BIG DATA VALUE cPPP

Monitoring Report 2018

Version 1. July 2019

BDV BIG DATA VALUE ASSOCIATION

EXECUTIVE SUMMARY

The **European contractual Public Private Partnership** on **Big Data Value** (**BDV cPPP**) was signed on 13 October 2014 and marked the commitment of the European Commission, industry and partners from research to **build a data-driven economy across Europe**, mastering the generation of value from Big Data and creating a significant competitive advantage for European industry, thus boosting economic growth and jobs[1]. The **Big Data Value Association** (**BDVA**) is the private counterpart to the European Commission in implementing the BDV cPPP.

The BDV cPPP started in 2015 and was operationalised with the launch of the Leadership in Enabling and Industrial Technologies (LEIT) work programme 2016/2017 of Horizon 2020 (H2020). **The first tranche of cPPP projects started on January 2017**[2], with a **second tranche** of projects following in **2018**. The **BDV cPPP projects** cover **Big Data technology, including Artificial Intelligence methods,** and **application research and innovation**, **new data-driven business models**, data **ecosystem support, data skills**, **regulatory and IPR requirements** and **societal aspects**. The value generated by Big Data technologies empowers **Artificial Intelligence** to foster linking, cross-cutting and vertical dimensions of value creation at the technical, business and societal levels **across many different sectors**.

The year **2018** has been a **year of remarkable progress** and **advancements** for the BDV cPPP and the BDVA.

With an **initial indicative budget from the European Union of 534 M€** for the period 2016-2020, and **201 M€ allocated in total by end of 2018**, the **BDV cPPP already has mobilised 1,570 M€** of **private investments** since the launch of the cPPP (467,47 M€ for 2018).

With **42 running projects** at the beginning of 2019, the BDV cPPP in only 2 years has developed **132 innovations** of exploitable value (**106 delivered** in **2018**, 35% of which are **significant innovations**) including technologies, platforms, services, products, methods, systems, components or/and modules, frameworks/architectures, processes, tools/toolkits, spin-offs, datasets, ontologies, patents and knowledge. **93% of the innovations** delivered in 2018 have **economic impact** and **48%** have **societal impact.** In only 2 years the cPPP is already delivering **disruptive innovations** with **high** level **TRLs** close to the **market**.

During 2018 resources have been put in place by the **cPPP CSA BDVe project** to set up the necessary **coordination and collaboration structures and tools** for the projects to **unlock the innovation potential** of the BDV cPPP as a programme such as the **BDV Marketplace**, **BDV Landscape**, the **Education Hub** and the **skills recognition programme**.

The BDV cPPP covers **4 major sectors** with **close to the market large-scale implementations** (**Bio-Economy**; **Transport**, **Mobility** and **Logistics**; **Healthcare**; and **Smart Manufacturing**) and the remaining BDV cPPP projects cover **over 15 different sectors**, including (in addition to the ones already mentioned) Telecom, Earth Observation, Media, Retail, Energy, Finances and banking, Public services, Water and natural resources, Business Services, Smart Cities insurance, public safety, personal security, public tenders, e-commerce, marketing, fashion industry, citizen engagement, ICT/Cloud services, social networks, procurement and legal services.

[1] BDV Contractual agreement and BDV CPPP SRIA
[2] 2 projects of the 15 granted projects of the 2016 call started at the very end of 2016

The BDV cPPP has developed **120 large Scale experiments** (**92 involving closed data**) and **over 389 use cases and experiments** and made available **0,10696 Exabytes** (106,96 Petabytes) of data for experimentation[3].

The BDV cPPP developed during 2018 **181 training activities** involving **over 18 300 participants**. Projects developed 16 interdisciplinary programs during 2018 outreaching **250** participants. **48 job profiles** were created or identified by projects in **2018** and running projects foresee a **direct contribution to job creation** with estimated numbers **over 7 500 directly linked to project activities** by 2023 and many more considering indirect effect.

The BDV cPPP has organised **323 events** outreaching up to **630 000 participants** during 2018 contributing to the professional, user and general public awareness raising, sharing project results and engaging a wide variety of stakeholders in many different sectors and application domains. Overall, **dissemination and communication activities** developed by the projects during 2018 (including events, online media, mass-media communication and others) have outreached **7,8 million people**.

There is also evidence of contribution to the **environmental challenges** with some projects showing **25% and 51% in energy reduction** and improvements concerning **CO_2 emissions reaching up to 29% and to 23%** of emission reductions in general.

Results of the Monitoring Report 2018 show that a wide range of SMEs in Europe benefit from the BDV cPPP, considering **size, age and geographical distribution.** Participation of **SMEs in the BDV cPPP is over 20%** and the BDV cPPP has launched targeted data incubation activities for start-ups. SMEs play a variety of roles in the data value chain[4] and SMEs participating in the BDV cPPP clearly show a trend of **increase in turnover** (60% average with respect to 2014, beginning of H2020, and a 17.7 % increase in the last year[5]) and **increase in number of employee**s (75% with respect to 2014 and a growth of 11.83% in the last year).

During 2018 the **Association** (BDVA) has contributed to the data and data-driven AI ecosystem development by organising **over 10 workshops/events** with members and external communities, 1 **large event** (EBDVF 2018 with 600 participants), and has implemented the third wave of **BDVA i-Spaces labelling**[6], with 10 labelled i-Spaces selected and promoted during 2018. BDVA has developed **7 strategic papers (4 of which have been developed jointly with other communities)** leveraging the work of the BDV cPPP and community towards next Framework Programme. BDVA has also built and developed strong collaborations with other international associations and platforms (euRobotics, ETP4HPC, AIOTI, ECSO, EFFRA, etc) and Standardisation bodies.

BDVA officially joined the **EuroHPC Joint Undertaking** as a **private member** and that way committed strong contribution in the alignment of HPC, Big Data and AI strategies and roadmaps in Europe. Additionally, on December 7th 2018, the European Commission presented an **AI coordinated plan** prepared with Members States to foster the development and use of AI in Europe, proposing the **creation of a new partnership on AI, Data and Robotics** (**AI-PPP**) in the context of Horizon Europe and Digital Europe Programme, building upon both the BDV cPPP and the SPARC cPPP. BDVA and euRobotics have delivered during the first half of 2019 a joint vision paper, a joint Strategic Research, Innovation and Deployment Agenda (SRIDA) and mobilised collaboration with the rest of the Digital PPPs and research communities.

[3] Data for experimentation in the context of the project

[4] This information has not been specifically gathered through a questionnaire but it is known because of the role of the companies in the projects. In future exercise it could be useful to request this information also.

[5] In alignment with the macro-economic figures provided in KPI II.3

[6] All information about the i-Spaces labelling can be found on the BDVA website. General information: http://bdva.eu/I-Spaces. Labelling process and labelled i-Spaces 2018 http://bdva.eu/node/790

ABOUT THIS VERSION

This report is combined with 5 additional annexes (annex 1 directly embedded in this document) providing many additional details.

Main editor: Ana García Robles (Secretary General BDVA) (BDVA Task Force 2 acting lead)

Contributors:

- BDV cPPP projects active in 2018 and for-profit companies part of the projects who provided data and input through the questionnaires. In particular:
  - Projects from the Call 2016: AEGIS, BDVe, BigDataOcean, Data Pitch, DataBio, e-Sides, euBusinessGraph, EW-Shopp, FashionBrain, SLIPO, SODA, SPECIAL, TT, QROWD, MH-MD,
  - Project from Calls 2017: BigDataGrapes, BigDataStack, BigMedilytics, BODYPASS, BOOST 4.0, CLASS, Cross-PPP, DataBench, E2Data, EDI, FANDANGO, I-BiDaaS, ICARUS, Lynx, TheyBuyForYou, Track and Know, TYPHON.
- BDV cPPP projects selected in 2018 but not active until 2019: CloudButton, Data Market Services, ELASTIC, EXA MODE, ExtremeEarth, INFORME, MOSAICO, MUSKETEER, Safe-DEED, SmartDataLake (contribution to SRIA implementation)
- BDVA members[7] who provided data and input through the questionnaires.
- European Commission DG CNECT G1: Annex 3 and some KPIs in part 3 of annex 1 (contribution to programme-level KPIs)
- Gabriella Cattaneo/IDC: Macro-economic KPIs. Input from the European Data Market Monitoring Tool
- Andreas Metzger/Paluno/BDVe project: analysis coverage technical priorities implementation
- Daniel Alonso/ITI/BDVe project: EBDVF 2018 and BDV Meetup 2018 reports

Reviewers and additional contributors:

- Ernestina Menasalvas/UPM/BDVe project: review skills and job creation section
- Andreas Metzger/Paluno/BDVe project: overall review main report
- Jean-Christophe Pazzaglia/SAP/BDVe project: overall review main report
- Thomas Hahn/Siemens/BDVA President: overall review main report
- Maruša Babič/BDVA Secretariat: proof reading main report, annex 2 and 4

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Version 1 (July 2019) First official version of the Big Data Value cPPP Annual Monitoring Report 2018.

***Disclaimer**: This document has been prepared by the Big Data Value Association (BDVA) and it reflects the views only of its authors.*

7 Full list of members in alphabetical order http://www.bdva.eu/?q=members-alph

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1. INTRODUCTION: THE BIG DATA VALUE CPPP

The BDV cPPP started in 2015 and was operationalised with the launch of the Leadership in Enabling and Industrial Technologies (LEIT) work programme 2016/2017 of Horizon 2020 (H2020) **with the first cPPP projects (Call 1) starting on January 2017[8].**

The Big Data Value PPP plays a central role in the **implementation of the revised DSM strategy**[9], contributing to multiple pillars including "Digitizing European Industry", "Digital Skills", "Building the European Data Economy" and "Developing a European Data Infrastructure". The Big Data Value PPP and the BDVA also play a central role in the **European AI and Data Strategies** launched by the European Commission in 2018.

The vision, overall goals, main technical and non-technical priorities, and a research and innovation roadmap for the European Public Private Partnership (PPP) on Big Data Value are defined in the **Big Data Value Strategic Research and Innovation Agenda** (**BDV SRIA**) [10].

The BDV SRIA defines an implementation strategy involving four main mechanisms:

- **I-Spaces** are cross-organisations cross-sector interdisciplinary Innovation Spaces to anchor targeted research and innovation projects. They offer secure accelerator-style environments for experiments for private data and open data, bringing technology and application development together. I-Spaces act as incubators for new businesses and the development of skills, competence and best practices.
- **Lighthouse projects** are large-scale data-driven innovation and demonstration projects that aim to create superior visibility, awareness and impact.
- **Technical projects** tackle specific Big Data technical priorities.
- **Cooperation & coordination projects** foster cooperation for efficient information exchange and coordination of activities, and address non-technical challenges such as skills, ethical issues, etc.

The BDV cPPP SRIA defines the roadmap and methodology describing 3 different phases:

- **Phase I**: Establish Innovation Ecosystem (H2020 WP 2016–2017 calls)
- **Phase II**: Disruptive Big Data Value (H2020 WP 2018-2019 calls)
- **Phase III**: Long-term Ecosystem Enablers (H2020 WP 2019–2020 calls)

The BDV SRIA has been regularly updated incorporating the multi-annual roadmap of the BDV cPPP. BDV SRIA v4 (delivered at the end of 2017) provides direct input to the LEIT WP 2018-2020 as defined in its updated phase II and III.

BDVA[11] is an industry-driven and fully self-financed international non–for-profit organisation under Belgian law. BDVA has 200 members all over Europe with a well-balanced composition of large and small and medium-sized industries (over 30% of SMEs), as well as research and user organisations. BDVA members come together to collaborate in a common mission: developing the **European Big Data Value**

[8] 2 projects of the 15 granted projects of the 2016 call started at the very end of 2016
[9] https://ec.europa.eu/digital-single-market/en/news/digital-single-market-mid-term-review
[10] BDVA SRIA v4.0: http://bdva.eu/sites/default/files/BDVA_SRIA_v4_Ed1.1.pdf
[11] www.bdva.eu

Ecosystem that will **enable the data-driven digital transformation** in Europe delivering maximum **economic and societal benefit**, and **achieving and sustaining Europe's leadership on Big Data Value creation and Artificial Intelligence.**

To achieve this mission BDVA members develop the following activities also included as part of this Monitoring Report 2018:

- **Develop Data Innovation Recommendations**: Providing guidelines and recommendations on data innovation to the industry, researchers, markets and policy makers.
- **Develop Ecosystem**: Developing and strengthening the European Big Data Value Ecosystem.
- **Guiding Standards:** Driving Big Data standardisation and interoperability priorities, and influencing standardisation bodies and industrial alliances.
- **Know-How and Skills**: Improving the adoption of Big Data through the exchange of knowledge, skills and best practices.

The cross-technological nature of the data value chains, flowing across different technologies (IoT, Cloud, 5G, Cybersecurity, infrastructures, HPC, …) has triggered and accelerated during 2017 and 2018 the **development of stronger collaborations** between the BDV cPPP/BDVA and other technological (cross-sectorial) sectorial communities and in particular **with other PPPs.**

During 2018 the BDV cPPP shows remarkable results in value-created in investments, jobs and skills, innovations created and support to SMEs. During 2018 the Association (BDVA) has also developed strong foundations for the future building upon the current BDV cPPP by joining the EuroHPC Joint Undertaking (as private member) and by driving (together with euRobotics) the future partnership on AI, data and Robotics. BDVA has delivered 7 strategic papers during 2018 supporting this strategic roadmap.

During 2017 the European Commission and the Association merged their main European Data Community events in a single new branded European large event: The **European Big Data Value Forum** (EBDVF) (which first edition took place in November 2017 in Versailles), and in 2018 EBDVF is consolidated as the flagship event of the community associated to the Presidencies of the EU (Austria in 2018, Finland in 2019[12], Germany for 2020).

2. MAIN ACTIVITIES AND ACHIEVEMENTS DURING 2018

The main achievements of the Big Data Value cPPP during 2018 can be summarised as follows:

- **Mobilised private investments** since the launch of the cPPP of **1.57 B€** (**468 M€** in 2018).
- **42 projects running at the beginning of January 2019**, with **32 projects active during 2018** (contributing to many of the KPIs) and **10 additional projects selected for funding in 2018** and starting in 2019. Participation of **SMEs over 20%** and targeted data incubation activities for start-ups (25,3% SME participation in call for proposals 2018)
- The **BDV cPPP** has **organised 181 training activities** involving **over 18 300 participants** during 2018. Projects have contributed with **85 training activities during 2018** involving over **9700 participants.**

[12] Associated event to the Presidency in Helsinki 2019

BDVA members contributed with **96 training activities involving over 8500 participants.** Projects have developed 16 interdisciplinary programs during 2018 outreaching **250** participants.

