility of a user and quantitatively describe the expected impact of switching to EVs on their mobility lifestyle. Electric mobility is frequently addressed as one of the future ways to make cities more sustainable and to improve the quality of life in urban environments.

However, when it comes to private vehicles, the switch has to face the practical difficulties that it might introduce in the lives of travellers, and this is currently a big deterrent for mass conversions to electric vehicles. Single users need to evaluate how their mobility lifestyle is going to change when their fuel-based vehicle is replaced by an electric one, given the various constraints it introduces – the foremost being less independence and (at present) lower availability of recharge points – and in most cases, their lack of means. Our approach includes two answers: 1) numerical Key Performance Indicator (KPI), in particular ‘How often would I recharge?’, ‘How

I-BiDaaS	I-BiDaaS URL: https://www.ibidaas.eu/ Contact: Prof. Sotiris Ioannidis sotiris@ics.forth.gr CaixaBank contact: Ramon Martin de Pozuelo Genis rmartindepozuelo@caixabank.com	Industry: Financial Success Story 2020

Fig. 11 "Towards open and agile big data analytics in financial" Entry

much time would I waste?', 'How much battery/how many euros would I spend?' and 'How much CO2 would I conserve?'; 2) impact on lifestyle, we place the (expected) recharge activities on the Individual Mobility Network (IMN), in order to understand which moments of a user's life will be affected: the home-to-work routine? Trips to occasional destinations?

A mass analysis of several users can help to identify those who easily convert to using EVs and those who have difficulties. Put on a map, this will help to shape market strategies that address different geographical areas in different ways (Fig. 12).

13 Enabling 5G in Europe

Rui Costa and Nuno Ribeiro were two young(er) researchers developing software for the telecom sector when they decided to take a chance and create their own business. The year was 2007, and Ubiwhere was born in the lovely city of Aveiro, on the sunny and windy coast of Portugal. With a team of three inspired and motivated people, the start-up was created to do precisely what the founders did best: research projects for the telecom sector. Building on its know-how, Ubiwhere focused on the research and development of innovative user-centred software solutions, with expertise in Internet-of-things (IoT) and machine-to-machine (M2M) solutions, data management and analysis, open data, and cloud-based services, targeting the future through innovation. In 2015, the company succeeded in taking the first steps into the next-generation network world. Having shown the SME's data analysis skills and ambition, Ubiwhere was invited to participate in two research projects funded by the European Commission, under the first phase of the 5G-PPP programme. This opened the doors to the creation of future-proof concepts and solution. All experts were present to propose an integrated approach for smart cities and city service providers and to combine multiple vertical domains into a unified ecosystem (mobility, environment and energy), allowing service providers to enhance their operational efficiency and cities to make better decisions based on data collected from diverse sources (Fig. 13).

Ubiwhere is now almost 13 years old, with around 70 employees, building solutions to connect people with everything and leveraging an infinite number of possibilities for services in several sectors that can have a real impact on people's lives. This motivation has led Ubiwhere to continually seek partners that can provide strategic value to both its research activities and commercial endeavours. Today, Ubiwhere is enhancing the future of 50 cities around the world (Fig. 13).

Track & Know

Electric Vehicles for humans

Mirco Nanni (ISTI-CNR, Pisa, Italy), Leonardo Longhi (Sistematica S.p.A., Rome, Italy)

EVs as a viable solution for everybody. Or not? Electric mobility is frequently addressed as one of the future ways to make cities more sustainable and to improve the quality of life in urban environments. However, when it comes to private vehicles, the switch has to face the practical difficulties that it might introduce in the life of travelers, and that are currently a big deterrent for mass conversions to Electric Vehicles (EVs). Single users need to evaluate how their mobility lifestyle is going to change when their fuel-based vehicle is replaced by and electric one, given the various constraints it introduces – the foremost being shorter autonomy and (at the present) smaller availability of recharge points – and in most cases they lack the means to do it.

