



**Big Data and
Artificial Intelligence
Centres of Excellence
Framework**

**Critical Success
Factors**



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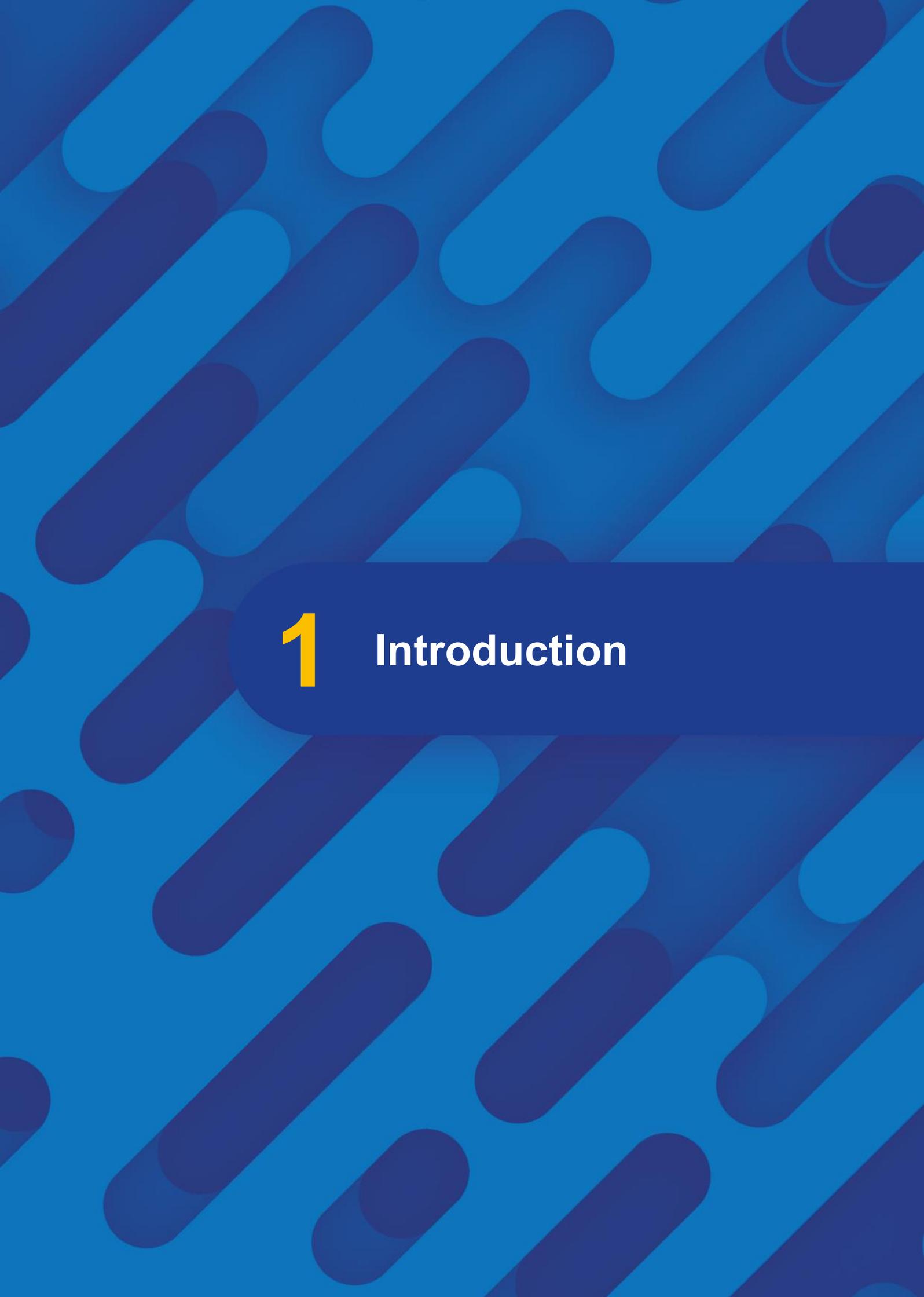


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1

Introduction

Big Data and Artificial Intelligence Centres of Excellence Framework

The goal of the BDVe project is the further development of the European data ecosystem as a data-driven economy. One objective of the project is to foster collaboration and promote sharing of best practices and know-how among Big Data Centres of Excellence (CoE) and national initiatives, and to provide expert guidance and (non-financial) support to member states looking to establish new National CoE for Big Data and Artificial Intelligence (BDAICoE). As part of this work, we present in this report a more detailed elaboration of the best practices within the BDAICoE model. This involved identifying specific practices for the capabilities part of our framework. This was achieved by performing a detailed analysis of the case studies and interviews with subject experts. This report details the current best practices for the following capabilities: Intellectual Property and Data Protection, Policy Outreach, Education and Public Engagement, Technology and Knowledge Transfer, and Performance and Impact.