- **48 job profiles** created or identified by projects in **2018.**
- Data skills activities including the launch of the **BDV cPPP Educational Hub** for European MSc programmes in Data Science and Data Analytics and the launch of **the pilot on skills recognition** programme.
- Organisation of **323 events** outreaching **over 630.000 participants** during 2018.
- **106 innovations of exploitable value**, **39** of which are **significant innovations** (37%) delivered by running projects during 2018. The BDVe project launches the **Big Data Value Marketplace**[13] and the Big Data Value **Landscape**[14].
- **77% of the BDV cPPP projects contributing to job creation by 2023**, with an estimation in accumulated numbers of thousands. **Estimated numbers go over 7 500 new jobs created by 2023 linked to project activities** and many more considering indirect effect.
- **2 patents**, over **61 publications** and **24 products or software components** in the field of **advanced privacy and security respecting solutions** for data access, processing and analysis in 2018.
- **63 new economically viable services of high societal value** developed during 2018.
- **100%** coverage of research priorities defined in SRIA, with **204 new systems and technologies** in developed different sectors during 2018. The major focus of technical contributions lies in the "Data Analytics".
- **224 use cases** or/and experiments conducted during 2018 by projects and **165** additional experiments conducted by BDVA i-Spaces.
- **82 large scale experiments** have been developed by the projects during 2018, **64 involving closed (private) data. BDVA i-Spaces** also contributed to this KPI reporting in total **38 large scale experiments** performed during 2018, **28 involving private data**.
- **4 major sectors** (Bio Economy; Transport, Mobility and Logistics; Healthcare; Smart Manufacturing) covered with close to the market large-scale implementations, **and over 15 different sectors covered** in total.
- **0,10696 Exabytes** (106,73 Petabytes) of data made available for experimentation (**86,25 Petabytes** by the projects, **20,71 Petabytes** by i-Spaces).
- Evidence of **contribution to the environmental KPIs**, with some pilots showing **25% and 51% in energy reduction** and improvements concerning **CO_2 emissions reaching up to 29% and to 23%** of emission reductions in general.
- During 2018 Master and PhD students in numbers of **396 equivalent FTEs** (260 Master and 136 PhD) have been involved in PPP projects.
- **SME turnover evolution increase** of **60% increase with respect to 2014** and **17,7% in the last year. Positive trend in employment evolution** with an average increase in employment for the SMEs part of the PPP is of **75% with respect to 2014** and a **growth of 11,83% in the last year**.

13 http://marketplace.big-data-value.eu/
14 https://landscape.big-data-value.eu/

- The European data Incubators **DataPitch** and **EDI** have given support and new opportunities to **47 start-ups and entrepreneurs,** creating impact in revenues, jobs created and competitiveness and supporting them to raise additional private finding.
- Organisation of the **BDV-PPP Meet-up in Sofia** (Bulgaria) in May 2018.
- Organisation of the **European Big Data Value Forum (EBDVF) 2018** event in Vienna (Austria) in November 2018.
- **7 strategic papers developed by the BDVA providing Big Data and AI guidelines to Industry, users, research and Policy makers** in strategic application areas and in collaboration with external communities, and defining the path towards next Multi-annual Financial Framework.
    - **Future Challenges for European Leadership in the Global Data Economy and Data-Driven Society: Input to Framework Programme 9** (March 2018)[15]
    - **Data-Driven Artificial Intelligence for European Economic competitiveness and Societal Progress** (November 2018)[16]
    - **Big Data Challenges in Smart Manufacturing v1** (March 2018)[17]
    - **The Technology stacks of high performance computing and Big Data computing: What we can learn from each other** (Oct 2018)[18]
    - **Joint Vision Paper for an Artificial Intelligence Public Private Partnership (AI PPP)** (March 2019)[19]
    - **TOWARDS A EUROPEAN DATA SHARING SPACE: Enabling data exchange and unlocking AI potential** (April 2019)[20] (initiated in mid-2018)
    - **Strategic Research, Innovation and Deployment Agenda for an AI PPP: A focal point for collaboration on Artificial Intelligence, Data and Robotics. Consultation Release**. (June 2019)[21]
- Third wave of **BDVA i-Spaces labelling**[22], with **10 labelled i-Spaces selected** during 2018.
- **BDVA joins the EuroHPC Joint Undertaking**[23] as one of its private members, bringing synergies between Big Data, AI and HPC and the industry as user viewpoint. BDVA appoints 2 official representatives in the EuroHPC RIAG and 2 additional observers.
- BDVA has developed **collaborations with impact** on technology integration, road mapping and the digitisation of industry challenges, and in particular:
    - Collaboration with euRobotics (MoU signed in December 2018 and joining forces towards a future AI/Data/Robotics PPP)
    - Collaboration **ETP4HPC** (European Technology Platform for HPC) (MoU signed in December 2018. Joining forces for EuroHPC)
    - Collaboration with **AIOTI** (for IoT) (MoU signed in March 2018)

15 http://www.bdva.eu/sites/default/files/BDVA%20position%20to%20Fp9_v1.pdf
16 http://www.bdva.eu/sites/default/files/AI-Position-Statement-BDVA-Final-12112018.pdf
17 http://www.bdva.eu/sites/default/files/BDVA_SMI_Discussion_Paper_Web_Version.pdf
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20http://www.bdva.eu/sites/default/files/BDVA%20DataSharingSpace%20PositionPaper_April2019_V1.pdf
21 http://www.bdva.eu/sites/default/files/AI%20PPP%20SRIDA-Consultation%20Version-June%202019%20-%20Online%20version.pdf
22 All Information about the i-Spaces labelling can be found on the the BDVA website. General information: http://bdva.eu/I-Spaces. Labelling process:Information about labelled i-Spaces 2018: http://www.bdva.eu/node/1172
23 https://eurohpc-ju.europa.eu/

- Collaboration with **EFFRA** (European Factories of the Future Research Association) (MoU signed in March 2018)
- Ongoing Collaboration ECSO (for cybersecurity), 5G (through 5G PPP and for the future Smart Network and Services), the European Open Science Cloud (EOSC)
- **DatSci and AI Awards** (MoU signed in October 2018) for skills and Ecosystem development.

- Official **liaison with the ISO/JTC1/SC42** with the main objective of channelling European input (cPPP) into global **standards for AI and Big Data**. In 2019 BDVA is in the process to sign an MoU with CEN/CENELC and ETSI.
- BDVe project is supporting the **collaboration of the Network of Centres of Excellence in Big Data** and the establishment of a **new Centre of Excellence** in Bulgaria, the first such centre in Eastern Europe.

2.1 Implementation of the calls for proposals evaluated in 2018

The calls evaluated in 2018 included 2 topics (ICT-12, ICT-13) with the deadline for submission of proposals of 17th April 2018. **10 proposals** were selected for funding (success rate of 8,85%) with a total EC contribution of **42,5 Million €** (and an estimated private contribution of 10,4 Million €).

From the total contribution of the EC to the calls 2018 (42,5 Million **€**), 45,7 % goes to private for-profit organisations, 29,0 % to High Education Institutions, 20,5 % to research institutions, 1,1 % to Public bodies, and 3,7% to others. 25,3 % of the original EU allocated budget total goes to SMEs (9,97 Million **€**).

In terms of participant types, 49,4% are private for-profit organisations, 18,4% Research organisations, 25,3% Higher or secondary education, 2,3% public bodies, and 4,6% others. SMEs represent the 25,3% of all participants.

The ratio of **BDVA member participation** for the calls 2018 was about 30% with an allocation of 36% of the budget. Annex 3 (Results from calls for proposals) provides further details and explanations on these results.

Portfolio analysis:

SRIA Mechanism	WP Topics	Projects calls 2016	Projects calls 2017	Project calls 2018
i-Spaces	ICT-14-2016-2017	**EW-Shopp:** Supporting Event and Weather-based Data Analytics and Marketing along the Shopper Journey **AEGIS:** Advanced Big Data Value Chain for Public Safety and Personal Security **QROWD:** Because Big Data Integration is Humanly Possible **FashionBrain**: Understanding Europe's Fashion Data Universe **euBusinessGraph**: Enabling the European Business Graph for Innovative Data Products and Services **SLIPO**: Enabling the European Business Graph for Innovative Data Products and Services **BigDataOcean**: Exploiting Ocean's of Data for Maritime Applications	**BODYPASS:** API-ecosystem for cross-sectorial exchange of 3D personal data **Fandango:** FAke News discovery and propagation from big Data ANalysis and artificial intelliGence Operations **ICARUS:** Aviation-driven Data Value Chain for Diversified Global and Local Operations **TheyBuyForYou**: Enabling procurement data value chains for economic development, demand management, competitive markets and vendor intelligence **Lynx**: Building the Legal Knowledge Graph for Smart Compliance Services in Multilingual Europe **Cross-CPP**: Ecosystem for Services based on integrated Cross-sectorial Data Streams from multiple Cyber Physical Products and Open Data Sources	**N/A**
		Data Pitch: Accelerating data to market **(INCUBATOR)**	**EDI**: European Data Incubator **(INCUBATOR)**	
Lighthouse Projects	ICT-15-2016-2017	**DataBio**: Datan-Driven Bioeconomy	**BOOST 4.0:** Big Data Value Spaces for COmpetitiveness of European COnnected Smart FacTories 4.0	**Deep-Health:** Deep Learning and HPC to Boost Bio-medical applications for Health **LEXIS:** Large-scale EXecution for Industry and Society
	ICT-11-a-2018 (Associated projects)	**TT**: Transforming Transport	**BigMedilytics:** Big Data for Medical Analytics	**CYBELE:** Fostering precision agriculture and livestock farming through secure access to large-scale HPC-enabled .. **EVOLVE:** HPC and Cloud-enhanced Testbed for Extracting Value from Diverse Data at Large Scale
Cooperation and Coordination Projects	ICT-17.a	**BDVe:** Big Data Value ecosystem	N/A	N/A
	ICT-18.b	**e-Sides**: Ethical and Societal Implications of Data Sciences	N/A	N/A
	ICT-13.c	**N/A**	N/A	**Data Market Services:** Supporting the European data market providing free support services to data-centric SMEs and start-ups
Technical Projects	ICT-16-2017 ICT-12-2018	N/A	**BigDataGrapes**: Big Data to Enable Global Disruption of the Grapevine-powered Industries **BigDataStack**: High-performance data-centric stack for big data applications and operations **CLASS**: Edge and CLoud Computation: A Highly Distributed Software Architecture for Big Data AnalyticS **E2Data**: European Extreme Performing Big Data Stacks **I-BiDaaS:** Industrial-Driven Big Data as a Self-Service Solution **Track and Know:** Big Data for Mobility Tracking Knowledge Extraction in Urban Areas **TYPHON:** Polyglot and Hybrid Persistence Architectures for Big Data Analytics	**CloudButton**: Serverless Data Analytics Platform **ELASTIC**: A Software Architecture for Extreme-ScaLe Big-Data AnalyticS in Fog CompuTIng Ecosystems **EXA MODE**: EXtreme-scale Analytics via Multimodal Ontology Discovery & Enhancement **ExtremeEarth**: From Copernicus Big Data to Extreme Earth Analytics **INFORE:** Interactive Extreme-Scale Analytics and Forecasting **SmartDataLake:** Sustainable Data Lakes for Extreme-Scale Analytics
	ICT-18-2016 ICT-13 b - 2018	**SODA**: Scalable Oblivious Data Analytics **MH-MD**: My Health - My Data **SPECIAL:** Scalable Policy-awarE linked data arChitecture for prIvacy, trAnsparency and compliance	**N/A**	**Safe-SEED:** Safe Data Enabled Economic Development **MUSKETEER:** Machine learning to augment shared knowledge in federated privacy-preserving scenarios **MOSAICrOWN**: Multi-Owner data Sharing for Analytics and Integration respecting Confidentiality and Owner control
	ICT-17.b	N/A	**DataBench**: Evidence Based Big Data Benchmarking to Improve Business Performance	N/A

Table 1 shows the mapping of the BDV SRIA mechanisms to the funded projects by the H2020 LEIT WP

2016-17[24] and WP 2018[25] and introduces for the first time in this report the name of all the funded projects as they will be referenced throughout next sections. It includes also the ICT-11-a-2018 projects (HPC and Big Data enabled Large-scale Test-beds and Application) identified as "associated" projects to the BDV cPPP, and although not included in this assessment exercise, contributing strongly to the BDV cPPP SRIA implementation.

[24] Table 1 does not include the sister project from ICT-35-2016 (Enabling responsible ICT-related research and innovation - KPLEX project) was added to the cPPP portfolio

[25] Only calls for proposals resolved during 2018

SRIA Mechanism	WP Topics	Projects calls 2016	Projects calls 2017	Project calls 2018
i-Spaces	ICT-14-2016-2017	**EW-Shopp:** Supporting Event and Weather-based Data Analytics and Marketing along the Shopper Journey **AEGIS:** Advanced Big Data Value Chain for Public Safety and Personal Security **QROWD:** Because Big Data Integration is Humanly Possible **FashionBrain**: Understanding Europe's Fashion Data Universe **euBusinessGraph**: Enabling the European Business Graph for Innovative Data Products and Services **SLIPO**: Enabling the European Business Graph for Innovative Data Products and Services **BigDataOcean**: Exploiting Ocean's of Data for Maritime Applications	**BODYPASS:** API-ecosystem for cross-sectorial exchange of 3D personal data **Fandango:** FAke News discovery and propagation from big Data ANalysis and artificial intelliGence Operations **ICARUS:** Aviation-driven Data Value Chain for Diversified Global and Local Operations **TheyBuyForYou**: Enabling procurement data value chains for economic development, demand management, competitive markets and vendor intelligence **Lynx**: Building the Legal Knowledge Graph for Smart Compliance Services in Multilingual Europe **Cross-CPP**: Ecosystem for Services based on integrated Cross-sectorial Data Streams from multiple Cyber Physical Products and Open Data Sources	**N/A**
		Data Pitch: Accelerating data to market **(INCUBATOR)**	**EDI**: European Data Incubator **(INCUBATOR)**	
Lighthouse Projects	ICT-15-2016-2017 ICT-11-a-2018 (Associated projects)	**DataBio**: Datan-Driven Bioeconomy	**BOOST 4.0:** Big Data Value Spaces for COmpetitiveness of European COnnected Smart FacTories 4.0	**Deep-Health:** Deep Learning and HPC to Boost Bio-medical applications for Health **LEXIS:** Large-scale EXecution for Industry and Society
		TT: Transforming Transport	**BigMedilytics:** Big Data for Medical Analytics	**CYBELE:** Fostering precision agriculture and livestock farming through secure access to large-scale HPC-enabled .. **EVOLVE:** HPC and Cloud-enhanced Testbed for Extracting Value from Diverse Data at Large Scale
Cooperation and Coordination Projects	ICT-17.a	**BDVe:** Big Data Value ecosystem	N/A	N/A
	ICT-18.b	**e-Sides**: Ethical and Societal Implications of Data Sciences	N/A	N/A
	ICT-13.c	**N/A**	N/A	**Data Market Services:** Supporting the European data market providing free support services to data-centric SMEs and start-ups
Technical Projects	ICT-16-2017 ICT-12-2018	N/A	**BigDataGrapes**: Big Data to Enable Global Disruption of the Grapevine-powered Industries **BigDataStack**: High-performance data-centric stack for big data applications and operations **CLASS**: Edge and CLoud Computation: A Highly Distributed Software Architecture for Big Data AnalyticS **E2Data**: European Extreme Performing Big Data Stacks **I-BiDaaS:** Industrial-Driven Big Data as a Self-Service Solution **Track and Know:** Big Data for Mobility Tracking Knowledge Extraction in Urban Areas **TYPHON: P**olyglot and Hybrid Persistence Architectures for Big Data Analytics	**CloudButton**: Serverless Data Analytics Platform **ELASTIC**: A Software Architecture for Extreme-ScaLe Big-Data AnalyticS in Fog CompuTIng Ecosystems **EXA MODE**: EXtreme-scale Analytics via Multimodal Ontology Discovery & Enhancement **ExtremeEarth**: From Copernicus Big Data to Extreme Earth Analytics **INFORE:** Interactive Extreme-Scale Analytics and Forecasting **SmartDataLake:** Sustainable Data Lakes for Extreme-Scale Analytics
	ICT-18-2016 ICT-13 b - 2018	**SODA**: Scalable Oblivious Data Analytics **MH-MD**: My Health - My Data **SPECIAL:** Scalable Policy-awarE linked data arChitecture for prIvacy, trAnsparency and compliance	**N/A**	**Safe-SEED:** Safe Data Enabled Economic Development **MUSKETEER:** Machine learning to augment shared knowledge in federated privacy-preserving scenarios **MOSAICrOWN**: Multi-Owner data Sharing for Analytics and Integration respecting Confidentiality and Owner control
	ICT-17.b	N/A	**DataBench**: Evidence Based Big Data Benchmarking to Improve Business Performance	N/A

Table 1: Portfolio analysis: mapping with the BDV SRIA implementation mechanisms

For what concerns to the **SRIA coverage** (KPI II.10), measured as "% of research priorities covered compared to overall scope of research priorities defined in SRIA" projects have delivered contributions during 2018 covering already **100%** of all the SRIA technical priorities. The major focus of technical contributions lies in the "Data Analytics" priority, followed with some distance by "Data Processing Architectures" and "Data Management". This is a significant change in from MR2017, where "Data Management" was the top priority. A clear trend to focus on technical contributions in the areas of "Data Analytics" and "Data Processing Architectures" was anticipated, thus supporting our explanation that a solid base of "Data Management" solutions will enable analytics and processing innovations. Specific details per technical priority can be found in Annex 2 to this report.

