

# ORCHESTRATING INNOVATION ECOSYSTEMS – A CASE STUDY ON THE FINANCIAL BIG DATA CLUSTER

**The role of hub firms within Gaia-X**

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When Gaia-X was initiated, many were uncertain what it would bring: a European cloud service provider, a new platform, open innovation? The project's mission is



**to create a proposal for the next generation of data infrastructure: an open, transparent and secure digital ecosystem, where data and services can be made available, collated and shared in an environment of trust.**



Its mission is to develop common requirements for a European data infrastructure as a response to the increasing pressure on European business models on a global scale. At this point in time, as we will show, Gaia-X is already delivering on it through various lighthouse projects, such as the 'Financial Big Data Cluster' (FBDC).

Therefore, we deep-dive into the case of the safeFBDC explaining the progress made by highlighting how the project has evolved so far. Starting with the paradigm shift towards ecosystems for open innovation we follow up by shining light on the emergence of the role of an ecosystem orchestrator and the dynamic capabilities that an organization taking up such a role should exhibit. We conclude this with our assessment of innovation hubs being prime targets as ecosystem orchestrators as they promote the competitive advantage of the entire business ecosystem, instead of only their own organizational aims, through its orchestration initiatives. With this necessary fundamental understanding on ecosystems, we unfold the FBDC through our case study of the safe FBDC to showcase how this lighthouse project already successfully implemented an ecosystem to be opened and grown in future endeavours of Gaia-X.

## **Towards a new paradigm: ecosystems for open innovation**

Digitisation accelerates global structural change in previously unknown dimensions in successive innovative waves (Schwab; 2017). This ever-increasing technological progress has significantly driven down the cost of information processing, storage, and communication costs, a former barrier that keeps

firms from making their optimal decisions when striving for excellent innovative performance (Altman, Nagle, & Tushman, 2015; Hilbert & Lopez, 2011; Koh & Magee, 2006). Instead, the newfound wealth of information and the extractable knowledge imposes new challenges for organisations: the formerly abundance of optimal (or near-optimal) decisions has exploded so that organisations face the dilemma to decide out of a plethora of thousands of (near-) optimal decisions (Altman et al., 2022). To enable themselves to make the best of their options, to reduce the risk of reoccurring failure when innovating, in face of today's rapid technological change firms would need to adapt their process of bringing innovative value propositions to the market. To do so they are bringing down the barriers of competition by moving towards collaboration outside their organisations to a formerly unknown scale. This allows making the innovative process less risky through (1) an increased pool of resources as these can be harnessed from outside of organizational boundaries allowing organisations to efficiently search large solution spaces; and thereby (2) diversification of risk as with a joint resource commitment the sunk costs in case of a failed innovation are decreased. This shift toward the direction of cooperation gives birth to the new paradigm of ecosystems. As a new form of organizing themselves and their environment ecosystems allow organizations, willing to shift paradigm in search of innovativeness, to address today's complex challenges in science and business (Eisenhardt et al., 2016; Davidson et a., 2015).

But what exactly are ecosystems? Back in school ecology taught us that ecosystems are systems of living and non-living interacting components within the same environment. Applying this idea an innovative reader<sup>1</sup> may think about something in the line of the following:



**Business ecosystems are a network of firms with differing interests bound together as a collective whole such that the fate of its [actors] is bound to the structure of that network and the roles played by its [actors].** - *Tan, Tan & Oh, 2007: 2*



In its most basic form ecosystems are a form to govern a collaborative venture. In other words, ecosystems are a way to organize undertakings with a multilateral set of partners. Historically, we understand collaborative efforts as restricted to a joint value chain as alliances and networks are directly interlinked with a focal firm. In this light competitive instead of collaborative behaviour was the norm

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<sup>1</sup> Based on Schumpeter (1950, 1939, 1934) and more recent Martín et al. (2011) who understand one form of innovation as the application of an established idea to a new context.

when it came to innovative endeavours conducted by organizations of the same kind.<sup>2</sup> While this idea has prevailed for a long time the predominance of strict competition has been slowly losing ground to the idea of partial cooperation (Jacobides et al., 2018; McKinsey and Company, 2015). The strategical behaviour which combines both competitions with cooperation, labelled coopetition, occurs when firms of the same market cooperate in the exploration of knowledge and research while competing in its resulting exploitation (Brandenburger and Nalebuff, 1996). Nowadays, with the backdrop of the risks of the technological transformation, this concept has culminated in ecosystems as they not only bring together competitors but a vast array of different firms - public institutions, corporations, as well as small and medium enterprises or start-ups.