1.1. Big Data and AI CoE Best Practice Framework

The BDAICoE framework is a best practice guide for use in promoting value generation and sharing of ideas within the Big Data and AI innovation ecosystem. The framework was developed following a phased design science process, starting from a literature review to create an initial framework which was enhanced with the findings of a multi-case study of existing successful CoEs. Each case study involved an in-depth analysis and a series of in-depth interviews with CoE leadership.

The BDAICoE framework has three components, and each of these is designed to cover each of the three elements defined in open systems theory that comprises of Input (Environment), Transformation (BDAICoE) and Output (Impact). Figure 1 shows the main components of the framework. Within the framework, there is a process flow in the form of a value chain starting from the Environment (which supplies input) through the Core BDAICoE capabilities (which processes the input) to the Output represented by the impact of the output received by the society under various categories; economic, scientific and societal. There is a backward flow (feedback) of

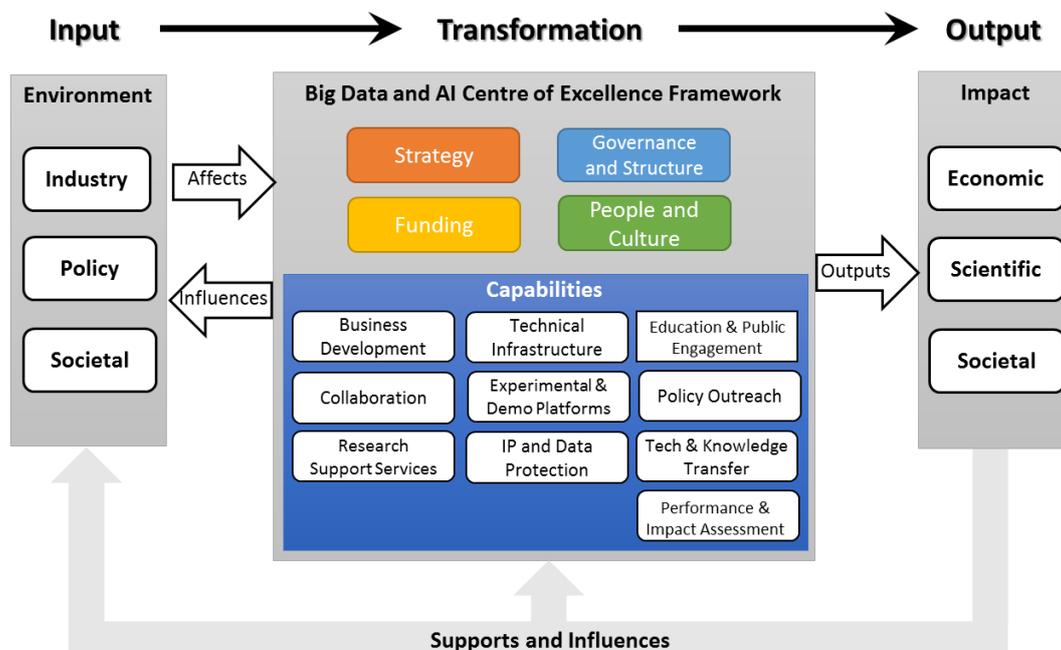


Figure 1: BDAICoE Framework

value from the Impact of a CoE back to the research centre and to the Environment in which the centre operates. For example, a CoE may hire personnel it trained as a postgraduate or receive income from services rendered to a partner, which can return value to the CoE. Similarly, the impact created can influence the environment in which it operates, particularly regarding policymaking and funding decisions. The quality of output from a research centre is often the most significant determinant of funding decisions by the funding agencies.

1.1.1. Environment

The context of a COE is heavily influenced by the external forces that demand a response from the centre; these external environmental forces can be divided into three areas:

- **Industry:** Industry is defined as the ecosystem of companies surrounding a BDAICoE, that is associated with the creation of economic value at both national and European levels.
- **Policy:** Policy is defined as the set of public laws, regulations, and policies that govern research and innovation activities at national and European level, as well as dictate the access, manipulation, and distribution of data.
- **Societal:** The societal environment of a BDAICoE comprises of state of human development as measured by composite statistics and indices, and the national priorities for human development in terms of the United Nations Sustainable Development Goals and H2020 Societal Challenges.