2.2 Mobilisation of stakeholders, outreach, success stories

2018 has been a **year of remarkable progress** and **advancements** for the Big Data Value cPPP and the BDVA.

In its second year of operations, the PPP can show a great quantity and variety of success stories from projects and the Association. Main success stories from projects relate to:

- **Impact created in specific sectors** (e.g. results in the lighthouse projects TT and DataBio already reporting evidence in reduction of operation and production costs, reduction of emissions, improvements on energy efficiency, etc.),
- "**Close to the market**" **technology and solutions** delivered (e.g. FLAIR (framework for Natural Language Processing developed by FashionBrain) is already integrated in the PyTorch ecosystem, or SLIPO workbench already used by other PPP projects and in commercial settings in the PPP POI data sets on a world-scale),
- **Performance** (e.g. BigMedilytics achieved in one of its pilots a better prediction of re-admission for Chronic Heart failure over 50%),
- **Resources generated** (new knowledge, new ontologies, datasets,…),
- **Incubation of new data-driven businesses** (47 start-ups in 2018 with individual success stories),
- **Research excellence** (publications and paper awards),
- **Impact in Standardisation**, and,
- Strong foundations put in place for future activities.

The European data Incubators/accelerators DataPitch and EDI have given support and new opportunities to 47 start-ups and entrepreneurs helping them to grow their business in the new Data Economy offering skills development, access to resources, data, infrastructure, ecosystem and additional private funding. This has generated significant impact in revenues, jobs created and competitiveness.

It is important to highlight the **positive effect that participation in a larger programme** brings to individual projects. 80% of the projects reported value created for their Research and Innovation projects by being part of the BDV cPPP e.g. facilitating collaboration and exchanges in between projects, such as complementary functionalities (e.g. SLIPO and QROWD), re-use of projects outcomes (functionality, solutions or ontologies, data sharing[26] and specific know-how sharing. Additionally, the PPP is seeing to be effective in coordinating communication activities, providing new opportunities for Start-ups and providing a common framework and vocabulary to develop effective end-to-end ecosystems.

26 Discussions going on in between projects working in same sector

A summary and examples of success stories from the projects and the BDVA members can be found in Annex 4 section 4.

It is also quite remarkable the overall impact in communication and engagement of the PPP overall with estimated numbers of people outreached in dissemination activities around **7,8 million people** in 2018 with the objective of raising awareness about their different activities, to engage new stakeholders, and communicating results:

- Over 630 000 participants have been outreached through events, conferences, etc.
- Over 10 000 have been engaged in online activities such as webinars, online training, etc.
- Over 5,8 Million people have been outreached via mass media, online or physical format, and,
- Over 1,3 Million people have been outreached via other ways of communication and dissemination.

Additionally, the **BDV cPPP** has **organised 181 training activities** involving **over 18 300 participants** during 2018. The **range and diversity of actors and stakeholders** outreached is very broad, in alignment with the overall objectives of the PPP.

BDVA has successfully developed **collaborations** with other PPPs, European and international standardisation bodies, industrial technology platforms, AI and data-driven research and innovation initiatives, user organisations and policy makers at national, European and international level. To highlight[27]:

In 2018 BDVA has established **official collaboration agreements** with **euRobotics**, **ETP4HPC**, **AIOTI**, **EFFRA**, and **the DatSci and AI awards**, and it is strengthening collaboration with many others (ECSO, IDSA…)

BDVA has **officially joined the EuroHPC Joint Undertaking** as a private member (together with ETP4HPC) with the objective of shaping and strengthening European innovation on HPC/Big Data/AI related technologies and services by taking innovation joint efforts based on industrial needs.

BDVA and euRobotics have joint forces to develop a **new partnership in AI-Data-Robotics**, leveraging investments, knowledge synergies and outputs from the **BDV and SPARC cPPPs** towards next framework programme, aiming at transforming this new partnership in a focal point for Europe with focus on adoption and impact in business and society. This new partnership is part of the AI Coordinated plan in between European Commission and Member states published last December 7th 2018. In this line **BDVA has also established an official liaison with ISO/IEC JTC1/SC42.**

In addition to this, the Association (**BDVA**) has also contributed with the organisation of 2-day events with 6 Activity Groups (with an average attendance of 50-70 participants, BDVA members and external guests), the organisation of 2 standalone workshops (Data4AI and DIH on Big Data), and it has supported organisation and participated in over 10 other events with speakers and by organising workshops.

All these activities deployed during the year culminated in the **European Big Data Value Forum 2018** (Vienna on November 12-14 2018), flagship event of the Big Data and Data-Driven AI community, **organised by the Austrian Government** (host and main organiser as official event of the Austrian Presidency to the EU)**, BDVA and the European Commission** where all projects, BDVA members and many external actors in the European Big Data and AI landscapes had the opportunity to meet, share experiences, present their achievements, and discuss about the future[28].

[27] Annex 4 section 1 and 2 provides details of BDVA international and national collaborations.
[28] Report of EBDVF 2018 in Annex 4

2.3 Governance

The main governance structure of the BDV cPPP (

Figure 1), was prepared and delivered at the beginning of the cPPP to provide the framework for collaboration and alignment among all members of the cPPP (EC, funded projects, the Associations and its members).

The **Cooperation Charter**[29] was created by the Association as one of the key governance mechanisms to facilitate cooperation among the BDV cPPP actions and the BDVA and updated every year accordingly.

The BDVe project[30] (CSA of the BDV cPPP) has supported the implementation of the PPP projects Governance structure by establishing the BDV cPPP **Steering Committee** (SC) and the **Technical Committee** (TC). The Steering Committee (SC) provides executive-level steering and advice to ensure effective and efficient coordination and communication between the BDV cPPP actions. The Technical Committee (TC) facilitates knowledge exchange and cooperation on the technical aspects, methodology and implementation of the BDV cPPP programme. During 2018 the PPP organised 1 SC meeting and 2 TC meetings. In particular:

- SC03 meeting, 8th Feb 2018, Brussels
- TC02 meeting, 15th May 2018, Sofia
- TC03 meeting, 14th Nov 2018, Vienna

A non-formal Communication Committee was also established to support cooperation in Marketing and Communications.

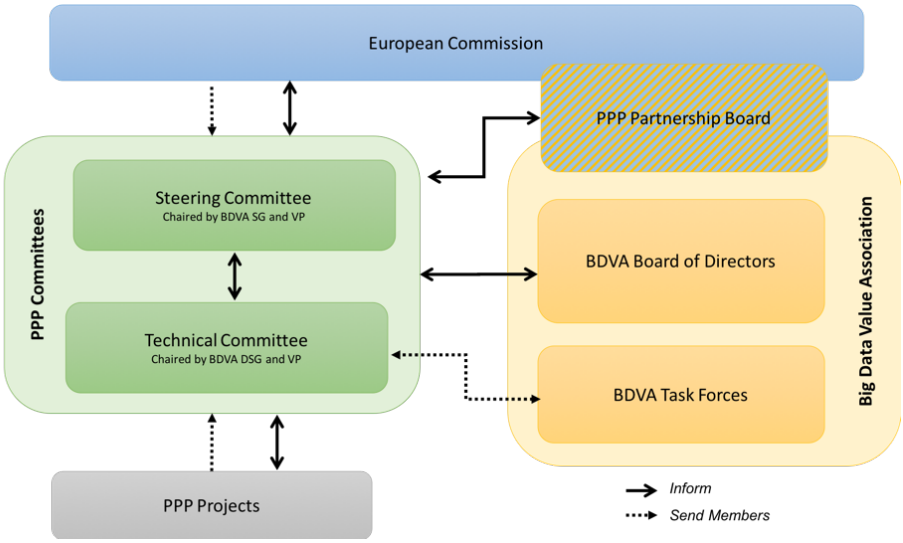

Figure 1: BDV cPPP Governance structure

The **Board of Directors**[31] (BoD) of BDVA is selected by the General Assembly of the Association (2-year mandate) and is in charge to achieve the Objectives of the Association. It follows the resolutions,

[29] The Cooperation Charter was produced by the BDVA during 2016 and it has been integrated in the CAs or GAs of the Call 1 and 2 actions, thereby formalizing the actions' commitment to supporting the cooperation among the BDV ecosystem. Latest version: http://www.bdva.eu/sites/default/files/BDV%20PPP%20COOPERATION%20CHARTER%20January%202019_approved.pdf

[30] Reported as part of BDVe project D3.17

[31] List of BoD members: http://www.bdva.eu/board-members

instructions and recommendations adopted by the General Assembly. During 2018 the Association Board organised 10 official meetings. The BDVA **General Assembly** (GA), conformed by all the BDVA members, approves the general policy of the Association. During the year 2018 the GA was officially convened 4 times (4 official meetings). The **BDVA Task Forces**[32] (TFs) are the main centres of BDVA activities and are regulated by its bylaws and established or dismissed by the BoD. Details of all activities and meetings organised by BDVA can be found in Annex 5.

The **Partnership Board** (PB) is the monitoring body of the cPPP formed by selected directors of the Board of the BDVA, and representatives of the European Commission. The PB meets approximately 1-2 times per year and complements this with regular bi-weekly exchanges of information. The European Commission is represented by DG Connect Directorate G (Unit G1 in particular). Following the elections of the BoD on November 2018, 10 Association directors were appointed during 2019 to renew the PB PSM. Appointment is based on expression of interest and assessment on the balance in composition.

During 2018 **one official Partnership Board** meeting was held: **PB09** on June 19th, 2018 (Brussels). **Discussion topics** included vision and strategy for the BDV cPPP in particular towards next MFF, engagement with other PPPs and other initiatives, contribution to different application domains, SRIA and input to Work Programmes, review of overall progress in commitments and achievements from the private and public side, cPPP mid-term review (cPPP KPIs), cPPP implementation topics, governance, common events (EBDVF) and overall progress.

3 MONITORING OF THE OVERALL PROGRESS SINCE THE LAUNCH OF THE CPPP

3.1 Achievement of the goals of the cPPP

According to the Big Data Value PPP SRIA v4[33] the programme will develop the European data ecosystem in distinct phases of development, each with a primary theme. The three phases are:

- Phase I: Establish the ecosystem (governance, i-Space, education, enablers) and demonstrate the value of existing technology in high-impact sectors (Lighthouses, technical projects) (Work Programme WP 16–17).
- Phase II: Pioneer disruptive new forms of Big Data Value solutions (Lighthouses, technical projects) in high-impact domains of importance for EU industry, addressing emerging challenges of the data economy (WP 18–19).
- Phase III: Develop long-term ecosystem enablers to maximise sustainability for economic and societal benefit (WP 19–20).

The cPPP goals achieved are analysed based on the defined roadmap. Year 2018 lays between phase I and phase II so the progress of the PPP is assessed considering objectives of both phases.

Phase I: Establish Innovation Ecosystem (WP 2016-17), focused on laying the foundations needed to establish a sustainable European data innovation ecosystem. In particular (Table 2):

[32] http://www.bdva.eu/task-force-overview
[33] And Multi-Annual roadmap version 2017

Expected cPPP activities and outcomes for WP2016-17 according to BDV cPPP SRIA / Multi-Annual roadmap	Achievements
Establish a European network of i-Spaces for cross-sectorial and cross-lingual data integration, experimentation and incubation (ICT14 – 2016–17)	• **15 projects** running in 2018 **including 2 European Data Incubators.** • **10 labelled BDVA i-Spaces** providing data experimentation and data incubation capabilities for SMEs. • **Over 15 sectors covered** • **82 large scale experiments** have been developed by the projects during 2018, **64 involving closed (private) data. BDVA i-Spaces** also contributed to this KPI reporting in total **38 large scale experiments** performed during 2018, 28 of them involving private data. • **0,10696 Exabytes** (106,96 Petabytes) of data made available for experimentation (**86,25 Petabytes** by the projects, **20,71 Petabytes** by i-Spaces).
Demonstrate Big Data Value solutions via large-scale pilot projects in domains of strategic importance for EU industry, using existing technologies or very near-to-market technologies (ICT15 – 2016–17)	• **4 lighthouse projects** running in 2018. Additional 4 HPC-Big data enabled lighthouse projects associated projects) selected in 2018 to start in 2019 • 4 major domains of strategic importance covered: **Bio Economy; Transport, Logistics and mobility; Healthcare; and Manufacturing**.
Tackle the main technology challenges of the data economy by improving the technology, methods, standards and processes for Big Data Value (ICT16 – 2017).	• 100% of SRIA technical priorities covered in 2018. • 7 technical projects running in 2018 and 6 additional projects funded (started in 2019) • **132 innovations** of exploitable value (**106 delivered** in **2018**) 35% of which are **significant innovations**, and including technologies, platforms, services, products, methods, systems, components or/and modules, frameworks/architectures, processes, tools/toolkits, spin-offs, datasets, ontologies, patents and knowledge. • **204 new systems and technologies** developed different sectors during 2018. The major focus of technical contributions lies in the "Data Analytics". • BDV cPPP reference model (2017)
Advance the state of the art in privacy-preserving Big Data technologies and explore the societal and ethical implications of this (ICT18 – 2016).	• **4 projects running in 2018** (1 focused on societal and ethical implications). **3 additional projects selected in 2018** and starting in 2019 to scale solutions • **2 patents**, over **61 publications** and **24 products or software components in the field of advanced privacy and security respecting solutions** for data access, processing and analysis in 2018. • BDVA TF5 (Societal and Ethical aspects of Data, among other things)
Establish key ecosystem enablers including programme support and coordination structures for industry skills and benchmarking (ICT17 – 2016-17).	• **BDV Marketplace**, **BDV Landscape**, the **Education Hub** and the **skills recognition programme** • The **BDV CPPP** has **organised 181 training activities** involving **over 18 300 participants** during 2018. Projects have contributed with **85 training activities during 2018** involving over **9700 participants. BDVA members** contributed with **96 training activities involving over 8500 participants.** Projects have developed 16 interdisciplinary programs during 2018 outreaching **250** participants. • Centres of Excellence in Big Data