However, there are more factors necessary for such an ecosystem to be of success. First, the participating organisations must work jointly on the same offer of a user value proposition (Kapoor, 2018). Such a common mission makes it attractive for participants to mutually grant access to assets and resources with the aim to create more value for their customers, reduce costs or improve business processes. Second, the ecosystem should be organized in a modular fashion (Shipilov and Gawer, 2020). Modularity is key for ecosystems as it prevents an overdependence on single participants (Jacobides et al., 2018; Baldwin, 2014).

Achieving the missioned value proposition consequentially should not depend on a single participant, instead, the contribution of each actor within an ecosystem should be substitutable by a different actor. This ensures the fulfilment of the value proposition by preventing failure through e.g., the withdrawal of a participant from the ecosystem or an overconfident assessment of a participant's usable capabilities. A good example of modularity is, fittingly, a cloud server that can easily be adapted to customers' needs. Third, directly intertwined is the complementarity of ecosystem participants. Participants should not only be modular but provide complementary capabilities, in form of e.g., innovations, products, or services, with significant interdependencies (Shipilov and Gawer, 2020). Therefore, it is important that the ecosystem not only consists of coopetitors but diverse organizations from e.g., different industries or of different nature e.g., public, or private, established or newcomer. Keeping the example of the cloud server, imagine we use it to host an Operating System (OS) platform with a complementary app. Without the OS platform the app does not work; with the app the OS platform can increase its value (and with increased usage also the value of the app itself). Should an increased usage deem it necessary the cloud server can be adapted in its specifications.

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<sup>2</sup> This is based on Schumpeters (1950 ,1939 ,1934) work who expected that innovative behaviour is based on the profit expectations during the growth of an industry as the major determinants of a firms growth.

# Managing Ecosystems

## The emergence and role of ecosystem orchestrators

Ecosystems build in a modular and complementary fashion allow their members, to some degree, autonomy in their activity. Consequentially, the locus of control of ecosystem activities resides outside of the organizational boundaries of single members. An alignment, or more explicitly, a mutual agreement among the members regarding the value proposition but also the positions of and flows between participants, therefore, is necessary.



**If we are to make strategic sense of innovation communities, ecosystems, networks, and their implications for competitive advantage, we propose that a new approach to strategy [called] 'open strategy' is needed.** - Chesbrough and Appleyard, 2007: 5



Accordingly, the underlying strategy determining 'how' to achieve the ecosystem's value proposition, while securing the participant's roles in it, (Adner, 2017) has to be a shared one (Gooyert et al, 2019). To achieve consensus in that matter ecosystems follow an open approach. Such an open strategy can be defined as "an openness in terms of inclusiveness, in other words, the range of people involved in making strategy; and an openness in terms of transparency, both in the strategy formulation stage and, more commonly, in the communication of strategies once they are formulated" (Whittington et al., 2011: 532).

When it comes to monitoring and managing the implementation of the open strategy and thereby the activities between multiple, diverse stakeholders of an ecosystem one has to zoom in on the coordinative interactions of inter-organisational cooperation (Teixeira, 2014; Tsai, 2002). Only when we understand what an ecosystem orchestrator does, we can tackle the question who such an orchestrator should be. Naturally, the tasks for an orchestrator depend on the specific ecosystem, its members, and the value proposition that is pursued. However, to make it tangible for our readers we offer an exemplary set of activities, derived from a study of an ecosystem orchestrator (Reypens et al., 2019), that is likely to be encountered:

- Formulating the ecosystems mission
- Developing the proposal of the value proposition
- Stimulating initial encounters between members
- Bridging stakeholders to build the ecosystem
- Creating small teams for an agile way of working
- Stimulating bottom-up collaboration
- Discussing differences & raising awareness to showcase and utilize complementary
- Facilitating relationships within and outside of the ecosystem
- Assigning roles and a flow
- Providing flexibility to ensure modularity
- Motivating key contributors
- Monitoring progress
- Showcasing the ecosystem and sub-projects
- Showcasing results

**These orchestration activities are exemplary as they depict dynamic capabilities such an orchestrator should have. Dynamic capabilities for orchestration are an organisation's ability to purposefully adapt its resources and competencies to handle change in a flexible manner (Eisenhardt and Martin, 2000; Teece et al., 1997). In the case of ecosystem orchestration such dynamic capabilities can be synthesized as (Adner, 2017; Dhanarai and Parkhe, 2006):**

1. Connecting; this encompasses tasks revolving around the consolidation of disperse resources & capabilities e.g., knowledge, of members
2. Facilitating; by engineering processes to initiate and grow the ecosystem
3. Governing; in form of overseeing the creation and extraction of value for members.