Within the Track & Know H2020 project, solutions are being developed and tested that, through a mix of mobility data analytics, trip planning and simulation, is able to analyze the current fuel-based mobility of a user and quantitatively describe the expected impact of switching to EVs on her mobility life style.

First, know yourself, or at least your mobility. The fundamental requirement for understanding whether EVs are good for me, is to first understand my own mobility. While that might seem a trivial requirement, individual self-awareness is actually surprisingly overestimated. We all know the key components of our own daily life: going to work, coming back home, maybe shopping every Thursday afternoon; yet, getting a complete and detailed picture that includes occasional trips, deviations from normal routines, the distances covered everyday, which places we pass close by, etc. is well beyond the capability of most users. This precise awareness is what we want to achieve first, and we provide a tool for that, called Individual Mobility Networks (IMNs).

IMNs are concise graph representations of the mobility history of individuals (in our case, the mobility of their cars). From raw GPS traces the trajectories of a single mobility user are reconstructed and processed to infer the relevant locations that the user visited (the nodes of IMNs) and aggregate the trips between two locations (the edges of IMNs). Nodes and edges are enriched with several statistics of the associated trips, such as temporal distributions and distances. The following figure shows a pictorial representation of a IMN (left) and several examples extracted from different cities in Tuscany, which reveals a high variability of mobility behaviours, even between users in the same city.

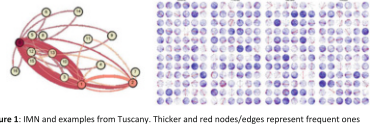


Figure 1: IMN and examples from Tuscany. Thicker and red nodes/edges represent frequent ones

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement No 780754

Track & Know

IMNs allow to automatically identify some of the key components of mobility (home, work, systematic movements, etc.) as well as provide detailed statistics about it (average distance of recurrent trips, stay durations, propensity to make occasional trips), allowing to make more precise evaluations and also to better understand the role of each trip in the overall context.

Simulating my new life with an EV. The approach developed starts from the trips performed by the user in her recent history, and estimates what would be the battery consumption needed to perform each trip, taking into consideration the vehicle type (and its battery capacity), the typical speeds of the roads traversed and the their slope. The battery level is therefore simulated along the whole history, and when it is not sufficient to reach the next destination, a stop at a recharge station is included. This simulation is repeated over various scenarios that consider different recharge options: indeed, some users might have a private garage to recharge during the night; others might work in an EV-recharge-equipped building; somebody might be so lucky to have both of them. The Figure below shows the different (and real) stories of a lucky user that recharges a little at home every day (green dots), and an unlucky one that has to rely on public recharge stations and therefore recharges a lot more each time, yet more rarely (red dots).

Although recharging rarely is appealing for a prospect user, the time spent in a recharge station is in most cases simply wasted, while home/work recharging more efficiently goes in parallel with her life.

An interpretable information for an informed choice. The analysis described above provides the means for measuring and characterizing the changes that EVs would have on my mobility. How to convey this information to the average user in an understandable and usable way? Our approach includes two answers: numerical KPIs, in particular "how often I would recharge", "how much time I would waste", how much battery/euros would I spend", "how much CO2 I would save to the environment"; as numbers are not everything, we place the (expected) recharge activities on my IMN, in order to understand which moments of my life will be affected: the home-to-work routine? My trips to occasional destinations?

The business view. A potential EV user is a potential customer for EV providers and related services. A mass analysis on several users can help identifying those who are more easily convertible to EVs, and those that have more difficulties. Put on a map, this will help shaping market strategies that address different geographical areas in different ways.