	• EBDVF and BDV cPPP Meet-up (summit in 2019) • DataBench project ongoing

Table 2: Summary achievements of the goals of the BDVA cPPP: Phase I of the roadmap

Phase II: **Pioneer disruptive new forms of Big Data Value solutions** (Lighthouses, technical projects) in high-impact domains of importance for EU industry, addressing emerging challenges of the data economy (WP 18–19). According to the SRIA this second phase is meant to build on the foundations established in Phase I, and will have a primary **focus on Research and Innovation** (R&I) activities to deliver the next generation of Big Data Value solutions. Although the projects implementing phase II started in 2019 (or will start in 2020) there are some activities in 2018 supporting the implementation of this stage. In particular (Table 3):

Expected cPPP activities and outcomes for WP2018-19 according to BDV cPPP SRIA / Multi-Annual roadmap	Achievements
Supporting the emergence of the data economy with a particular focus on accelerating the progress of SMEs, start-ups and entrepreneurs, as well as best practices and standardisation (ICT-13-c).	• 10 labelled BDVA i-Spaces providing data experimentation and data incubation capabilities for SMEs. • 2 European Data incubators (EDI and DataPitch) with 47 Start-ups incubated during 2018. • Data Market Services project started in 2019 (support to SMEs and Standards).
Pioneering disruptive new forms of Big Data Value solutions with the Cloud and HPC or the IoT via large-scale pilot projects in emerging domains of importance for EU industry using advanced platforms, tools and test-beds (ICT-11, DT-ICT-11-2019).	• 4 ICT-11-a-2018 projects (HPC and Big Data enabled Large-scale Test-beds and Applications) funded in 2018 and started in 2019 (associated projects to the PPP). Cooperation established with the new projects. • 2 additional projects selected in 2019 for IoT-Big Data (ICT-11-b-2018)
Tackling the next generation of Big Data research and innovation challenges for extreme-scale analytics (ICT-12-a).	• 6 technical projects selected in 2018 (started in 2018) with focus on extreme-scale analytics. • From the running projects in 2018 there is a clear trend to focus on technical contributions in the areas of “Data Analytics” and “Data Processing Architectures”, thus supporting the explanation that a solid base of “Data Management” solutions will enable analytics and processing innovations.
Addressing ecosystem roadblocks and inhibitors to the take up of Big Data Value platforms for data ecosystem viability, including platforms for personal and industrial data (ICT-13).	• 3 projects selected for funding in 2018 (started in 2019) to advance the state of the art in the scalability and computational efficiency of methods for securing desired levels of privacy of personal data and/or confidentiality of commercial data. • Call for proposals for ICT-13-a for setting up and operating platforms for secure and controlled sharing of "closed data" (proprietary and/or personal data) closed in April 2019.
Providing programme support (continuing), facilitating networking and cooperation among ecosystem actors and projects, and promoting community building between BDV, Cloud, HPC and IoT activities (ICT-12-b).	• BDVA has built strong collaborations with ETP4HPC (for HPC), AIOTI (for IoT), EFFRA and euRobotics • BDVA has become private member of the EuroHPC Joint Undertaking. • BDVe project supports collaborations.

Table 3: Summary achievements of the goals of the BDVA cPPP: Phase II of the roadmap

3.2 Progress achieved on KPIs[34]

3.2.1 Mobilised Private Investments (I.1)

Through this KPI we attempt to understand and capture/show the level of industrial engagement within the BDV cPPP. This KPI includes both direct and indirect leverage as described in Figure 2.

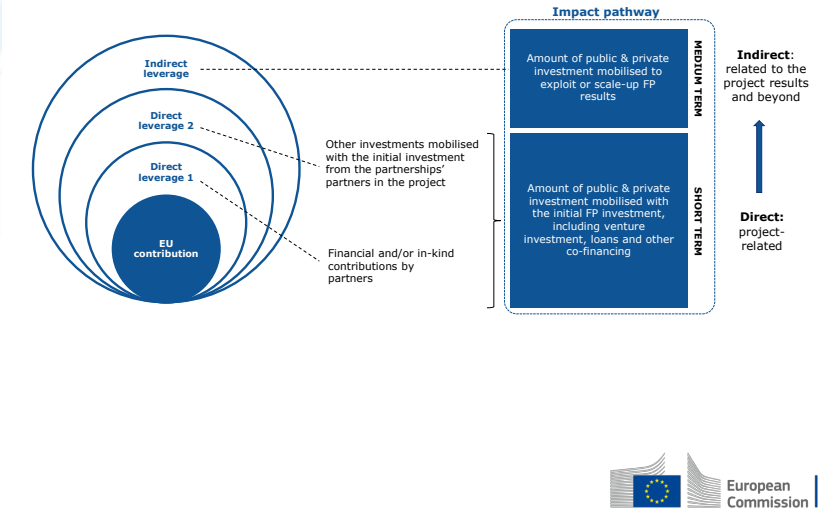

Figure 2: Methodology and KPI structure proposed by EC for MR2018 (cPPPs)

To calculate both the private investment mobilised in R&D activities and the private expenditure mobilised in projects, **a questionnaire was sent out to 296 companies** representing all **for-profit organisations** participating in Big Data Value cPPP projects active during 2018 (including not only projects partners but also third parties engaged through cascade funding) and all for-profit organisations members of BDVA. In total **121 for-profit organisations provided input** to this KPIs (overall response rate of 40,9%).

Table 4 shows the overall results of private investments for 2018.

Description	2018 (Meuros)	Response rate (%)
EC: EU contribution received for projects under the cPPP	**63,52**	Calculated over 100%
Direct leverage (A = A1 + A2)	**19,16**	
A1: Direct contributions from the industry to the cPPP projects, as predetermined in the projects (co-funding)	9,64	Calculated over 100%
A2: Additional investment or resources spent by your company for the execution of cPPP projects, beyond the direct contributions under A1 (these are typically due to shortfalls in fixed overheads for a project, infrastructure costs not covered by direct funding, consumables and	9,52	19%

[34] Details in methodology, response rates, and detailed outcomes and analysis can be found in annex 2.

maintenance costs, equipment costs, additional personnel costs, other costs)		
Indirect leverage (B = B1 + B2)	**448,31**	
B1: Additional investment or resources spent as a follow-up to the activities and results related to cPPP projects (e.g. to exploit or scale-up results) and that are not supporting directly the execution of these projects. This can include additional funding mobilised thanks to the cPPP projects such as venture capital, other public funding, etc.	7,57	7%
B2: Additional investments or resources spent that support the objectives of the cPPP and that have been triggered/encouraged by the existence of the cPPP, but that are not following up activities or results of the cPPP projects as such (hence, not counted in A1, A2 and B1).	440,74	31%

Table 4: Investment results 2018

Details of the methodology used to calculate these numbers as well as the specific questionnaires used to collect the information can be found in Annex 2 to this report.

Table 5 shows the evolution of reported numbers in private investments from 2015 to 2018.

KPI	Description	Unit	2015	2016	2017	2018	TOTAL
B2	Estimate the amount of R&D expenses that are related to the Big Data PPP but are not related to EC funded projects. (This excludes any expenses that are funded by the EC by definition!)	MEUR	245,80	289,10	388,67	370,33	**1 293,90**
B2	Estimate the amount of R&D expenses resulting from follow-up investments of projects funded by the EC that are topic-wise related to the Big Data PPP however initiated outside the Big Data PPP (in FP7 or in H2020). (This excludes any expenses that are funded by the EC by definition!)	MEUR	35,10	49,40	83,55	70,40	**238,45**
B1	Estimate the amount of R&D expenses resulting from follow-up investments of Big Data PPP projects (This excludes any expenses that are funded by the EC by definition!)	MEUR	N/A	N/A	1,09	7,57	**8,67**
A2	Additional investments in execution of PPP projects (in BDV CPPP projects). (This excludes any expenses that are funded by the EC by definition!)	MEUR	N/A	N/A	3,46	9,52	**12,97**
A1	Annual private contribution (estimated for reporting period 2018)	MEUR	N/A	N/A	5,48	9,64	**15,12**

Table 5: Evolution of private investments on BDV cPPP over time[35]

[35] Input to PPP project investment was 0 before 2017 as project had not started. Number 12,4 MEuros is calculated based on real input extrapolated based on percentage of responses and expected annual private investment explained ealier.

[31] Considering the response rate we can assume this number is much higher, but as in previous years we only report on aggregated numbers based on real individual inputs with no extrapolation. As the methodology used this year to calculate this KPIs is the same that the one used in previous

Aggregated to the numbers reported in 2015 (280,9 M€), 2016 (338,5 M€) and 2017 (482,25 M€) the amount of mobilised private investments since the launch of the cPPP is **1 569,1 M€ (1,57 B€).** Considering the amount of EU funded allocated to the cPPP so far (201,30 M€) the BDV cPPP ends 2018 with a **leverage factor of 7,8** much higher than the leverage factor of 4 committed contractually.

3.2.2 Job creation, new skills and job profiles (I.2, II.8)

77% of the BDV cPPP projects indicated their project will contribute to job creation by 2023, with an estimation in accumulated numbers of thousands. **Estimated numbers go over 7 500 new jobs created by 2023 linked to project activities** and many more considering indirect effect.

BDV cPPP projects contribute to job creation in Europe by 1) **increasing of market share of Big Data Technology providers** in Europe; 2) developing **new job profiles** that generate new jobs; the creation; 3) **developing new opportunities for entrepreneurs and start-ups** in the new Data Economy; 4) generating job opportunities by **increasing data sharing**; 5) creating new **jobs** already **during the life time of the project**; and, 6) forecasting jobs created as a **follow up of project results**.

On the other hand, **40% of the BDVA members stated that their participation in the BDVA/BDV CPPP has already contributed** directly or indirectly **to job creation**, either directly because of the hiring of new experts to develop H2020 projects, start-ups created...), and/or new profiles hired to develop operations.

Projects reported **48 job profiles were created or identified in 2018**, and 106 new job profiles are reported as expected to be created from 2019 onwards and by the end of the project linked to the project activities. Projects directly contributing to new job profiles are DataPitch, SODA, TT, MH-MD, BigMedilytics, Boost 4.0, E2Data, EDI, and TYPHON. 30% of the projects running in 2018 reported contribution to the creation of **new job profiles**. Some examples include Data scientists with special expertise in health sector and Knowledge Engineers in the health sector (BigMedilytics and MHMD), Big Data Infrastructure Engineer (EDI) and Hybrid Data Manager (Typhon). Details are provided in Annex 2 to this report.

67% of the projects running in 2018 reported **contribution to the generation of new skills** by end of the project. In addition to the skills linked to the new job profiles new skills are expected to be developed in cross sectorial domains (e.g. new skills in the form of 'privacy aware data processing' and 'privacy aware big data innovation' as reported by the SPECIAL project) and in specific sectors (e.g. analysis techniques using weather data, reported by the EW-SHOPP project). Some projects will contribute to the combination of skills and expertise needed to support users in an end-to-end scenario (e.g. DataBio project, where workers need to combine expertise in Big Data technologies, Earth Observation technology and services, domain knowledge in agriculture, forestry or fishery). The BDV cPPP incubators (DataPitch and EDI) help developing skills of start-ups in both technical and non-technical skills needed to develop business in the Data Economy.

Among the **BDVA members**, **51%** of organisations have reported contribution to the **creation of new job profiles** and **almost 60% contribute to the creation of new skills linked to the Big Data Value**. Finally, 60% of the projects and 51% of the BDVA members have reported contributions to the to the Skills Agenda for Europe.

The **BDV cPPP** has **organised 181 training activities** involving **over 18 300 participants** during 2018. Projects have contributed to this with **85 training activities during 2018** involving over **9700 participants. BDVA members reported 96 training activities involving over 8500 participants.** Projects have developed 16 interdisciplinary programs during 2018 outreaching **250** participants.

During 2018 Master and PhD students in numbers of **396 equivalent FTEs** (260 Master and 136 PhD) have been involved in PPP projects therefore collaborating with industrial players in developing industry-driven solutions and deploying experimentation testing scenarios.

Contributing to the professional, user and general public awareness raising the BDV cPPP has organised **323 events** outreaching around **630 000 participants** during 2018.

Details for any of the KPIs reported in this section can be found in Annex 2 (section 3).

3.2.3 Impact of the BDV cPPP on SMEs (I.3, II.18)

Results of the Monitoring Report 2018 show that a wide range of SMEs in Europe benefit from the Big Data Value cPPP, considering **size** (12% medium-size companies, 41% are small companies and 48% are micro companies[36]), **age** (20% of the SMEs are 0 to 4 years old, 36% of the SMEs are 5 to 10 years old and 42% of the SMEs are 10 years old or older) and wide **geographical distribution**. The SMEs play a variety of roles in the data value chain[37]. SMEs participating in cPPP projects clearly show a trend of increase in turnover and increase in number of employees. It is also important to mention that not all the SMEs involved in BDV cPPP projects are technology companies but Data users or providers, and the overall results and trend clearly indicate an **ongoing growth of turnover along the whole value chain**.

Total turnover reported for SMEs in 2017 is **260,4 M€**[38]. In terms of **turnover evolution** there is an **increase in turnover in the SME companies part of the cPPP** with reported numbers of **60% increase in turnover with respect to 2014** and **17,7% in the last year**. This number is in full alignment with the macro-economic numbers of Data companies in Europe, and higher for some specific categories. In particular young SMEs (5 and 10 years-old) show in average the biggest growth in turnover in relation to 2014 (up to 284%). The youngest companies (<5 years) show in average the largest growth in the last year (54,8%).

In terms of **employment evolution**, the trend is also very positive in all companies part of the cPPP with an average of increase in employment for the SMEs part of the PPP is of 75% with respect to 2014 and a growth of 11,83% in the last year (2018 compared with 2017).

Special emphasis should be made on the cPPP instruments focused on supporting SMEs, and in particular the **Data Incubators** (DataPitch and EDI projects in 2018) and i-Spaces. Average age of the companies receiving cascade funding from the Data incubators (DataPitch and EDI) is 4,9 years, 41% of those SMEs younger than 5 years, 50% are in between 5 and 10 years, and only 9% are older than 10 years. Companies reported an increase in turnover of the 315% with respect to 2014 and 48,8% in relation to 2017, and 118,5% increase in employment in relation to 2014 with a 22,4% increase in the last year.

As results of the call for proposals 2018 new **22 SME**s are participating in projects (**25,3% of the partners are SMEs)** taking **23,5% of the total budget** of the call.

[36] Criteria for classification following EC rules: http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en

[37] This information has not been specifically gathered through a questionnaire, but it is known because of the role of the companies in the projects. In future exercise it could be useful to request this information also.

[38] Aggregated total of the companies

Detailed results based on age and size of the company are provided in Annex 2.