Having these dynamic capabilities for ecosystem orchestration, or at least exhibiting the ability to build them quickly, is of relevance as orchestration necessitates a leadership role without the benefit of hierarchical authority. Accordingly, the question of how to orchestrate and who should orchestrate an ecosystem is an intertwined question. Recent research has shown these questions should be answered with a decisive 'it depends' (Reypens et al., 2019). Naturally, the orchestration mode can be understood as a spectrum.

On the one end of the spectrum, a core actor (or a small group of core actors) sets the collaborative agenda, recruits partners, and typically relies on formal contracts to steer relationships (e.g., Kazadi et al., 2016) - accordingly, we call this dominating orchestration. On the other end, multiple members collectively negotiate the agenda, membership is often voluntary, and trust predominantly governs relations (e.g., Roloff, 2008) - therefore we call this consensus-based orchestration. Table 1 contrasts the two ends of the spectrum showcasing the strengths and respective weaknesses of both approaches.

*Table 2: Dominating versus consensus-based orchestration modes (Reypens et al., 2019)*

<b>Orchestration mode</b>	<b>Dominating</b>	<b>Consensus-based</b>
Vision creating connections	Formulated Set up arranged marriages and blind dates	Negotiated Build emergent teams around key contributors and key challenges
Coordination	Top-down division of work Centralised pooling of innovation efforts	Bottom-up, self-selection into work Decentralised aligning of innovation efforts
Handle plurality	Select complementary partners Create convergence around common goal	Create platform for collaboration Create harmony and awareness of different objectives
Control over outcomes	Set goals and outcomes	Provide flexibility to deviate from goals
Member engagement	Enforced through contracts	Enforced through relationships

As is often the case neither of the ends of the spectrum is optimal. Instead, an ambidextrous approach, mixing both modes, is the most beneficial option. The so-called hybrid orchestration, lending to both sides of the spectrum over the lifetime of an ecosystem allows an orchestration that makes the most use of (1) connecting, (2) facilitating, and (3) governing capabilities. Bringing together the exemplary tasks and orchestration modes allows to showcase that for some practices a certain orchestration mode is deemed more suitable than for others.

As a result, switching between these and using a hybrid approach is optimal. Table 2 depicts this by mapping the aforementioned orchestration tasks to the respective orchestration mode considering the number and diversity of stakeholders in the ecosystem. The activities depicted can be understood as a toolbox of orchestration practices to address distinct challenges an ecosystem faces. The takeaway from table 2 is that different kinds of tasks are more efficiently fulfilled when either conducted by a dominant orchestrator or by a consensus-based group. Conclusively, switching between both modes - hybrid orchestration - ensures the most successful innovation trajectory over time (Reypens et al., 2019).

*Table 3: How dominating and consensus-based orchestration help orchestrators address distinct ecosystem challenges brought by the number and diversity of stakeholders (Reypens et al., 2019)*

<b>Orchestration mode</b>	<b>Dominating</b>	<b>Consensus-based</b>
Dominating orchestration	<ul style="list-style-type: none"> <li>Practices to overcome ecosystem opacity</li> <li>Developing project proposal</li> <li>Assigning roles</li> <li>Stimulating initial encounters</li> <li>Bridging stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>Practices to create a shared representation of the project</li> <li>Formulating project vision</li> <li>Showcasing projects</li> <li>Showcasing results</li> </ul>
Consensus-based orchestration	<ul style="list-style-type: none"> <li>Practices to address collective action problems</li> <li>Motivating key contributors</li> <li>Creating smaller teams</li> <li>Monitoring progress</li> </ul>	<ul style="list-style-type: none"> <li>Practices to increase legitimacy</li> <li>Discussing differences and raising awareness</li> <li>Providing flexibility</li> <li>Stimulating bottom-up collaboration</li> <li>Facilitating relationships</li> </ul>

The showcased exemplary tasks provide an understanding of tangible activities the orchestrator, either in form of a focal organisation or multiple members, could utilise to govern the ecosystem. These activities can be understood as

a toolbox of orchestration practices to address distinct challenges through hybrid orchestration to ensure a success of the ecosystem (Reypens et al., 2019).

As some of the exemplary tasks already reflect ecosystem orchestration also necessitates the governance of members on a more intangible level. Bringing together diverse, modular, and complementary organisations under one focal value proposition makes an ecosystem a potpourri of organisational culture.

At the interplay of cooperation and competition, digital business ecosystem orchestration often requires a dual perspective on other seemingly contradictory situations. Wareham, Fox, and Cano Giner (2014), for instance, describe how orchestrators of digital business ecosystems need to balance tensions like openness versus closedness, standard versus variety, or individualism versus collectivism. Accordingly, an orchestrator should be able to set a culture that embraces the value of togetherness ('contributing to a focal value proposition'), working with tensions and contradictions ('embracing dualities') and active acceptance of uncertainty ('working with proto-visions') to set the right tone for successful collaboration. This is, however, not only the task of a single orchestrating entity. Instead, representatives of organisations active in ecosystems, need to achieve a mindset shift from competitive opposites ("them versus us") to a complementarity-oriented attitude ("collaborative but distinct"). As a result, managers in such settings often must build multi-faceted identities and distinguish between their internal corporate role and the role they play with other digital business ecosystem participants (Neudert and Kreutzer, 2021).