1.1.2. Core Organisational Model

The main element within the BDAICoE core model are:

- **Strategy:** Strategy represents how a CoE intends to achieve its overall mission and goals.

- **Governance:** Governance in a CoE refers to the level of decision-making about strategy and operations.
- **Structure:** The structure is how a CoE is designed (i.e., levels, roles, units, decisions, rights, and accountability).
- **Funding:** Funding refers to the availability, diversity, and sustainability of the monetary support for carrying out research and educational activities in a CoE.
- **People:** People are the human capital required to carry out specific tasks towards the goals of the organisation.
- **Culture:** Culture represents the underlying values, beliefs, and norms that drive the teams and the CoE as a whole.

1.1.3. Capabilities

The framework identifies a set of operational capabilities that are needed to operate a CoE.

- **People** – People are the human capital required to carry out specific tasks towards the goals of the organisation.
- **Process** - Process is the knowledge of procedures and tasks for the achievement of the goals of the CoE.
- **Infrastructure** - Infrastructure is the systems, practices, and tools that facilitate and reinforce the work within the organisation.
- **Outreach:** Outreach is the collection of information dissemination activities with which a research centre informs the public about the science and technology developments in the centre. The aim is to enable the public to appreciate science and technology.
- **Collaboration:** Universities-Industry collaboration (UIC) refers to the formal and informal engagement and interaction between a higher educational institution and an industry partner to facilitate knowledge and technology

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exchange as well as to provide ad-hoc advice and networking opportunity for the professionals. This can be national through the establishment of activities such as collaborations, research contracts and the provision of consulting services.

Capabilities are analysed more in Table 1.

1.1.4. Impact

The direct and indirect ‘influence’ of research or its

technology communities around the world. It includes the contributions it makes to the invention of novel ideas or concepts and the development of general science and technology principles.

- **Societal:** This relates to the beneficial impact of the result of a research centre on the entire human society, including the impact on awareness about science and technology development, better life (improved living

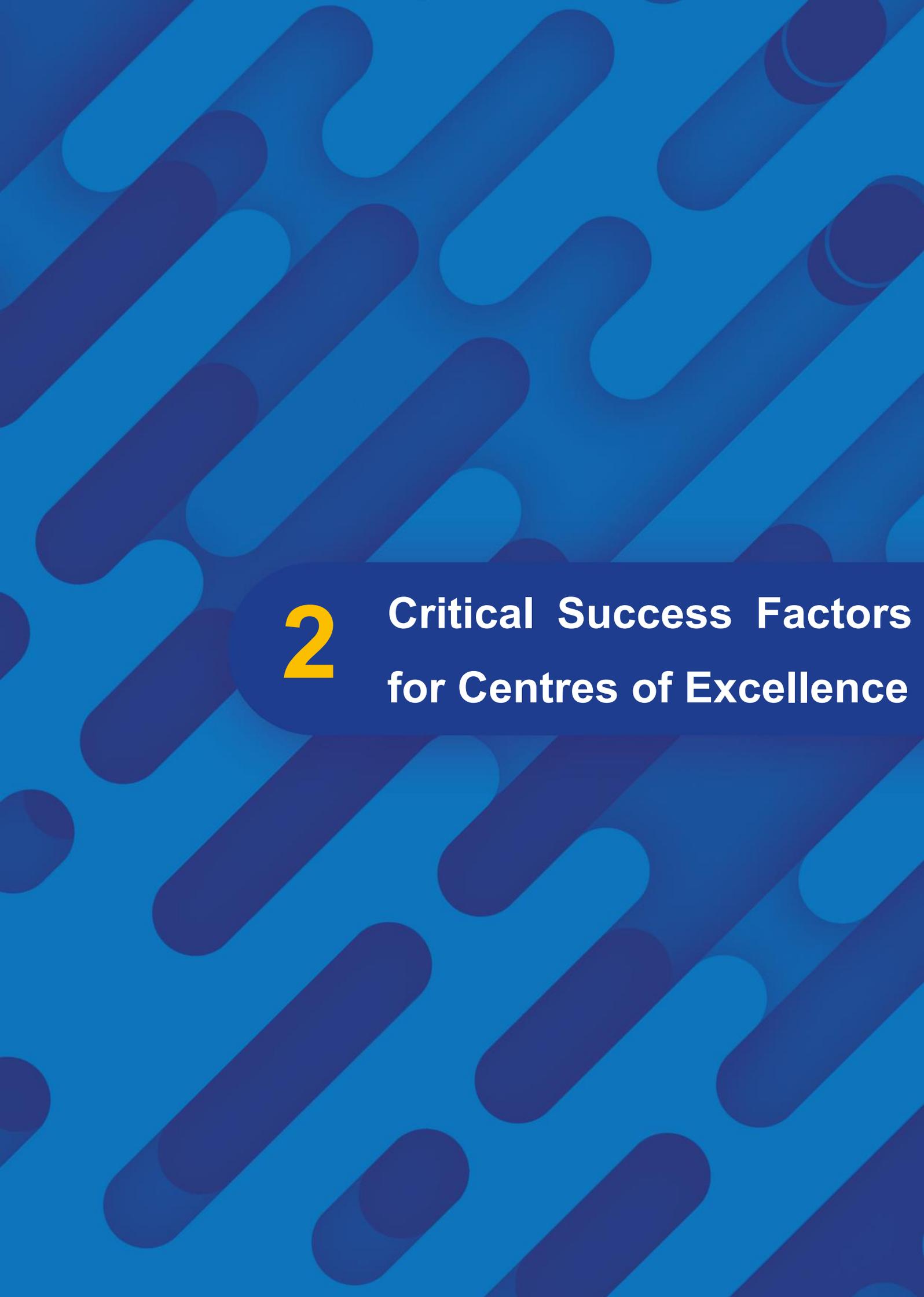
Table 1: Core operational capabilities of the BDAICoE framework