3.2.4 Innovations emerging from projects (I.4, II.7, II.17)

Innovations arising from the BDV cPPP include:

- **Specific project developments that have a marketable value**, including Big Data **products, processes, instruments, methods, systems and technologies** offering value to a wide variety of economical and industrial sectors (I.4).
- **Services of high societal value** developed by projects (II.7) (including solutions contributing to the environmental challenges II.6, II.19, II.20, II.21).
- **Spin-offs** arising from projects and **start-ups** incubated by the programme activities (I.2 and I.3).
- **Patents** and **solutions** enabling **advanced privacy and security respecting solutions** for data access, processing and analysis (II.4).
- **Contribution to Standards** (III.3) (Individually as projects and coordinated activities at a programme level).
- **Innovations result of cooperation in between projects** or programme-coordinated activities (e.g. advances in data sharing, innovative skill programmes, re-use of technical solutions across different sectors, etc).
- Transformation of sectors of high economical value (led by the cPPP lighthouse projects, but also triggered by project cooperation): **New business models** and **scaling innovations** (advances in TRLs, cross-border solutions and bringing technology closer to the market accelerating adoption).

It is therefore necessary to have a full overview of the contribution to many different KPIs to understand the innovation value of the cPPP.

In its second year of operation, the 32 running projects of the BDV cPPP reported **106 innovations of exploitable value** are reported as **delivered in 2018**, **63%** have **medium impact** and **37%** are considered innovations of **significant impact**. **50%** of the innovations delivered in 2018 are **incremental innovations**, **6% are architectural**, **36% are disruptive innovations**, and 1**% is radical innovation**[39].

93% of the innovations delivered in 2018 have **economic impact** and **48% have societal impact**[40].

41% are **technologies** (including platforms), 32% are **services**, 7% **products**, 8% are **methods**, 8% are **systems**, 1% is **software**, 4% are **components or/and modules**, and 11% **others**, including **frameworks/architectures**, **processes**, **tools** and **toolkits**, **spin-offs**, **datasets**, **ontologies**, **patents** and **knowledge.**

16% of the innovations delivered in 2018 are fully cross-sectorial.

75% provide solutions to the **Transport, mobility and logistics sector** (the one with the best coverage in the PPP); **20%** of the innovations relate to **Public services and Smart Cities**; **19%** to **industry and manufacturing**; **14%** to the **bio-economy**; **13%** are innovations linked to the **Telco sector**; **12%** are linked to **Marketing activities**; **8%** relate to **health and healthcare**; **8%** to the **ICT market**; **7% geospatial market**; **5%** to **commerce** and **3% to others** (including fashion, retail, business services, energy, media, compliance, etc).

[39] 8% are not included in any of these categories.
[40] Note than many innovations have both economic and societal impact.

In relation to the Maturity levels and TRLs, 7% of the innovations delivered are TRL 3 (experimental proof of concept), 10% are TRL 4 (technology validated in lab), 36% is TRL5 or TRL 6 (technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies), 32% is TRL 7 (system prototype demonstration in operational environment), 8% is TRL 8 (system complete and qualified) and 1% TRL 9 (actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space).

Figure 3 provides the full overview of the innovations delivered by the BDV cPPP during the year 2018 combining level of significance, type of innovation (incremental, disruptive, architectural and radical) and the TRLs. Although a large amount of innovations is classified as incremental innovation of medium impact, it is remarkable the high % of significant innovations (and expected growth in the upcoming years), the large amount of disruptive innovations (similar magnitude order than incremental), and the high TRLs in some cases close to deployment (and therefore to real impact in the market and society). Although at a lower level the BDV cPPP is also delivering some architectural and radical innovations.

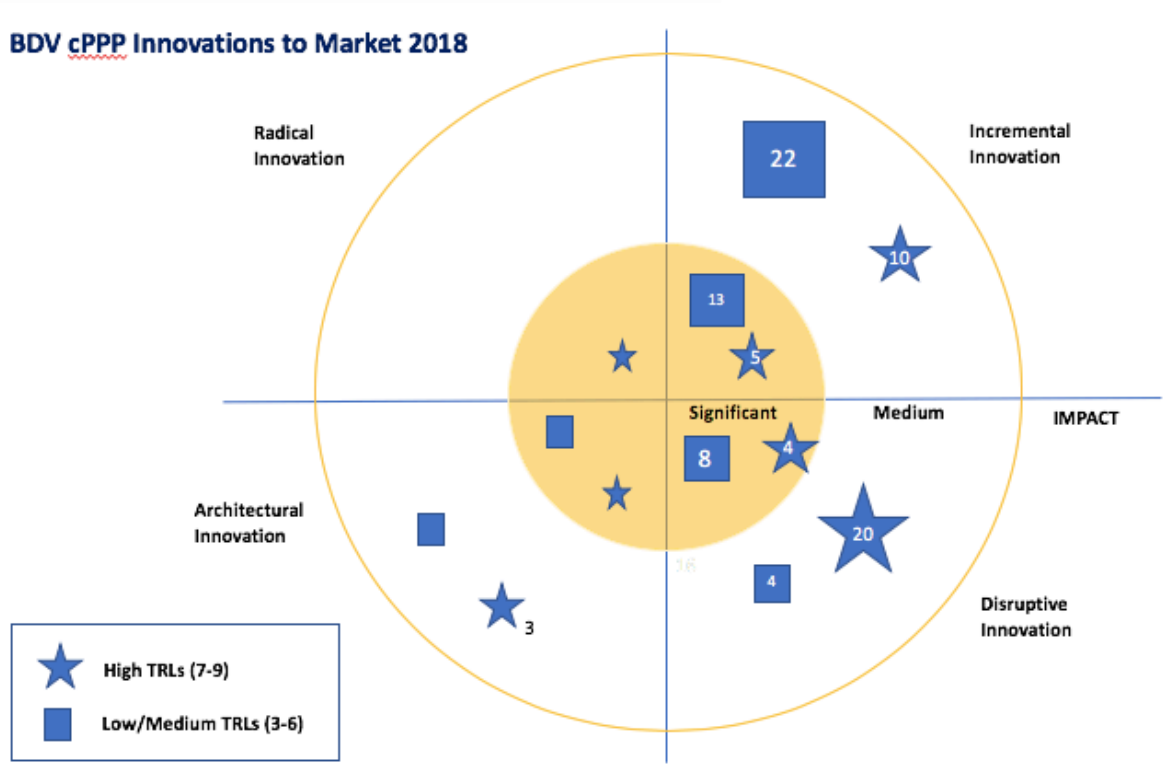

Figure 3: BDV cPPP innovations to market 2018

Full list of innovation of exploitable value (fully categorised) can be found in Annex 2 section 5.

63 new economically viable services of high societal value were developed during 2018 as result of the projects. 47% (over 30 projects) contributed to this KPI.

Projects have reported **204 new systems and technologies** developed during 2018. Many of them are reported already as part of the KPI "Significant innovations to Market". Systems and technologies developed are not limited to one sector and in fact the majority of the new systems and technologies can be utilised in different sectors/markets and by that stimulating the use of Big Data technologies in many areas.

Finally, all the solutions and innovations arising from the Big Data PPP will be promoted in the BDV cPPP Marketplace[41] developed by the BDVe CSA project to spread the knowledge about the outcomes of the cPPP.

3.2.5 Support major sectors and major domains by Big Data technologies and applications (II.13)

The BDV cPPP lighthouse projects[42] active in 2018 focused on the Bio economy (Agriculture, Fisheries, and Forestry) (**DataBio project**), Transport, mobility and logistics (**Transforming Transport project**), Health and Healthcare (**BigMedilytics** project) and Manufacturing (**BOOST4.0**), with a total of **4 major sectors supported** by Lighthouse projects and therefore widely supported with multiple use cases, scenarios and solutions.

20% of the projects are fully cross-sectorial (their outcomes can be used in any sector or application domain) and **80% of the projects are working in more than 1 sector or application domain** (this explains why the total is superior to 100% in Table 6)**.** In particular the BDV cPPP projects address a great variety of sectors[43] as shown in Table 6.

Sector/application domain	Projects addressing this sector/application domain (% over active projects in 2018)	Innovations to market (delivered in 2018, % over the total)
Public services and Smart Cities	50%	20%
Transport, Mobility and logistics	43%	75%
Retail	37%	20%
Business Services	37%	20%
Health and healthcare	33%	8%
Manufacturing	23%	19%
Media	23%	0%
Finances and banking	23%	14%
Telecom	20%	13%
Energy	20%	0%
Bio-Economy: Agriculture, forestry and fishing	17%	14%
Water and natural resources	17%	0%
Earth Observation	13%	7%
Others	43%	27%

Table 6: Support major sectors and domains

41 http://marketplace.big-data-value.eu/

42 Large-scale data-driven innovation and demonstration projects that aim at creating superior visibility, awareness and impact in specific relevant economic sectors

43 Grouped with a good level of alignment to the NACE registry These categories are part of the information in the BDV CPPP Marketplace that will be used for promoting all exploitable solutions coming out of the cPPP Projects (if needed new categories can be added)

Others (43% or the projects) includes sectors such as insurance, public safety, personal security, public tenders, e-commerce, marketing, fashion industry, citizen engagement, ICT/Cloud services, social networks, procurement, legal domain, etc.

Considering the whole project portfolio, the number of sectors supported is larger than **15**, with a solid distribution of use cases, experiments, solutions, and outreach activities among different sectors.

3.2.6 Experimentation (II.11, II.12, II.14)

Projects reported **224 use cases** or/and experiments conducted during 2018 with a contribution from 18 different projects. This is an increase of **48,3%** with respect to 2017 (151 experiments) baseline for this monitoring report. List of all use cases and experiments and additional information can be found in Annex 2. (II.12). BDVA i-Spaces have reported additional **165** experiments with 6 i-Spaces contributing to this KPI. Details can also be found in Annex 2.

Projects reported **82 large scale experiments** have been developed by the projects during 2018, **64 involving closed (private) data** (78% of the total). Large-scale experiments either involve a large number of users with high TRLs, or/and are developed in large geographical areas, in many cases involving a large number of users and actors or/and involve a combination of data volume, complexity, and velocity, a large number or data sources or integrate complex datasets flowing across borders. **BDVA i-Spaces** also contributed to this KPI reporting in total **38 large scale experiments** performed during 2018, **28 of them involving private data**.

In relation to the amount of data made available for experimentation, reported information from projects and i-Spaces (members of BDVA) show that the amount of data made available by the BDV cPPP for experimentation in 2018 is **0,10696 Exabytes** (106,96 Petabytes). A total of 0,08625 Exabytes (**86,25 Petabytes**) has been reported by the projects[44]. It is important to notice that some of the projects are not only providing internal access to diverse data sets from different sources, but also are **improving and creating new valuable datasets** (e.g. of DataBio project). BDVA i-Spaces contributed to this KPI reporting additional **20,71 Petabytes** of data for experimentation.

Additional details for each of the projects and i-Spaces can be found in Annex 2.

3.2.7 SRIA update and implementation (II.9, II.10)

For what concerns SRIA coverage (KPI II.10), measured as "% of research priorities covered compared to overall scope of research priorities defined in SRIA" projects have delivered contributions during 2018 covering already **100%** of all the SRIA technical priorities. The major focus of technical contributions lies in the "Data Analytics" priority, followed with some distance by "Data Processing Architectures" and "Data Management". This is a significant change from MR2017, where "Data Management" was the top priority. A clear trend to focus on technical contributions in the areas of "Data Analytics" and "Data Processing Architectures" was anticipated in BDV cPPP Annual Monitoring Report 2017[45] thus supporting our explanation that a solid base of "Data Management" solutions will enable analytics and processing innovations.

Section 8 of Annex 2 to this report provides a detailed analysis of the SRIA implementation.

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44 13 projects provided data for this KPI (Aegis, BigDataOcean, DataBio, euBusinessGraph, EW-Shopp, TT, QROWD, BigDataStack, BigMedilytics, Boost 4.0, CLASS, EDI, TheBuyForYou)

45 http://www.bdva.eu/sites/default/files/MR2017_BDV_PPP_Main%20Report_September%202018_1.pdf

In relation to the BDV SRIA update (KPI II.9), at the end of 2017 BDVA released the BDV cPPP SRIA v4.0 (detailed process and results reported in the Monitoring Report 2017). This version was the basis to support the H2020 LEIT ICT WP2018-20. During 2018 a minor update towards a version 4.1 was launched in the community crystallising in a series of individual deliverables in the format of vision, position or discussion papers that are supporting the transition towards next framework programme and the creation of a new Strategic Agenda and Roadmap.

Papers released during 2018 (or launched during 2019) are considered the basis of a new Strategic agenda and roadmap for the future of Big Data Value and Data-Driven AI are the following:

- Future Challenges for European Leadership in the Global Data Economy and Data-Driven Society: Input to Framework Programme 9 (March 2018)[46]
- Data-Driven Artificial Intelligence for European Economic competitiveness and Societal Progress (November 2018)[47]
- Big Data Challenges in Smart Manufacturing v1 (March 2018)[48]
- The Technology stacks of high performance computing and Big Data computing: What we can learn from each other (Oct 2018)[49]
- Joint Vision Paper for an Artificial Intelligence Public Private Partnership (AI PPP) (March 2019)[50]
- TOWARDS A EUROPEAN DATA SHARING SPACE: Enabling data exchange and unlocking AI potential (April 2019)[51]
- Strategic Research, Innovation and Deployment Agenda for an AI PPP: A focal point for collaboration on Artificial Intelligence, Data and Robotics. Consultation Release. (June 2019)[52]

In total there were at least 12 events organised during 2018 that contributed to input in the BDVA Strategic papers, multiple online meetings with a total of **2085** participants/contributions.

In total since the launched of the BDV cPPP we can count **6422** potential contributions to the Strategic road-mapping activities.

3.2.8 Technical Projects (II.4, II.15, II.16)

The BDV cPPP contributes **in enabling advanced privacy and security respecting solutions for data access**, **processing** and **analysis** (II.4). For 2018, **97 contributions** were reported (2 patents[53], 61 publications and 24 OSS/SW/Products). Table 7**Error! Reference source not found.** shows the consolidated and aggregated results for the three specific sub-KPIs evolution over the years and projects (based on running projects 2018) for 2019+.

In relation to the assessment of quality, diversity and value of data assets (KPI II.15) **50% of the projects** confirmed they are **assessing quality, diversity and value of data assets.** Details per project can be found in section 9 of Annex 2. These results show the intense usage of metrics to measure quality, diversity and

46 http://www.bdva.eu/sites/default/files/BDVA%20position%20to%20Fp9_v1.pdf

47 http://www.bdva.eu/sites/default/files/AI-Position-Statement-BDVA-Final-12112018.pdf

48 http://www.bdva.eu/sites/default/files/BDVA_SMI_Discussion_Paper_Web_Version.pdf

49 http://www.bdva.eu/sites/default/files/bigdata_and_hpc_FINAL_16Nov18.pdf

50 http://www.bdva.eu/sites/default/files/VISION%20AI-PPP%20euRobotics-BDVA-Final.pdf

51http://www.bdva.eu/sites/default/files/BDVA%20DataSharingSpace%20PositionPaper_April2019_V1.pdf

52 http://www.bdva.eu/sites/default/files/AI%20PPP%20SRIDA-Consultation%20Version-June%202019%20-%20Online%20version.pdf

53 Filled patents

value of data assets in projects and some projects have developed specific metrics and methods to ensure quality, diversity and value in the data (e.g. I-BiDaaS has developed a Data Quality Assurance Process (DQAP) aiming at ensuring the high quality of the data generated/collected during the lifetime of the project). However we cannot talk yet (2018) about "cPPP" developed metric expected for 2019+[54].