Conclusively, the question of how and by whom ecosystems should be orchestrated can be best described as a "translucent hand" (Altman et al., 2022). Situated between the infamous invisible hand of the market (Smith, 1776) and the visible hand of organisational hierarchy (Chandler, 1977) ecosystems are a hybrid form found right between both. While organisations engaging within an ecosystem retain their own agency an orchestrator that shepherds all participants without exploiting them is necessary for guidance. Such a



shepherd has the task to uphold the openness of an ecosystem (Tan et al., 2020; Adner, 2017) by enabling and implementing an orchestration which is both dominating at some and consensus-based in other times.

## Innovation Hubs as ecosystem orchestrators

Technological innovation and the rapid development of ecosystems have often been credited with having significant strategic implications for organizations by shifting the competitive landscape and changing the industry's market dynamics. Against this background, so-called hub firms (or innovation hubs) play an increasingly important role for stimulating indigenous innovation to reduce dependence on foreign technology and enhance the innovative capabilities of German and European firms. Considering our foregoing explanations we conclude, in line with literature (Russell and Smorodinskaya, 2018; Williamson and De Meyer, 2012), that an innovation hub provides the dynamic capabilities required for an ecosystem orchestrator to shapes the ecosystem indirectly rather than through direct command and control. Dynamic capabilities are regarded as key for hub firms orchestrating business ecosystems (Gomes et al, 2018; Helfat and Raubitschek, 2018). Still, most of the existing research focuses on how the hub company achieves its own competitive advantage by leveraging the ecosystem's resources. Only a few studies examine how the hub company promotes the competitive advantage of the entire business ecosystem through its orchestration initiatives.

Looking at the business landscape, in many contexts a hub firm coordinates services for the ecosystem (e.g., Gaia-X, Mobility Data Space). In these settings, the hub firm must coordinate, influence, and manage various players in the ecosystem to create value (Jacobides et al, 2018). Hub firms must balance various tensions, such as tensions between efficiency and inclusion, self-interested motivations, and collective benefits, as well as complexity and high costs. Following this, they need to make decisions while considering what every other active firm in the ecosystem is doing. Hub firms may have control over the technological infrastructure, they may control the brand that determines the value of the ecosystem or regulate access to a given shared platform or community. In this way, hub



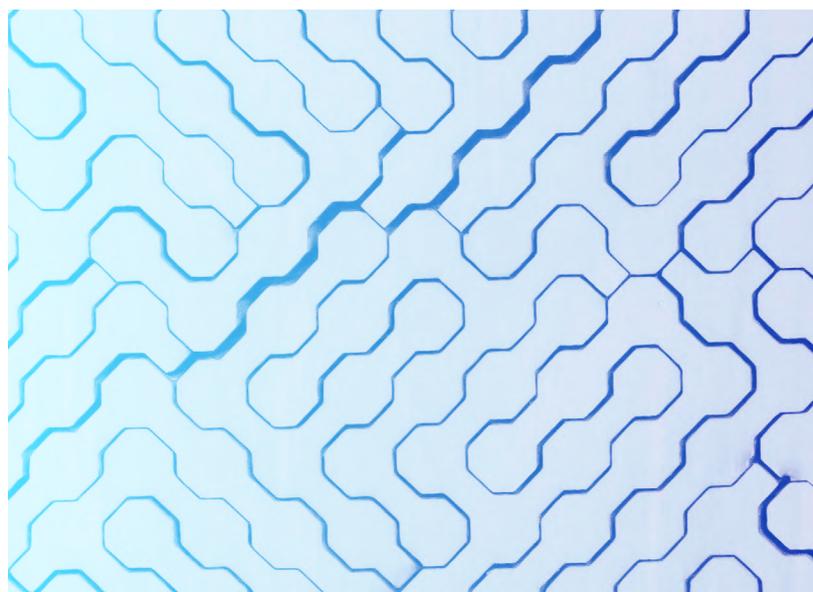
firms are known as ecosystem orchestrators, purposefully building, and managing inter-firm ecosystems by using their prominence and power to perform a leadership role in pulling together the dispersed resources and capabilities of the different ecosystem actors (Scaringella and Radziwon, 2018; Su et al, 2018).