Operational Capability	Definition
Business Development	How the centre develops new business opportunities and manages its partnerships
Collaboration	How the centre enhances Academic to Academic and Academic to Industrial Interactions
Research Support Services	The local research support services implemented by the centre
Technical Infrastructure	Computing resources used to support the research and innovation activities of the centre
Experimentation/Demonstration Platforms	The platforms that support the scientific and innovation activities of the centre
Intellectual Property (IP) and Data Protection (DP)	How the centre approaches IP management and DP
Education and Public Engagement (EPE)	How the centre's dissemination activities inform the public of the science and technology developments
Policy Outreach	How the centre tried to Influence future policy
Technology and Knowledge Transfer	How the centre drives the transfer of know-how and adoption of its technology
Performance and Impact Assessment	How the centre identifies and tracks its performance and impact

‘effect on’ an individual, a community, or society as a whole, including benefits to the economic, social, human, and natural capital.

- **Economic:** The economic impact is the effect on commerce, employment, or incomes generated from big data research in general and by the CoE in particular.
- **Scientific:** This relates to the influence a research centre has on the entire science and

standard, health, and lifestyle), societal behaviour, improved organisational capabilities, and environmental care.



2

**Critical Success Factors
for Centres of Excellence**

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Critical success factors are a range of key enablers that CoEs, like corporate bodies, employ to achieve success in their operations. While some are very easily identifiable, e.g. funding availability and a mix of employees' capabilities and cooperation, other success factors are not quite salient, e.g. the role of culture in the success of a CoE. Similarly, some success factors are common to a majority of CoEs, e.g., the importance of enough funding to success, possession of world-class researchers, collaboration with important partners, and output publicity. Other factors are very peculiar to individual CoEs because certain factors apply to the research focus of a CoE. However, whatever the key success factor is, it is the responsibility of the management team to identify it early enough and to harness it to drive success in the required direction.

This section reports the findings of the BDAICoE case studies as success factor recommendations for existing BDV CoEs and potential ones for their research operations. These factors are gathered from interviews with the CoEs' senior management using a series of open-ended questions:

1. What are the common difficulties faced by the CoE in achieving its objectives?
2. What factors contribute to/enable the success of the CoE?
3. What are the typical mechanisms deployed to address success factors and challenges in the CoE?
4. What would you need to do to be more successful?

Challenges are the drawbacks on the progress of any organisation, while the success factors facilitate progress. Therefore, the management team of an organisation, according to its mandate, has to devise strategies and practices to eliminate or at least mitigate challenges and other risks to success. Success factors can be leveraged to drive the development of capabilities to meet the CoE's goal.

2.1. Challenges

The key challenges identified in our interviews are detailed in Table 2. They are aligned to the related strategic or operational capability. The list does not have an order or priority.