II.4 a) Number of patents filed that enable advanced privacy and security respecting solutions for data access, processing and analysis			II.4 b) Number of publications that describe advanced privacy and security respecting solutions for data access, processing and analysis			II.4 c) Number of OSS contributions / SW / Products that enable advanced privacy and security respecting solutions for data access, processing and analysis		
Year 2017	**Year 2018**	2019+ (planned)	Year 2017	**Year 2018**	2019+ (planned)	Year 2017	**Year 2018**	2019+ (planned)
3	**2**	**7**	**23**	**61**	**79**	**7**	**24**	**44**

Table 7: Sub-KPIs for KPI II.4 "Enable advanced privacy and security respecting solutions for data access, processing and analysis"

In relation to the speed of **data throughput** 40% of the projects reported they expect the project to improve data throughput. Some projects such as BigDataOcean and FashionBrain have measured improvements over 1000%. Others such as I-BiDaaS have specific objectives to develop data processing tools and techniques applicable in real-world settings and demonstrate a significant increase of speed of data throughput and access, however results are still not available at the end of 2018 (project started in 2018).

Details can be found in section 9 of Annex 2.

3.2.9 Macro-Economic KPIs (II.1, II.2, II.3, II.5)

The monitoring of the macro-economic KPIs (KPI II.1, II.2, II.3 and II.5) is based on input from the European Data Market Monitoring Tool[55] as they are presented in the most recent report[56] by IDC.

KPI II.1 assesses development of the **market share of the European Union in the global Big Data Market**. As an indicator, we compare the total revenues of EU Data Companies with other economies, i.e. the US, Japan, and Brazil, as they are used as a benchmark in the IDC report[57]. The EU share of the total revenues in these economies the 2013 baseline was 27,7%. This share increased slightly to 27.9% in 2018, which is remarkable because the international indicators grew very fast in this period, but the EU kept pace with them. In absolute terms, the amount of the total revenues of US Data Companies in 2018 was approximately twice the revenues of EU28 Data Companies in the same year (162 B€ vs. 77 B€). **70% of the cPPP projects active in 2018**[58] reported contribution to increase revenue share of EU companies. Projects contribute either by:

- Accelerating adoption of new technologies,
- Supporting EU data driven companies to build innovative solutions that can be scaled internationally,

54 DataBench project

55 SMART 2016/0063 – Study "Update of the European Data Market Monitoring Tool", IDC and Lisbon Councils

56 Gabriella Cattaneo, Giorgio Micheletti et al. "Update of the European Data Market Tool - Second report on Facts and Figures" April 2019 www.datalandscape.eu

57 Gabriella Cattaneo et al. Ibidem, chapter 10 pp.129-142

58 Based on number of respondents.

- Developing innovative technologies that European companies can be more competitive (e.g. news data protection approaches), and/or,
- Enabling industries to exploit their big data efficiently and therefore increase their market share and services provided to their customers.

According to the most recent report[59] **the number of Data Companies (KPI II.2)** they increased to 283 100 by 2018, compared to 271 700 in 2017, with a growth rate of 4,2%. It should be noticed that, due to the high concentration of the ICT industry in the UK, almost half of them are based in the UK. BDVA i-Spaces and Data Incubators (ICT 14-b projects, so DataPitch and EDI) are in particular designed to contribute to this KPI as they support start-ups and entrepreneurs from early ideas to technical and business development till go-to-market.[60] **77% of the BDV cPPP projects active in 2018[61] reported contribution from their project to increase the number of European Companies** offering data technology and applications. Projects contribute in different ways such as:

- Creating tools that will stimulate the creation of new companies,
- Creating new companies as results of the project (e.g. BigDataOcean),
- Supporting EU data driven companies,
- Building innovative solutions to solve data related challenges,
- Supporting companies in complying with the GDPR, and/or,
- Lowering the threshold to create new business in a particular sector.

In addition, 25% of the BDVA members reported their organisation run or support a programme that is specifically targeted at supporting start-ups or entrepreneurs in the Big Data area.

The **revenues of Data Companies in the European Union** (**KPI II.3**), according to the IDC report[62], reached 77 B€ in 2018 compared to 69 B€ in the year before, with a growth of 12%. The revenue share of SMEs in 2018 amounts to 55,5 B€ (72% of the total revenues), an absolute growth of 5,7 B€ on the year before. The growth rate of revenues increases in proportion to company size, with the revenues of large companies over 500 employees growing at 16% in 2018 over 2017. **77% of the cPPP projects** active in 2018[63] reported contribution (or plan to contribute) to the revenue generated by European Data Companies. Project contribution to this KPIs is mainly by:

- Opening up sectors to data-intensive companies,
- Offering direct support and getting funding for data start-ups,
- Making data processing easier and cheaper for companies,
- Creating new opportunities through privacy-preserving analytics solutions,
- Through the commercialisation of new services with marketable value,
- Creating opportunities for common exploitation based on joint Big Data technology pipelines, and/or,
- Developing simplicity in some business ecosystems.

The baseline for **Data Professionals** in the European Union in 2013 (**KPI II.5**) amounts to 5,77 million. The number of Data Professionals increased to a total of 7,2 million by 2018, resulting in a total absolute growth of 1,453 million professionals since 2013. The rate of growth of data professionals is increasing, with

59 Gabriella Cattaneo et al. "ibidem

60 Further information can be found in section 2.1 of this report.

61 Based on number of respondents.

62 Gabriella Cattaneo et al. "Ibidem pages 89-97

63 Based on number of respondents.

approximately 559 000 positions added in 2018 and an increase of 8,4% on the year before[64]. **87% of the cPPP projects active in 2018[65] reported contribution** from their project **to increase the number of Data Workers in Europe**. Projects contribute to this KPI in different ways:

- New organisations created as result of the project hiring new data professionals;
- Supporting emerging start-ups to grow;
- Developing more data-driven services that will require new data-workers;
- Unlocking value of data services introducing privacy preserving technologies;
- Creating of new job profiles;
- Supporting the adoption of data solutions in different sectors; and/or,
- Supporting education and training.

Details of contribution from the different projects to the macro-economic can be found in Section 10 of Annex 2.

3.2.10 Contributions to environmental challenges (II.6, II.19, II.20, II.21)

Over 20% of the projects running in 2018 have reported they contribute to the **reduction of energy** and **30% contribution to the reduction of CO_2 (II.19**). Quantitative results are provided by some projects such as the Transforming Transport (TT) project that shows in some specific monitored items improvements in efficiency range between **25% and 51% in energy reduction** and improvements concerning **CO_2 emissions reaching up to 29% and to 23% of emission reductions in general** (including PM and NO_x).

The 3 or the 4 lighthouse projects running in 2018 (DataBio, Transforming Transport and Boost4.0) have reported contribution to the reduction of waste (**II.20**). For example, in DataBio and in particular in forestry, although still with early data and experiments, the experience from customer cases shows **up to 10% reduction in waste**. Some pilots in TT project **show a percentage of improvement about 25% in the management of assets** which can fairly well demonstrate a relative **high level achievement of reduction waste itself at this final stage of the project.**

17% projects running in 2018 have reported contribution to the reduction in the use of material resources (**II.21**) e.g. BigMedilytics, provides quantitative data in a particular scenario reporting that the Asset Management pilot aims to reduce the no. of **unused mobile assets in hospitals by up to 20%**.

Finally, in relation to the energy reduction in big data analytics (**II.6**) there is no quantitative input in results provided by any project but e.g. **E2Data** project develops a framework that optimises calculations, leading to decreasing the use of energy. Project started just in 2018 and results are expected to be provided in the future.

3.2.11 Standardization activities with European Standardization Bodies (III.3)

During 2017 BDVA and the BDV cPPP set up some foundations defining priorities for the PPP in Big Data Standardisation, implemented during 2018 as follows:

- **Establish an official liaison in between the BDVA Standards Group and the AIOTI WG3**, activity developed through different workshops during 2017 and implemented in 2018 with the signature of a MoU with AIOTI and common activities organised during the year.
- **Further develop the BDVA Reference Model pursuing alignment with others such as oneM2M, BDE Platform, AIOTI, RAMI 4.0**, etc, implemented through different workshops organised during 2017 and

64 ibidem

65 Based on number of respondents.

2018.

- **Open an official dialogue with CEN, CENELEC and ETSI** on standards harmonisation, implemented through different workshops during 2017 in 2018. BDVA is intended to sign an MoU with CEN/CENELEC in 2019 and it is under discussions with ETSI.
- Create BDVA Roadmap for Big Data Standards harmonisation and industry engagement in Global Big Data standards development.

The following activities have been developed during 2018:

- **Liaison with ISO/IEC JTC1/SC42:** At the end of 2017 BDVA stablished an official liaison with the ISO/IEC JTC1/WG9 with the main objective of channelling European input (cPPP) into global standards. As WG9 was integrated in a new Sub-Committee SC42 (Artificial Intelligence), BDVA has worked throughout 2018 to set up at the beginning of 2019 an **official liaison with ISO/IEC JTC1/SC42.**

- **Organisation of 2 workshops** (BDV CPPP Meetup and EBDVF 2018) and **participation in 3 additional workshops** (ITU-T FG-DPM meeting, CEN/CENELEC Trustworthy Artificial Intelligence: building a framework with standardization, World Standards Day conference[66] organised in Brussels on October 12th)

- **Data Market Services project**, CSA of the BDV cPPP including as one of its pillars standardisation support for SMEs, was selected for funding in 2018 and started in 2019.

30% of the projects running in 2018 reported they perform **activities leading to data/Big data Standardisation.** 3 projects reported contribution to European Standardization Bodies (ESBs) activities and reporting 11 working items in ESBs. **20% of BDVA members reported its organisations perform activities leading to data/Big data Standardisation**. In particular BDVA members have reported contributions to IEC, DIN DKE and other consensus-base standardisation bodies, OPC foundation and other consortia-based standardisation bodies, OASIS, W3C committees and community group discussions, open data harmonization national activities, ISO/IEC JTC1, contribution to define standards in georeferenced data for geoscience (OGC and IUGS/CGI) and ETSI. Details can be found in Annex 2.

3.3 Evolution over the years

2018 is the 4th year of activity of the BDV cPPP but only the 2nd year with running projects, therefore results from the projects are limited to these last 2 years.

- **Leverage investments**: There is a clear indication of annual increase in **private R&D investments in the context of the PPP** along the first 3 years[67] (280,9 M€ in 2015, 338,5 M€ reported in 2016, 482,2 M€ reported in 2017, and 467,46 M€) with a total the amount of reported **mobilised private investments** since the launch of the cPPP of 1,57 B€. Considering the amount of EU funds allocated to the cPPP so far (201,3 M€) the BDV cPPP ends 2018 with a **leverage factor of 7,8** higher than the leverage factor of 4 **committed contractually.**

- **Progress in tangible outcomes of the PPP projects:** Such as specific outcomes that have a marketable value, including Big Data products, processes, instruments, methods, systems and technologies offering value to a wide variety of economical and industrial sectors, spin-offs and start-ups incubated/accelerated, patents, contribution to standards. Increase in tangible outcomes is quite extraordinary and shows a very positive growth, explained by the increase in the number of projects,

[66] https://www.cencenelec.eu/News/Brief_News/Pages/TN-2018-068.aspx
[67] The values don't increase from 2017 to 2018 mainly due to some data missing due to a decrease in size of the sample.

maturity of some projects, but it is also a good indication of the successful orientation of the PPP to impact creation.

Key Performance Indicator (KPI)	Value in 2017	Value in 2018
Significant Innovations to market	**45 innovations** of exploitable value	**106 innovations** of exploitable value, 39 of which are significant
New economic viable services of high societal value	**1**	**63**
New systems and technologies	32	204
Large scale experiments	19 from projects	64 from projects
Uptake of BDV use cases and experiments	151 from projects	224 from projects
Amount of data that has been made available to I-Spaces (including in particular closed data)	0,0854 Exabytes (85,4 Petabytes)	0,10696 Exabytes (106,96 Petabytes)
Increase the speed of data throughput compared to 2014	150-200%	Over 1000%
New systems and technologies	32	204
Enable advanced privacy and security respecting solutions for data access, processing and analysis	3 patents 23 publications 7 OSS/SW/products	**2** patents (7 patents planned 2019+) **61** publications **24** OSS/SW/products

- **Evidence of Innovations result of cooperation in between projects or programme-**coordinated activities such as re-use of projects outcomes (functionality, solutions or ontologies), data sharing (discussions going on in between projects working in same sector) and specific know-how sharing.

- **Achievements in implementing the BDV cPPP roadmap** and **the coverage of the SRIA technical priorities implementation** are described in Section 3.1 and Section 2.1 of this report. Results show the cPPP is in track with no major gaps identified considering not only the delivered activities during 2018 but also those ones planned for the already funded projects in the upcoming years.

- **Participation of SMEs in the programme has increased and kept over 20% of SME** participation in projects and over 30% in the Association. The evolution over the years of the SMEs involved in this PPP, show growth in revenues and employment in alignment with the macro-economic KPIs of the European Data Market.

- This year we can see an increase of the awareness on the importance of skills and job profile definition. The **Education Hub** and the **skills recognition programme** complement this remarkable progress.

Key Performance Indicator (KPI)	Value in 2017	Value in 2018
Job profiles	**0**	**48**

Higher establishment availability of big data value creation skills development	**18** training activities involving around 1700 participants in total (projects only) 0 developed interdisciplinary programs **49** (19 Master and 30 PHD) **100** events	**85 training activities** involving over **9700 participants** (projects only) **16** during 2018 with around **250** participants **396 equivalent FTEs** (260 Master and 136 PhD) **323 events** outreaching over 630 000 participants

- **Communication and dissemination** activities have grown exponentially since the launch of the PPP, with estimated numbers of **7,8 Million people outreached** and **630 000 participants** engage in events. The PPP has consolidated 2 large community events: The **European Big Data Value Forum** (EBDVF) and the BDV Meetup (**BDV Summit** in 2019).

- BDVA, the **Association,** was created at the end of 2014 with 24 founding members, and has grown over the years outreaching a solid based of almost 200 members at present, with a well-balanced composition of large industries, SMEs and research organisations and geographical distribution. Task Forces and Subgroups were already set up back in 2015 and have evolved along the 3 years to adapt to the multi-annual roadmap needs and members focus. Since the launch of the PPP until the end of 2018 the Association organised 30 Activity group meetings/workshops (for task force and cross-task force collaboration), 6 international open large events, 30 Board meetings, 16 General Assembly meetings, and 10 Partnership Board meetings, delivered 4 versions of the BDV SRIA, 10 strategic papers (including whitepapers, multiple position papers), and has built strong collaborations with other PPPs, International and national organisations as reported in Section 2 and Annex 4. By end of 2018 in addition to the BDV CPPP, BDVA is private member of the EuroHPC JU and it is driving together with euRobotics a new partnership on AI, data and robotics for next Framework Programme.

- The **Macro-economic KPIs** show evidence of growth in the sector and most of the projects provided qualitative statements and examples that give evidence of contribution of the PPP to those KPIs.