Value creation and capture from the ecosystem are the main goals of the ecosystem orchestrator (Dhanaraj and Parkhe, 2006), which depend on two orchestration processes that a hub firm must perform, namely managing knowledge mobility and innovation applicability. Knowledge mobility is defined as the ease with which knowledge is shared, acquired, and deployed within the ecosystem, and the hub company bears the responsibility for improving knowledge mobility and use of competencies in the ecosystem (Thomas et al, 2014). At the same time, a hub company must also address another key issue, that of appropriateness, to ensure equitable distribution of value among ecosystem actors and to prevent potential free-riding and opportunism (Jabobides et al, 2018).

## Case Study: Financial Big Data Cluster

### Managed Ecosystems for the Financial Service Industry

The rapid development of technology is presenting financial services providers with major challenges. This particularly applies to the current and future positioning of the financial services industry, as users increasingly ask for digitised services. Accordingly, financial service providers have an increasing interest in platformisation for the exchange of data but face, however, regulative, and cultural challenges that have kept them from exchanging freely (Westermeyer, 2020; Hendrikse et al., 2018; Khanagha et al., 2014). For many, the question arises as to whether they want to digitize their business models and if they have the necessary capabilities to do so. Even for organizations that have such capabilities readily available in-house the positioning in newly emerging ecosystems to create new product and service offerings can be attractive. Especially ecosystems that are enabled through an IT infrastructure (Tan et al., 2020) allow innovation at the forefront as they intertwine business and digital processes (Dini and Nachira, 2007). Such ecosystems



offer benefits as new forms of revenue generation, integration with specialised partners, greater customer retention, or sharing of costs. However, risks must also be taken into consideration ranging from the loss of customer interfaces to data security concerns, reduced margins, or the loss of established business models and brand identity.

According to a recent study, the business interests for participating in ecosystems is particularly related to a rising interest in monetising data (Deloitte, 2021). This comes as data ecosystems have made a significant impact on multiple fronts across organisations in the past, e.g., improving customer satisfaction, increasing operational productivity/efficiency and reduction of costs.

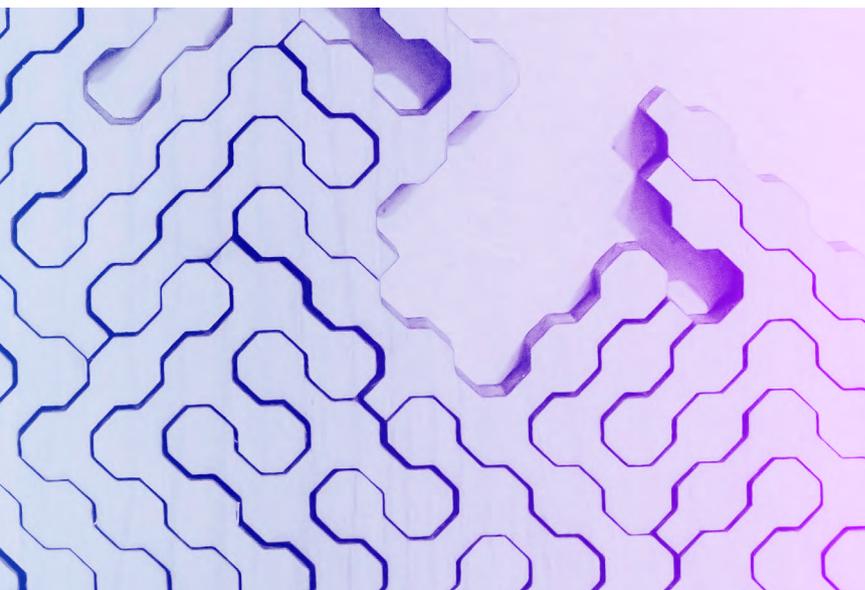
On the other hand, the increasing amalgamation of firms in data ecosystems could also result from perceived weaknesses in European data availability and access, especially among small and medium-sized companies, as well as regulatory barriers. The quest for ecosystems that offer innovative solutions is therefore also a logical conclusion, i.e., a diverse network of value-creating business partners is an essential part of a company's future assets.

## Approach and project context

In this article, we present a case study to investigate the orchestration activities of an innovation hub as ecosystem orchestrator and the role of ecosystem-based dynamic capabilities. Case study methodology is preferred when the units of study are not fully understood, complex and hard to isolate from real-life context. It enables detailed tracking of processes

that cannot be controlled in the lab and are difficult to find in archival data (Yin, 2013). Building on prior research, we've selected the case of a multi-stakeholder innovation project - the Financial Big Data Cluster (FBDC).

The aim of FBDC, which started already back in 2019, is to build and establish an ecosystem for the sovereign exchange of data between multiple parties in the



financial services industry, focusing on the handling of highly sensitive financial data. The architecture should be aligned with Gaia-X requirements to ensure long-term interoperability.