Table 2: Summary of Challenges

Challenge	Related Capability
To stay as a going concern – sustainability in the research industry.	Funding
Ensure essential funding to pursue basic research.	Funding
Satisfying high-performance targets for the CoE.	Strategy
Encourage more collaboration and partnership arrangements achieved.	Collaboration
Lack of autonomy. The lack of separate legal entity status.	Governance
The need to ensure that governance adds value to the CoE's operations creates some concerns.	Governance
Competing Interests – Funders' objectives versus Researchers' objectives.	Strategy
Human resource availability and retention, e.g. recruitment of PhD level graduates with significant industry experience can be a challenge.	People and Culture
Working with SMEs is challenging due to their resource availability problems, lack of clearly defined objectives, and often have short-term plans.	Collaboration

Challenge	Related Capability
Physical separation from important partners limits interaction and knowledge of themselves.	Collaboration
Facilitation of a flowing, open discussion of technology and solutions between the CoE and industrial partners.	Technology and Knowledge Transfer
Capability and capacity to assure partners that the CoE will help them to solve their challenges.	Collaboration
Bridging the knowledge gaps between academic IT, commercial IT with the associated research and business problems.	Business Development
The need to bridge the gap between people with knowledge of the business problem and those with knowledge of theory.	Knowledge Transfer
Maintaining a flow of new project contracts and adequacy in project management expertise.	Research Support Services
Industry Funding policy demands up to 25%-50% of its funding needs from industry. It creates a challenge of how to balance the interests of researchers with partners.	Funding
Aligning portfolio with the strategy to meet partners' demands. This also creates project selection and investment challenges, which often lead to frustrating researchers and industry partners.	Structure
Work overload arises from too many activities at the CoE which is, perhaps, contributed by the funding policy.	People and Culture
The trade-off between expediency and consensus in making decisions and at the same time, gaining staff commitment to achieve the CoE's goals.	Structure
Leading knowledge workers who are not driven by ordinary incentives like salaries because they have their own career agendas.	People and Culture
There is a need for the 'cross-pollination' of cultures between research and industry environments.	Knowledge Transfer

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2.2. Success Factors

The factors with which the CoEs' leadership contribute to their success are detailed in Table 3. They are aligned to the related strategic or operational capability.

Table 3: Summary of Success Factors

Success Factors	Related Capability
Ability to attract grant funding is based on reputation (both the CoE and individuals) for excellent research outputs.	Funding
Local presence of big industry players in tech, medical, pharma, etc. offer opportunities for collaboration and industry funding.	Funding
The stock of a talented team of people: The capability to assemble world-class academic talents attracts and satisfies stakeholders.	People and Culture
Ensuring that the people of the CoE can develop themselves and their careers.	People and Culture
Effective public outreach that translates science into something easy to understand for non-scientists.	Education and Public Engagement
Maximises outputs by providing (i) space (infrastructure and labs) that attract academics, (ii) money, and (iii) reputation of the individual members and the team.	Structure
Research turnover ensures that the CoE is fresh and relevant to the industry.	People and Culture
The more the CoE collaborates and works together, the more successful it will be.	Collaboration
Focus on projects that are proposed by industry members. This ensures that what is produced will have an immediate and beneficial impact.	Strategy
The produce-for-immediate-impact dynamic is highly motivating for the CoE to get to work on a huge variety of projects across many industries every six months.	Experimentation & Demonstration Platforms
Deep collaboration with industry partners provides the CoE with a huge opportunity for success, as it is involved in industry-focused research.	Collaboration
The support of the funding agencies is received in two ways – in the form of funding supply and help in the prioritisation of the research agenda.	Funding
The CoE is structured to support balancing scientific excellence and supporting business partners.	Structure
The CoE supports academic researchers in their career development and the goal of the CoE through operationalisation of both agendas in daily activities. This decision enables a robust structure that allows people to be focused both on their personal needs and the needs of the CoE.	People and Culture
The committed and hardworking young scientists of international combinations make significant contributions.	People and Culture

Success Factors	Related Capability
The industrial experience of the management team, which possesses a unique skill set in communication and industry-research collaboration and capability to speak/understand the languages of both the academics and industry.	Business Development

2.3. Mechanisms to Address Challenges

The mechanisms deployed by the CoE's leadership to address their challenges are detailed in Table 4. They are aligned to the related strategic or operational capability.