4. OUTLOOK AND LESSONS LEARNT

Year 2018 is a **transition year** and an important inflection point in between the so-called phase I (establishment of the ecosystem) to the second phase of the BDV cPPP (pioneer disruptive new forms of Big Data Value solutions). New calls for proposals are in place during 2018 and 2019 as part of the H2020 WP 2018-2020 (calls closing in April 2018, November 2018, April 2019 and November 2019) that will bring many new projects to the portfolio increasing **challenges of coordination, communication and cooperation**. At the same time and during 2018-2019, many new innovations are expected to be delivered and adopted demonstrating impact in different sectors. The **increase of the quality and quantity of the data available for experimentation**, and the launch of the **cross-border Industrial Data Platforms and Personal Data Platforms at the beginning of the year 2020**, supported by other ecosystem enablers will probably define final transition period towards phase 3 as defined in the SRIA v4. The BDV cPPP projects starting in 2020 and the ones selected in the last call for proposals of the BDV cPPP will define a strong foundation to the next framework programme (deployment of data platforms, federation of Big Data Innovation Hubs/data experimentation facilities, and advances data and data-driven AI capabilities).

During 2019 most projects from phase I will head towards an end with expectations of "follow-up private investments" from the BDV cPPP ramping up. We expect impact in job creation materialised mainly through the new job profiles and skills development.

Year 2018 is also a transition year in defining strategy and direction of the partnership next Framework programme (2021-2028).

In March 2018 BDVA delivered a **Vision paper** identifying challenges and defining an extended roadmap for the future data economy[68] in strong collaboration with the running BDV cPPP projects, other communities, engaging national initiatives, the European Commission and Member States in the discussion. BDVA identified the following working areas that guided collaborations and road-mapping activities during 2018 and 2019.

- Next Generation Data and AI Platforms
- Trust in Data-Driven Critical Decision Making
- Extract Value from Next Generation Digital Infrastructure
- Scaling Industrial Cooperation Models in the Data Economy
- Data Skills and Know-how

On April 25th 2018, the European Commission outlined a **European Strategy for AI** to boost investment and set ethical guidelines. In its communication, the European Commission put forward a European approach to Artificial Intelligence based on three pillars: "Boosting financial support and encouraging uptake by public and private sectors", "Preparing for socio-economic changes brought about by AI", and "Ensuring an appropriate ethical and legal framework". recognised that had existing members and Strategic Research and Innovation objectives that focused on AI and recognised that AI was a key component in the future direction and already provided input and align their roadmaps towards a European Partnership. Also, on April 25th the European Commission proposed a package of measures as a key step **towards a common data space in the EU** - a seamless digital area with the scale that will enable the development of new products and services based on data.

On June 6th, 2018, the European Commission announced its proposal to create the first ever **Digital Europe programme** and invest €9.2 billion to align the next long-term EU budget 2021-2027 with increasing digital challenges. The Commission's proposal focused on five areas: Supercomputers; Artificial intelligence (AI) (including Data/European Data Space); Cybersecurity and trust; Digital skills; Ensuring a wide use of digital technologies across the economy and society.

On June 7th 2018, the European Commission announced its proposal of €100 billion for the research and innovation the next long-term EU budget 2021-2027: **Horizon Europe**. Among many other things Horizon Europe plans to bring a **new generation of European Partnerships** and increased collaboration with other EU programmes.

On September 19th 2018 BDVA, euRobotics and the European Commission organised a **Data4AI workshop** focused on identifying the main challenges ahead to develop the so-called European Data Space, essential for the development of AI, and to identify potential paths for the future, building on current European, cross-border, national and private initiatives (so both BDV and SPARC PPPs).

Towards the end of 2018 BDVA committed its **official participation as private member of the EuroHPC Joint Undertaking** aiming at bringing synergies for HPC, Big Data and Artificial Intelligence, and providing industrial perspective.

[68] http://bdva.eu/sites/default/files/BDVA%20position%20to%20Fp9_v1.pdf

Additionally, BDVA and euRobotics officially joined forces at the end of 2018 and announced their intentions of working together in a future AI, data and euRobotics PPP. On December 7th 2018, the European Commission presented a coordinated plan prepared with Members States to foster the development and use of AI in Europe[69]. Among other things the plan proposes the development of a European AI public-private partnership building up the BDV cPPP and SPARC PPPs.

During 2019 BDVA and euRobotics have already developed a common Vision paper and the first version of a common AI-PPP Strategic, Research Innovation and Deployment Agenda with strong involvement of ongoing PPP projects, members and many external communities.

69 *http://europa.eu/rapid/press-release_IP-18-6689_en.htm*

5. ANNEXES TO THIS REPORT:

Annexes included in this public report:

- **Annex 1**: Results on all common and specific KPIs (embedded in this document)

In separate documents (referred throughout this report):

- **Annex 2**: Detailed explanations of KPIs (methodology, response rates, assessment and detailed input) and questionnaires used to collect data
- **Annex 3**: Results call for proposals 2018
- **Annex 4**: Collaborations, mobilisation of stakeholders, outreach, and success stories (details)
- **Annex 5**: BDVA activity report 2018 (including relevant sectors and applications domain from TFs)

Annex 1 Part 1: Common Priority Key Performance Indicators

	Key Performance Indicator (KPI)	Value in {2018}	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
I.1	Mobilised Private Investments	Direct leverage (A = A1 + A2) (2018): **19,16 M€** Indirect leverage (B = B1 + B2): **448,31 M€** Total leverage (2018): **467,47 M€** Accumulated (2018): **1 569,1 M€** (1,57 Billion €)	N/A	2 Billion € (total accumulated of private investments) Leverage factor: 4	Total private investment mobilised in other R&D activities related to the cPPP since the launch of the cPPP (2015) 1 569,1 M€ (1,57 B€) 2015: 280.9 M€ 2016: 338.5 M€ 2017: 482,25 M€ 2018: 467,47 M€ Total investment from EU (2016-2018): 201,30 M€ Leverage factor: **7,8**
I.2	New skills and/or job profiles	**48 job profiles created or identified by projects** in 2018 Planned +2019: **106** new job profiles (from projects running on 2018 only)	2017: 0	>0	**30% of the projects running in 2018 reported contribution to the creation of new Job profiles**. Projects reported **48 job profiles were created or identified in 2018**, and **106 new job profiles** are reported as expected to be created from 2019 onwards and by the end of the project linked to the project activities. Projects directly contributing to new job profiles are DataPitch, SODA, TT, MH-MD, BigMedilytics, Boost4.0, E2Data, EDI, and TYPHON. **67%** of the projects running in 2018 reported **contribution to the generation of new skills** by end of the project. Among the **BDVA members**, **51%** of organisations have reported contribution to the **creation of new Job Profiles** and **almost 60% contribute to the creation of new skills linked to the Big Data Value**.

					Finally, 60% of the projects and 51% of the BDVA members have reported contributions to the to the Skills Agenda for Europe. Details to support this KPI are provided on Annex 2.
I.3	Impact of a cPPP on SMEs	For 2018: Total turnover (reported for cPPP SMEs for 2018): **260,3 M€**. Increase of turnover: **60%** (baseline 2014) Last year increase of turnover (baseline 2017): **17,7 %** FTE evolution: **74,9%** increase respect to 2014, and **11,8%** respect to 2017.	Year 2017: Total turnover (reported for cPPP SMEs for 2017): **175,8 M€**. Increase of turnover: **69%** (baseline 2014) Last year increase of turnover (baseline 2016): **10,6 %** FTE evolution: **52%** respect to 2016 (and over 180% since the launch of H2020).	N/A	Profile participating SMEs: In total 69 SMEs that provided input to the Monitoring report 2018 for this KPI (87% non BDVA members and 13% are BDVA members): • 12% are medium-size companies (8), • 41% are small companies (28) and, • 48% are micro companies (33)[70]. Average age of the SMEs is 12,1 years, and in particular: • 20% of the SMEs (0 to 4 years old) • 36% of the SMEs (5 to 10 years old) • 42% of the SMEs (> 10 years old) Geographical distribution of the SMEs providing input to this KPI is large covering the following European Countries: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Luxembourg, The Netherlands, Norway, Portugal, Romania, Spain, Switzerland and UK. Details to support this KPI and mapping of SMEs are provided in Annex 2.
I.4	Significant Innovations	**106** innovations of exploitable value, **39** of which are significant innovations (37%) (significant impact). Accumulative 2017-2018: **132** innovations of exploitable value	N/A 2017: **45** innovations of exploitable value	>0	106 innovations delivered during 2018: • 39 of significant impact (37%) • 67 of medium impact (63%) From the 106 innovation of exploitable value delivered during 2018: • 53 incremental innovation (50%) • 6 architectural innovation (5,7%) • 38 disruptive innovation (35,8%) • 1 radical innovation (0,0%) • 8 were not categorised under any of these categories

70 Criteria for classification following EC rules: http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en

		delivered **by 2018** (2017+2108). 35% of with significant impact	(MR2017). 26 a per MR2018[71]		99 over 106 innovations can generate **economic impact** (93%) and 48 (45%) **societal impact** Exploitable Innovations include technologies (including platforms) (41%) Services (32%), products (7%), methods (8%), systems (8%), software, (1%), components (4%) and modules, and other types of innovation (11%) such as frameworks, processes, tool/toolkits, spin-offs, patents, datasets, ontologies and specific algorithms. Innovations can be exploitable in a single sector or in many of the cases in multiple sectors. 16% of the innovations reported are fully cross-sectorial (sector agnostic). Sectors covered are Transport, logistics and mobility (including maritime transport and aviation) 75%, Industry and Manufacturing (including production and automotive) 19%, Bio-economy (including agriculture, forestry, fisheries and food) 14%., Health and healthcare 8%, ICT 8%, Marketing 12%, Geo-spatial 7%, Pubic services and smart cities 20%, Telecommunications 13%, Commerce 5%, and others 3% (including retail, fashion, business services, Media, energy, law compliance). In relation to maturity level: • TRL3: 7% • TRL4: 10% • TRL5/6: 36% • TRL 7: 32% • TRL 8: 8% • TRL 9: 1% Accumulative 2017-2018. 132 innovations delivered since projects started (2017 and 2018): • 46 of significant impact (35%) • 86 of medium impact (65%) Forecast from projects active in 2018. **249 exploitable innovations** expected to be delivered by 2019+ by the projects active in 2018. • 114 of significant impact (46%)

71 Note that some of the innovations delivered in 2017 were advanced during 2018. Report 2018 differentiates in between innovations of exploitable value delivered in 2017 and no progress in 2018 (26 reported), delivered in 2017 and progress in 2018 (e.g advancing TRL or functionality), and the ones delivered directly in 2018.

					• 86 of medium impact (54%) Further details, full list of innovation in Annex 2.

Annex 1 Part 2: Specific Key Performance Indicators

KPIs listed in the PPP Contractual Agreement or/and the Multi-annual Roadmap of the PPP and not covered in Part 1.

	KPI domain	Key Performance Indicator (KPI)	Value in {2018]	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
II.1 (CA1)	Market Share of the European suppliers of the global Big Data Market	Increased revenue share of EU companies against total of revenue of EU, US, Japan, Brazil	2018 [M€]: EU: 77 082 US: 162 154 BR: 7 592 JP: 29 297 Total: 276 125 EU-Share: 77 082/276 125 = 27.9%	2013 [M€]: EU: 47 801 US: 97 237 BR: 4 703 JP: 23 021 Total: 172 762 EU-Share: 47 801/172 762 = 27.7%	>27.6%	Source: Update of the European Data Market Study (SMART2016/0063) D2.4 Second Report on Facts and Figures (Note: Baseline updated) **Details and contributions from projects in Annex 2.**
II.2 (CA5)	Number of Data Companies	Increased number of European Companies offering data technology, applications	2018: 283 100 2017: 271 700 Delta (2018-2017) 11 400 Delta (2018-2013): 43 255	2013: 239 846 Delta: 0	>0	Baseline: IDC report "European Data Market – SMART 2013/0063" D6 – First Interim Report 2016 value: IDC report European Data Market – SMART2013/0063" D8 – Second Interim Report Updated 2016, 2017 and 2018 value: Update of the European Data Market Study (SMART2016/0063) D2.4 Second Report on Facts and Figures **Details and contributions from projects in Annex 2.**
II.3 (CA6)	Revenue generated by European Data Companies	Increased revenue generated by European data companies compared to baseline in terms of:	Revenue: 2018: 77 082 M€ 2017: 68 846 M€	2013 [M€]: 47 801 M€	>0 >0%	Baseline: IDC report "European Data Market – SMART 2013/0063" D6 – First Interim Report

		Absolute growth Relative growth.	Growth (2018/17): absolute: 8 236 M€ relative: 12 % Growth (2018/13): absolute: 29 281 M€ relative: 42,5%			2016 value: IDC report European Data Market – SMART2013/0063" D8 – Second Interim Report **Details and contributions from projects in Annex 2.**
II.4 (CA7)	Enable advanced privacy and security respecting solutions for data access, processing and analysis	Number of patents filed by cPPP projects that enable … Number of publications by cPPP projects that describe … Number of OSS contributions/ products/ SW components resulting from cPPP projects that enable … … advanced privacy and security respecting solutions for data access, processing and analysis	2018: **2** patents 2019+ (planned): 7 patents 2018: **61** publications 2019+ (planned): 79 publications 2018: **24** 2019+ (planned): 44	2017: 3 patents 2017: 23 publications 2017: 7	>0 >0 >0	From the PPP projects active during 2018**, 3 technical projects are fully dedicated to advance the state of the art in privacy-preserving Big Data technologies**: SPECIAL, SODA and MHMD. Specific contributions from SPECIAL, SODA and MHMD can be found in annex 2. However, many other projects contribute to these KPIs and more expected to do it during 2019 and 2020 (as H2020-ICT-13-2018-19 call for proposals was focused on scaling privacy preserving technologies and close to deployment industrial and data platforms). (Note: values indicated as 2019+ are only considering input from projects running in 2018, so projects from calls 2016 and 2017). 2 projects have reported patents filed that enable advanced privacy and security respecting solutions for data access, processing and analysis: MHMD and BigMedilitycs (both in the Health/Healthcare sector). Finally, a large list of projects has contributed delivering OSS, software or products that enable advanced privacy and security respecting solutions for data access, processing and analysis during 2018. In particular AEGIS, EW-Shopp, SPECIAL, SODA, BigDataGrapes, BigMedilytics, Boost 4.0, I-BiDaaS and TheyBuyForYou **Details and contributions from projects in Annex 2.**
II.5 (CA8)	Employment	Increased Number of European Data Workers	2018: 7 225 810 2017: 6 666 109 Delta (2018/17): 559 701 Delta (2018/13): 1 453 947	2013: 5 772 000 Delta: 0	>200 000	Baseline: IDC report "European Data Market – SMART 2013/0063" D6 – First Interim Report 2016 value: IDC report European Data Market – SMART2013/0063" D8 – Second Interim Report Updated 2016, 2017 and 2018 value: Update of the European Data Market Study (SMART2016/0063) D2.4 Second Report on Facts and Figures