The main challenge of the FBDC architecture is to integrate and analyse data of multiple private institutions of the financial sector (e.g., Bank A, Bank B, Bank n) but also public institutions. Against this background it is also the declared goal of the consortium (see table 3) to tackle regulatory challenges and derive strategic recommendations for regulators, supervisors, and the public sector, when it comes to societal challenges such as e.g., money laundering. This ecosystem is bound by its set of goals and the project's mission. Within the framework of FBDC, it is to be shown how the European path of data sovereignty can become competitive with the commercialisation of data in the USA and the surveillance approach of China.

During the last 1.5 years, the FBDC ecosystem has grown significantly in the number of partners and use cases, being initialised by the lighthouse project safeFBDC. This research and development project is run by a consortium of selected firms, supported by numerous associated partners covering a large part of the German financial services industry. In order to provide a business foundation for the projects - and thus for the emerging ecosystem - it is necessary to determine incentives and requirements of financial market participants to partake in data sharing and the ecosystem in general. The analysis of these research aspects takes place implicitly within different use cases that have been selected by the ecosystem orchestrator i.e., the potentials, challenges, and incentives that cross-organisational data sharing entails are identified in relation to these use cases. The elaboration of these results will be carried out across organisations by analysing the incentives and requirements for data sharing in a business context from both a technical and an economical perspective.

# safeFBDC: From creating competitive advantage to contributing to a focal value proposition

The project duration of safeFBDC amounts to three years (2021-2023). During this time, safeFBDC receives funding by the German federal ministry of economics and climate protection (BMWK). FinTech Community Frankfurt GmbH (short "TechQuartier") was selected as the leading orchestrator (hub firm) due to its neutral shareholder structure and expertise in building ecosystems.

The consortium, which has come together under the leadership of TechQuartier, consists of private sector companies, startups and public institutions. Table 3 summarises the involved ecosystem participants.

Figure 15: Information structure (adapted from Chen et al, 2019)