Table 4: Summary of Mechanisms to Address Challenges

Practice	Related Capability
Planning and measuring process: <ul style="list-style-type: none"> – Development of a strategic plan, an annual appraisal plan, and key performance indicators (KPIs) plan to align with the CoE's goals. – Measured and reviewed monthly. – Iterative planning process: over time, a plan may need to be reviewed and adjusted because initial factors affecting the plan have changed. 	Strategy
Communicate the progress of the CoE regularly to all members of the CoE to promote unity and focus on the common goal.	Collaboration
Publish a strategic plan and allow people at all levels to engage. This allows people to engage with the vision.	People and Culture
To help attain very high targets: Break the KPIs down into manageable pieces that people can handle.	Strategy
Aligns research agenda with the National Government's science and technology agenda and the goals of industry partners and domain trends.	Strategy
Using media publicity on current trends and using the media to create awareness about its research output.	Education and Public Engagement
The CoE maintains a market-focused approach by engaging with industry and other CoE representatives at different events.	Business Development
Enables funding agencies to help to prioritise its research agenda.	Funding
Meet with industrial stakeholders twice yearly to deliberate and to set research agenda as well as help in decision-making processes.	Collaboration
Arrangement for obtaining IP is quick and straightforward. This attracts industry partners to sign up a contract for a collaborative project.	IP and Data Protection
A one-on-one mentorship programme with industry to enrich the CoE's experience in the development of researcher talent.	People and Culture

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Practice	Related Capability
A monthly meeting with industry partners' representatives to monitor and discuss the progress of the CoE. Meetings ensure regular engagement of industry partners and increase awareness of industry role in making the CoE a success.	Collaboration
Internal meetings (weekly and monthly) enable the management team to get constant visibility of the CoE's internal operations.	Collaboration

2.4. Ideal Situation

According to the CoEs' leadership, the ideal conditions for the operation of their CoE are detailed in Table 5. They are aligned to the related strategic or operational capability.

Table 5: Summary of Ideal Situations

Ideal Situation	Related Capability
Separate legal entity status may allow the CoE to evolve into a larger entity to deal with SMEs, become self-sustaining, and to be able to deliver all its mandates.	Governance
The right balance of resources to deal with all challenges, meet increasing knowledge and demands for Data Analytics outputs.	Strategy
Academic Service Level Agreement between the CoE and academics who are working for the CoE.	Structure
Meritocracy – a basis for decision-making on funding, performance, and rewards.	Governance
A Strategic Investment Fund can provide flexibility, particularly in a situation where a merit-based funding policy is lacking.	Funding
Collaboration-seeking techniques to attract people to collaborate across non-traditional boundaries, both internally and externally.	Collaboration
Having a less divided funding framework, an increased funding level and an aligning funding interest with stakeholders' interest and CoE's ambition.	Funding
Increase the cash contribution from industry partners.	Funding
Division of labour in a more balanced way among the CoE's people.	Structure
Need to develop international networks and collaborations.	Collaboration



3 About

Big Data and Artificial Intelligence Centres of Excellence Framework

3.1. About BDVe

The goal of BDVe project is to support the Big Data Value Public-Private Partnership (BDV PPP) in realising a vibrant data-driven EU economy by effectively combining in a consortium Large Enterprises, SMEs and Academia.

3.2. Big Data and AI Centres of Excellence

The BDV PPP is furthering the development of the European data ecosystems as a data-driven economy. One key action is the work to support a network of BDAICoE to foster collaboration, share best practices and know-how among centres, facilitate meetings of the network participants and provide expert guidance and support for the establishment of new CoEs in Europe.

3.3. Big Data and AI CoE Best Practice Framework

A best practice framework for BDAICoEs has been developed through an extensive survey of existing CoEs in Europe, identification of their challenges and opportunities, as well as their best practices and guidelines. The framework has been enhanced by feedback from experts within CoEs.

3.4. Persons of Excellence

We conducted interviews with a wide range of experts within the CoEs, from the top executives and academic leadership involved in daily operations, management decisions and strategic

decision-making processes to specialists in areas such as academic-industry collaborations.

3.5. Call to Action

- Are you a Big Data and Artificial Intelligence Centre of Excellence and want to share your best practices?
- Are you a senior manager or director of a Big Data and Artificial Intelligence Centre of Excellence and want to be interviewed?
- Are you a new Big Data and Artificial Intelligence Centre of Excellence or you know of any that seeks support?

Please do not hesitate to contact us at: edward.curry@insight-centre.org

3.6. BDAICoE Framework Team

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3.7. About Insight

The Insight Centre for Data Analytics is a joint initiative between researchers at Dublin City University, National University of Ireland Galway, University College Cork, University College Dublin and other partner institutions. Insight brings together more than 400+ researchers from these institutions, 100m+ funding, and with over 80+ industry partners, to position Ireland at the heart of global data analytics research.