Follow the updates on Track & Know H2020 project, G.A. n. 780754: https://trackandknowproject.eu/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement No 780754

Track & Know	Track & Know URL: https://trackandknowproject.eu/ Contact: Jennifer Rainbird jenny.rainbird@inlecomsystems.com	Industry: Transport Success Story 2020

Fig. 12 "Electric vehicles for humans" Entry

ENABLING 5G IN EUROPE

WITH INNOVATION AND TALENT FROM PORTUGAL

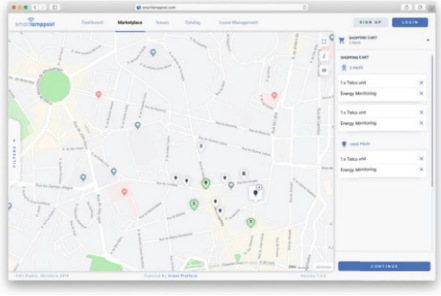
Rui Costa and Nuno Ribeiro were two young(er) researchers developing software for the Telecom sector when they decided to take a chance and create their own business. The year was 2007, and Ubiwhere was born in the lovely city of Aveiro, on the Portuguese sunny and windy coast. With a team of three - inspired and motivated - people, the startup was created to do precisely what the founders did best: research projects for the Telecom sector.

Ubiwhere's first logo

While developing software solutions for the largest Portuguese telecommunications service provider's innovation lab, and working with disruptive technologies for mobile devices that no one remembers about nowadays, Ubiwhere engaged a telecom operator as its customer for the first time in 2008, having managed to join its first international project just one year afterwards. The team started to grow, and so did the ambition. With the technologies and know-how portfolio expanding, Ubiwhere was able to bring to market three new and innovative solutions:

- **Ubistudio**, a real-time (multi-user) collaborative whiteboard software suite, where users could import Powerpoint presentations or edit Office documents, browse websites directly from the slides and annotate the documents shown in the whiteboard from their desktop;

UbiStudio presented by Rui and Nuno at BETT (left), and CeBIT (right), in 2010, when cameras were not that good.



Smartlamppost online marketplace.

Guimarães (Portugal) was the first city to accommodate this pioneering solution, in 2019, to become smarter and more sustainable. It will soon be made available in Barcelona and Évora as well, with so many more to come. A highly strategic vision, solid partnerships (in projects and alliances like BDVA) and EU-funded research have been the building blocks to unlock the potential of novel technologies and successfully implement solutions that can change the world.

Ubiwhere's most recent brand.

Ubiwhere is now almost 13 years old, with around 70 employees, building solutions to connect people with everything and leveraging an infinite number of possibilities of services in several sectors that can have a real impact on people's lives. This motivation has led Ubiwhere to continually seek for partners that can provide strategic value to both its research activities and commercial endeavours.

Today, Ubiwhere is suiting the future of 50 cities around the world.

ubiwhere SUITING THE FUTURE	Ubiwhere URL: https://www.ubiwhere.com/ Contact: Ricardo Vitorino rvitorino@ubiwhere.com	Industry: Telecom Success Story 2020 Best Promotional Video

Fig. 13 "Enabling 5G in Europe" Entry

14 Summary

Ranging from industry transformation to promising start-ups, from agriculture to the retail industry, from the adoption of electric vehicles to ethical and societal policies, we hope that these brief descriptions of the stories give the reader the wish to know more about them. These 13 success stories are only the tip of the iceberg of all the work that is ongoing in the projects and companies from the BDV PPP ecosystem. Exploiting big data requires adding processing capabilities and smart algorithms: in addition to classical analytics tools, we have to highlight that AI technology, especially data-driven AI, is used in the majority of these success stories or the start-ups followed by our different incubators.

The know-how of our members is an extremely valuable asset for Europe, and it is no surprise that several BDV PPP members were instrumental in developing solutions to fight COVID-19 and that INRIA (FR), Orange (FR), INDRA (ES) and SAP (DE) were on the front line in the development of the tracing applications embedded in the privacy by design approach that conforms to the EU's fundamental values.

Choosing amongst all the stories was not an easy task, but we hope that this chapter encourages the reader to learn more about the featured stories and the other stories that we cannot feature due to space limitations. If the reader wants to know more details about these stories and all of the participants in the 2020 contest, they can visit the BDV PPP website at the following URL: https://www.big-data-value.eu/best-success-story-award-2020/.

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