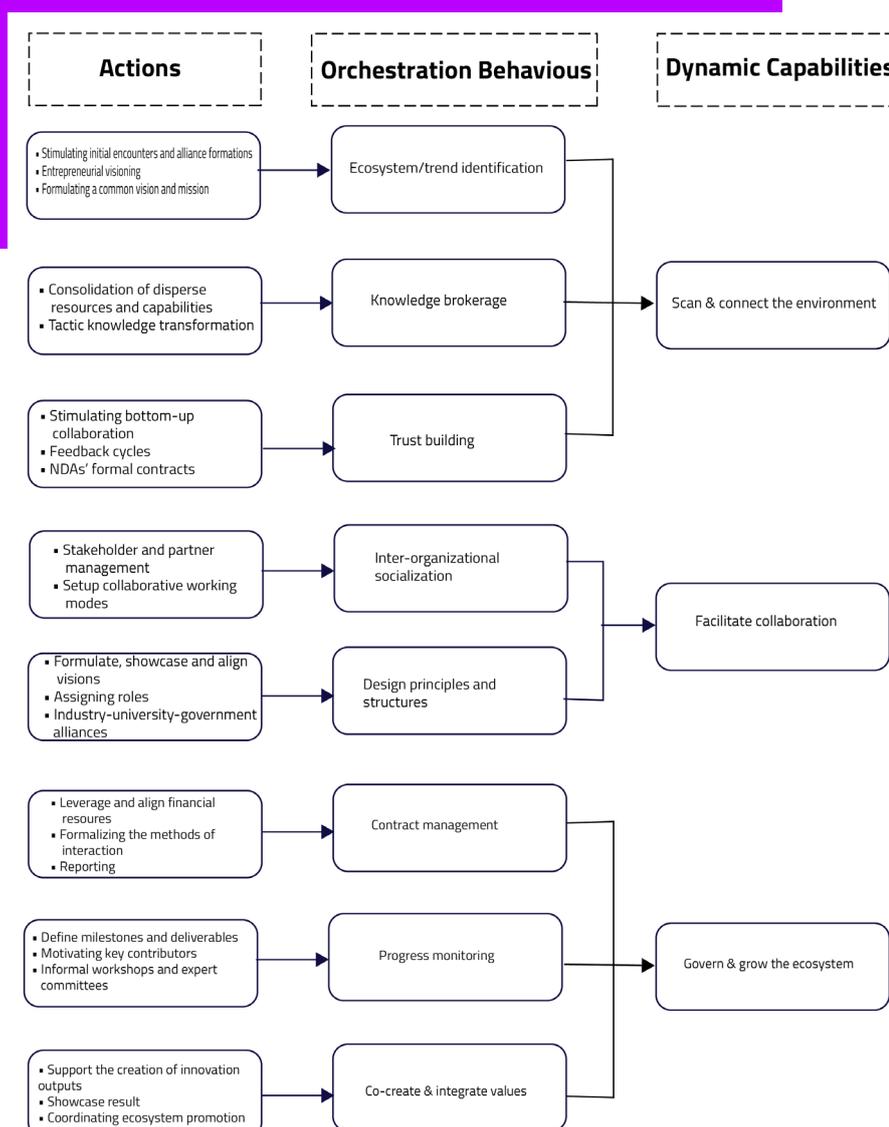


Table 3: List of involved companies, legally bound by a cooperation agreement; \*: companies subcontracted by one of the ecosystem participants

Research Institutions (5)	Private Companies (6)	Startups (2)	Public Institutions (3)
Frankfurt School of Finance & Management	Deutsche Börse	Hawk:AI	Hessisches Ministerium für Wirtschaft, Energie, Verkehr und Wohnen
Technische Universität Darmstadt	SAP Pioneer	spotixx	Deutsche Bundesbank
Fraunhofer-Institut für Materialfluss und Logistik (IML)	Helaba Landesbank Hessen Thüringen		Green & Sustainable Finance Cluster Germany*
Fraunhofer-Institut für Software und Systemtechnik (ISST)*	ING-DiBa*		
Deutsches Forschungszentrum für Künstliche Intelligenz*	Deutsche Bank		
	neosfer		
	TechQuartier		

The diversity of the project becomes clear when looking at the involved parties: While young companies are often “agile natives”, incumbents have to embark on an organisational transformation journey to be an integrative part of the ecosystem. Balancing clear processes along corporate hierarchies with re-designed agile units and fully experimental setups requires a differentiated understanding of which organisational design optimally contributes to value co-creation (on an ecosystem level) and value capture (on an organisational level). Formally, the cooperation is regulated by a jointly concluded cooperation agreement.

Orchestration activities (Case study findings) / Ecosystem-based dynamic capabilities of the hub firm

As innovation hub TechQuartier plays the important role of the translucent hand in the FBDC ecosystem orchestrating members who seek to create value and extract value from the ecosystem. Following the approach of Chen et al. (2019) in figure 15 we summarise the

key actions of the hub firm with an initial list of first-order concepts, related to the firms' actions. We retrieve this data from TechQuartier employees, which are amongst the authors of this article. We sorted this information and compared it across informants (employees) in order to identify key concepts and relationships among them for identifying second-order dimensions, linking them under orchestration behaviours. These second-order categories enable us to capture a higher level of abstraction and aggregate this into several key factors, namely ecosystem-based dynamic capabilities. Based on existing literature on ecosystem orchestration (Adner, 2017; Dhanarai and Parkhe, 2006) we map the orchestration behaviours to existing dynamic capabilities of orchestration. Furthermore, we adjust these based on our observations of capabilities exhibited by the hub firm.

Scanning and connecting the environment is a major orchestration capability of hub firms such as TechQuartier. It is key to combine the knowledge of their own and related complementary asset providers (e.g., start-ups) to identify trends and capture opportunities in response to the external environment and for the enhancement of the ecosystem. This capability implies that the hub firm can assess and select appropriate partners for the ecosystem formation. In the context of safeFBDC, TechQuartier was for example responsible for stimulating initial encounters and formulate a common mission, which also requires a certain level of entrepreneurial visioning. This mission defines the projects value proposition, binding together the ecosystem. Being driven by this value proposition allowed TechQuartier to build and understand the ecosystem in a structurist approach, meaning that the vision defines further activities (Adner, 2017). Furthermore, we find that the capability of scanning and connecting the environment is comprised of knowledge brokerage and trust building. The former is another key factor for hub firms to sense external opportunities, to evaluate trends and to derive strategic recommendations. TechQuartier adopted several tactics for knowledge brokerage, including but not limited to brownbag meetings, expert lectures, roundtables, and research forums. The latter, trust building, includes for example measures for stimulating bottom-up collaboration. For innovation ecosystem, trust is crucial for the strengthening of ecosystem identities among related partners, underpinning them to cope with the uncertainty of external environment. In the case of FBDC, the neutral shareholder structure of the orchestrator, i.e., the hub firm, is a central advantage and simplifies the paths for trust building, which include feedback cycles and formal contracts.

The capability of facilitating collaboration allows hub firms to organize the ecosystem actors in appropriate ways to leverage and gain essential resources for developing products and services, i.e., the innovation outcome (Jacobides

et al., 2018). According to our case analysis, we find that this capability contains inter-organizational socialisation and the design of principles and structures. To broaden inter-organizational socialisation it is an important task for the hub firm to strengthen communication and collaboration across regions, countries, and competitors. In the previous sections we have already outlined that this is a critical challenge for the ecosystem and its inherent competition. In our case, the inter-organisational socialization was even more challenging, since, until April 2022, due to the Covid-19 pandemic, no or very few physical meetings have been possible.