						Details and contributions from projects in Annex 2.
II.6 (CA9) (D9)	Contribution to the reduction of energy use	Energy saved in big data analytics using a specified benchmark through solutions provided by specific cPPP projects compared to baseline at beginning of H2020	2018: (N/A) but **1 project active** with objectives to optimise calculations, leading to decreased use of energy.	1 2017: N/A	<0.9	The **E2Data** framework optimises calculations, leading to decreased use of energy. E2Data started only in 2018 and we expect the project to provide quantitative results in the future. Details in Annex 2.
II.7 (CA10)	New economic viable services of high societal value	New economically viable services of high societal value developed or resulting from cPPP projects	2018: **63** Planned 2019+: (Additional) 61	2017: 1	>0	**63 new economically viable services of high societal value were developed during 2018** as result of the projects. 47% (over 30 projects) contributed to this KPI (BigDataOcean, DataPitch, DataBio, e-SIDES, euBusinessGraph, TT, QROWD, MHMD, BigDataGrapes, BigMedilytics, CLASS, DataBench, EDI, FANDANGO) Additionally, projects active in 2018 have forecasted (2019+) **additional 61 new economically viable services of high societal value as result of their projects in the upcoming 2 years** (2019-2020). 53% of the projects active in 2018 are planning to contribute (9 of them new to provide contributions to these KPI). Details in Annex 2.
II.8 (CA11) (D3, D4)	Higher establishment availability of big data value creation skills development	Number of training programs established arising from cPPP. Number of European training programs involving 3 different disciplines arising from cPPP Number of Master and PhD students involved in PPP projects Number of dissemination events, seminars, conferences organised in	Projects: **85 training activities during 2018** involving over **9700 participants** BDVA Members**: 96 training activities during 2018** involving over **8500 participants** Projects: **16** developed interdisciplinary programs during 2018 with around **250** participants	Projects: 18 involving around 1700 participants in total 0	>49 >9	Details in Annex 2 and Annex 4

		cPPP projects (including number of participants) Number of other actions that contribute to …. (e.g. updated curricula, etc)	**396 equivalent FTEs** (260 Master and 136 PhD) **323 events** outreaching over 630.000 people N/A	49 (19 Master and 30 PHD) 100 events 0	N/A N/A	
II.9 (CA12)	Ensure efficiency, transparency and openness of the cPPP's consultation process	Number of overall contributors in the SRIA consultation process Number of events to collect feedback from the community	2018 update: **2085** Total: **6422** 2018 update: 12 Total: 35	2017: 1592 Total: 4227 2017: 7 Total: 23		Details provided in Annex 2.
II.10 (CA13)	Ensure that technology progress is in line with multi-annual roadmap of SRIA	% of research priorities covered compared to overall scope of research priorities defined in SRIA (differentiate running, upcoming and not covered yet)	Delivered in 2018: 100% (which is as reported as planned in MR2017) Ongoing: 100% Planned for 2018+: 100%	Delivered in 2017: 67% Ongoing: 82% Planned for 2018+: 100%		The major focus of technical contributions lies in the "Data Analytics" priority, followed with some distance by "Data Processing Architectures" and "Data Management". This is a significant change in from MR2017, where "Data Management" was the top priority. As already anticipated as part of the analysis in MR2017, a clear trend to focus on technical contributions in the areas of "Data Analytics" and "Data Processing Architectures" was anticipated, thus supporting our explanation that a solid base of "Data Management" solutions will enable analytics and processing innovations. Details reported in Annex 2
II.11 (D1)	Large Scale experiments conducted in cPPP projects and I-Spaces involving closed data	Number of large scale experiments conducted in cPPP projects and BDV I-Spaces involving closed data	**92** (64 from projects and 28 from BDVA i-Spaces)	0 2017: 19	>49	Projects reported **82 large scale experiments** (aggregated number of experiments conducted by all projects in 2018), **64** of which involve closed (private) data (78% of the total). Projects also provided criteria to for experiments to qualify as "large-scale" with following criteria being mentioned: • Large number of users involved with high TRLs • Large geographical coverage • Large number of involved actors and users • High data value flowing cross-border

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<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>

A combination of data volume, data complexity and velocity.
Complex datasets integrating data in some case from different countries
Number of data sources
Significant impact for society and/ or business

7 projects have contributed to this KPI, and in particular the 3 lighthouse projects active in 2018, Transforming Transport, DataBio and BigMedilytics that have reported 13, 26 and 11 large scale experiments respectively using private data.

BDVA i-Spaces reported 38 large scale experiments, 28 of them involving close data. In the same way than in the projects main criteria to qualify as large scale relate to size, impact and cross-border experimentation. 5 BDVA i-Spaces provided input to this KPI.

Details in Annex 2.
</td></tr>
<tr><td>II.12
(D2)</td><td>Uptake of BDV use cases and experiments</td><td>Year over Year increase of the number of Big Data Value use cases supported in I-Spaces and cPPP projects</td><td>2018 from projects: 224
48,3% increase with respect to 2017 (baseline)

2018 from BDVA I-Spaces: 165</td><td>2017 from projects: 151 (baseline for the PPP to assess evolution)</td><td>30% (p.a.)</td><td>Projects reported 224 use cases or/and experiments conducted during 2018 with a contribution from 18 different projects. Table 7 in annex 2 provide details per project of the experiments and use cases developed during 2018.
BDVA i-Spaces have reported additional 165 experiments with 6 i-Spaces contributing to this KPI. Details can be found in Annex 2.</td></tr>
<tr><td>II.13
(D3)</td><td>Support major sectors and major domains by Big Data technologies and applications</td><td>Number of sectors and major domains supported by Big Data technology and applications developed in cPPP projects</td><td>Lighthouse projects: 4
Total: >15</td><td>2017: Lighthouse projects: (2 active and 2 selected) and 10 sectors and major domains</td><td>>9</td><td>Sectors supported in lighthouse projects: 4

Transport, logistics and mobility;
Bio Economy;
Healthcare;
Manufacturing

Sectors supported by Big Data technology and applications developed in cPPP project (including the ones covered by Lighthouse projects:
<table>
<tr><th>Sector/application domain</th><th>Projects addressing this sector/application domain (% over active projects in 2018)</th><th>Innovations to market (delivered in 2018, % over the total)</th></tr>
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						<table><tr><td>Public services and Smart Cities</td><td>50%</td><td>20%</td></tr><tr><td>Transport, Mobility and logistics</td><td>43%</td><td>75%</td></tr><tr><td>Retail</td><td>37%</td><td>20%</td></tr><tr><td>Business Services</td><td>37%</td><td>20%</td></tr><tr><td>Health and healthcare</td><td>33%</td><td>8%</td></tr><tr><td>Manufacturing</td><td>23%</td><td>19%</td></tr><tr><td>Media</td><td>23%</td><td>0%</td></tr><tr><td>Finances and banking</td><td>23%</td><td>14%</td></tr><tr><td>Telecom</td><td>20%</td><td>13%</td></tr><tr><td>Energy</td><td>20%</td><td>0%</td></tr><tr><td>Bio-Economy: Agriculture, forestry and fishing</td><td>17%</td><td>14%</td></tr><tr><td>Water and natural resources</td><td>17%</td><td>0%</td></tr><tr><td>Earth Observation</td><td>13%</td><td>7%</td></tr><tr><td>Others</td><td>43%</td><td>27%</td></tr></table> Others (43% or the projects; this includes sectors such as insurance, public safety, personal security, public tenders, e-commerce, marketing, fashion industry, citizen engagement, ICT/Cloud services, social networks, procurement, legal domain, etc) It is important to highlight **that 20% of the projects are fully cross-sectorial** (their outcomes can be used in any sector or application domain) and **80% of the projects are working in more than 1 sector or application domain**. Details in Annex 2.
II.14 (D6)	Amount of data that has been made available to I-	Number of Exabytes of data made available in cPPP projects and I-Spaces	0,10696 Exabytes (106,96 Petabytes)	0 2017: 0,0854 Exabytes	>10	13 projects provided data for this KPI (Aegis, BigDataOcean, DataBio, euBusinessGraph, EW-Shopp, TT, QROWD, BigDataStack, BigMedilytics,

	Spaces (including in particular closed data)	(including closed data) (access to data for experimentation) This include data made available for experimentation (e.g. Data incubators and I-Spaces) and data made available internally in the projects for experimentation purposes (e.g. Lighthouses and other projects)		(85,4 Petabytes)		Boost 4.0, CLASS, EDI, TheBuyForYou), reporting a total of 0,08625 Exabytes (**86,25 Petabytes**) for 2018. 5 i-Spaces contributed to this KPI reporting additional **20,71 Petabytes** of data for experimentation. Further details can be found in Annex 2, including type of data and data providers information.
15 (D7)	Availability of metrics for measuring the quality, diversity and value of data assets	Number of metrics developed by cPPP that allow for assessing quality, diversity and value of data assets	2018: 15 projects using metrics. 0 new metrics developed by cPPP	2017: 7 projects using metrics. 0 new metrics developed by cPPP	>0	50% of the projects running in 2018 confirmed they are assessing quality, diversity and value of data assets. Details of the metrics used can be found in Annex 2.
16 (D8)	Increase the speed of data throughput compared to 2014	Data throughput of specified benchmarks increases by contributions of cPPP projects and other technology advancements by a factor of 100 compared to 2014.	2018: over **1000%** reported in 2 projects (BigDataOcean and FashionBrain). 40% projects expect to improve data throughput	Baseline: 1 2017: 150-200% reported in 1 project. +30% projects expect to improve data throughput	100	40% of the projects reported they expect the project to improve data throughput. In particular BigDataOcean, Data Pitch, euBusinessGraph, FashionBrain, SLIPO, MHMD, BigMedilytics, Boost 4.0, CLASS, E2Data, I-BiDaaS and TYPHON reported expected outcomes in this area. Some projects such as BigDataOcean and FashionBrain have measured improvements over 1000%. Others such as I-BiDaaS have specific objectives to develop data processing tools and techniques applicable in real-world settings and demonstrate a significant increase of speed of data throughput and access, however results are still not available at the end of 2018 (project started in 2018) Details in Annex 2
II.17 (CA 4)	New systems and technologies	Number of systems and technologies developed in the relevant sector in cPPP projects (beyond state of the art)	2018: **204**	2017: 32	>0	204 new systems and technologies have been reported by cPPP projects as produced during 2018 and many of them are not only related to one sector. Assessing the results coming from the cPPP projects it can be determined that in fact the majority of the new systems and technologies can be utilized in different sectors/markets and by that stimulating the use of Big Data technologies in many areas. Details in Annex 2.

						Details about application areas in I.4 and II.13
II.18 (CA3)	Participation and benefits for SMEs	Number of SMEs participating in cPPP projects Share of participation of SMEs in cPPP projects Estimation of the increase in turnover in SMEs participating in the cPPP projects (Reported in I.3) Estimation of the increase in number of employees for SMEs participating in the cPPP projects	Call 2018: 22 SMEs (25,3% organisations, 23,5% budget) Projects 2018: 131 SMEs (69% of all total enterprises) %Organisations 2018: 25,3% %Budget 2018: 23,5% Increase of turnover: 60% (baseline 2014) Last year increase of turnover (with respect to 2017): 17,7 % %annual increase: 11,8% %increase on baseline: 74,9%	2014: 1 124 FTEs 2015: 1 409 FTEs 2016: 1 563 FTEs 2017: 1 757, 6 FTEs 2018: 1 965, 6 FTEs	20%	Details provided in Annex 3 and comments provided to KPI I.3 (and Annex 2)
II.19	Contribution to the reduction of energy use and CO2 emissions	Contribution of the cPPP projects to the reduction of energy use in the area of the cPPP Contribution of the cPPP projects to the reduction of	2018: Over 20% of the projects active in 2018 contributing. improvements in efficiency, range between **25% and 51%** in transport sector 2018: 30% projects contributing. Savings **up to 29% in CO_2** and	2017: 2 projects contributing in 2 major application domains Early results show 12-40% energy efficiency in some pilots 2017: 3 projects contributing. Early results show 20%		Over 20% of the projects running in 2018 have reported they contribute to the reduction of energy use (BigDataOcean, DataBio, TT, QROWD, BigDataStack, Boost4.0 and E2Data). Only TT project provides quantitative information in Energy reduction with current results show that for the specific monitored items **improvements in efficiency, range between 25% and 51%** 30% projects have reported contribution to the reduction of CO_2 and in particular BigDataOcean, DataBio, TT, QROWD, BigDataStack, BigDataMedilytics, Boost4.0, CLASS, and ICARUS. It is important to highlight that mostly all the projects contributing to this KPI are **linked to the transport and mobility sector** (maritime, aviation,

		CO2 emission in the area of the cPPP	**up to 23% of emission reductions.**	reduction in some pilots		terrestrial transport and mobility in general). Even projects focused on other sectors such as healthcare reductions of CO_2 relate to the reduction of needs or mobility. Only one project, TT, provides evidence in measurements in CO_2 reductions reporting KPIs Improvements concerning **CO_2 emissions, savings reach up to 29% and reaching up to 23% of emission reductions in general (including PM and NOx.** Details can be found in Annex 2.
II.20	Contribution to the reduction of waste	Contribution of the cPPP projects to the reduction of waste in the area of the cPPP	2018: 3 projects. Up to **10%** reduction in DataBio and potential **25%** reduction in TT	2017: 2 projects. Up to 10% reduction*		The 3 or the 4 lighthouse projects running in 2018 (DataBio, Transforming Transport and Boost4.0) have reported contribution to the reduction of waste Details can be found in Annex 2.
II.21	Contribution to the reduction in the use of material resources	Contribution of the cPPP projects to the reduction of material resources in the area of the cPPP	2018: Asset Management pilot in BigMedilytics project aims to reduce the no. of unused mobile assets in hospitals by up to 20%	2017: 2 projects contributing		17% projects running in 2018 have reported contribution to the reduction to the reduction in the use of material resources. The 4 running lighthouses (TT, DataBio, BOOST4.0 and BigMedilytics) contribute to this KPI in addition to TheBuyForYou project. Only one project, BigMedilytics, provides quantitative data in a particular scenario reporting that the Asset Management pilot aims to reduce the no. of unused mobile assets in hospitals **by up to 20%.** Further details in Annex 2

Annex 1 Part 3: Contribution to Programme-Level KPI's

	Key Performance Indicator (KPI)	Definition/Responding to question	Type of data required	Data [Commission/Association]	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
1	Patents		Number of patent applications. Number of patents awarded		n.a. [new cPPP under H2020]		To be provided in version 2.0
2	Standardisation activities (project level) Contributions to new standards (PPP level)		Number of activities leading to standardisation Number of working items in European Standardisation Bodies. Number of pre-normative research files – prEN - under consultation in ESBs	[Data from Association] 2018: over 30% of the projects 2018: 11 Total: 47 2018: 5 Total: 11	n.a. [new cPPP under H2020] 2017: 3 2015: 12 2016: 3 2017: 21 2015: 2 (from members) 2016: 0 2017: 4	No target No target	Over 30% of the projects running in 2018 reported they perform activities leading to data/Big data Standardisation 3 projects have reported contribution to European Standardization Bodies (ESBs) activities. 20% of BDVA members reported its organisations perform activities leading to data/Big data Standardisation Further details in Annex 2 Working items in European Standardisation Bodies. 2015: 12 2016: 3 (3 additional) 2017: 21 2018: 11 (6 Databio, 3 BOOST4.0, 2 LYNX) Pre-normative research files: 2015: 2 (from members) 2016: 0 2017: 4 from DataBio project 2018: 4 from DataBio project

	Key Performance Indicator (KPI)	Definition/Responding to question	Type of data required	Data [Commission/Association]	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
3	Operational performance	Time-to-grant	from call closure to grant agreement signature (days)	202,5 days [Commission]	2017: 196,41 days 2018: 196,41 days [Commission]	Max 8 months (243 days)	Average value
4	H2020 - LEIT - Number of joint public-private publications	Number and share of joint public-private publications out of all LEIT publications.	Properly flagged publications data (DOI) from LEIT funded projects		2018: 35 publications		[2017] The modest number of scientific project publications is due to the fact that all these projects only started in 2017. Many more publications are expected in the 2018 monitoring report. [2018] To be provided in v2 of this report

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