Against this background it was necessary to identify other ways of communication and collaborative working tools (e.g., virtual workshops and alignment meetings or secure communication platforms and messenger services). To fully leverage the ecosystem members and strengthen the innovation appropriability, the hub firm should also employ several design principles and structures. Consistency in alignment and decision-making processes can have a strong positive impact on voluntary cooperation and discourage hoarding of ideas (Dhanaraj, Parkhe, 2006). In the case of safeFBDC, work-breakdown structures, i.e., the formation of smaller teams, individual milestones and deliverables have been enforced, as depicted in figure 16. This was also necessary due to the diversity of thematic focal points.

Each organisation holds specific roles and individual tasks. The regular meetings and open discussions of designated organisational representatives result in a dense, highly decentralised, and inclusive

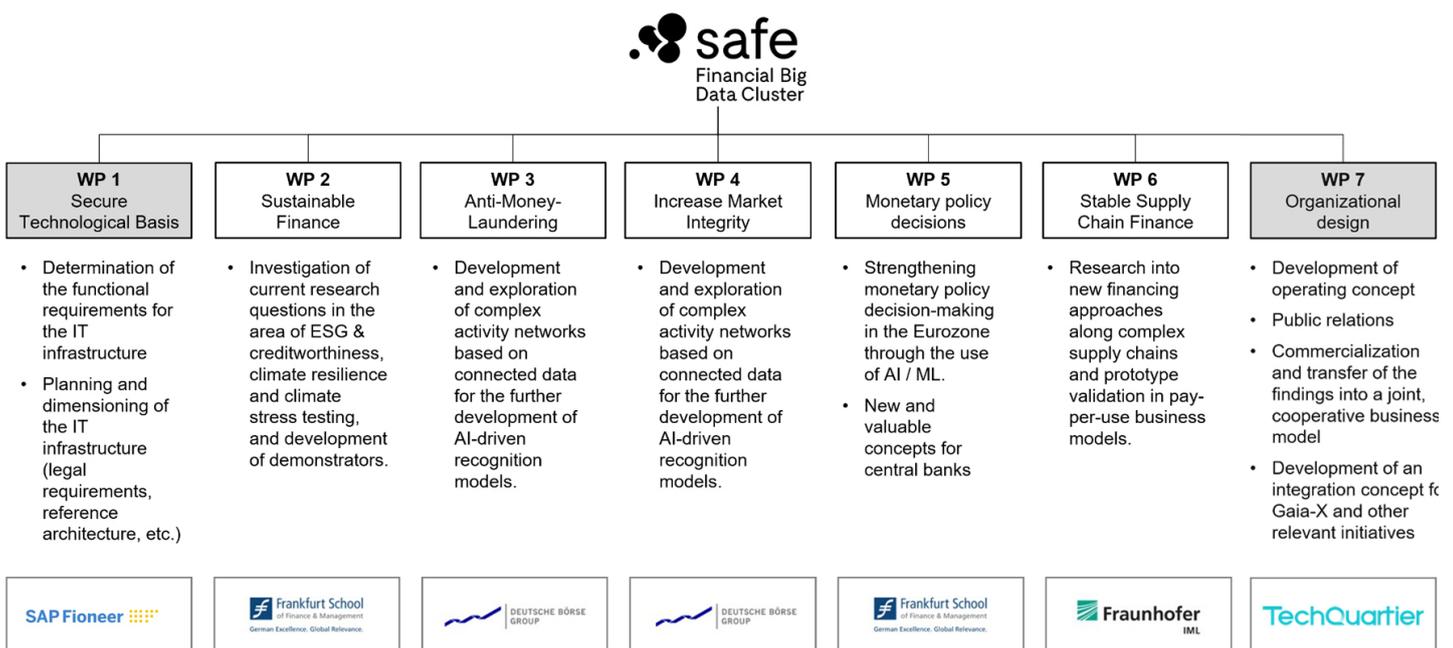


Figure 16: Work-breakdown structure of safeFBDC (simplified)

form. From the experience of TechQuartier, it is also apparent that more robust relationships can be built by a hub firm enforcing multiplexity, meaning that more than one relationship occurs at the same time within an ecosystem (Dhanaraj and Parkhe, 2006). Increasing multiplexity can help to expand the scope of relationships so that firms interact more broadly and deeply with each other. In our case, TechQuartier keeps establishing alliances between industry partners (start-ups and corporates), universities, research institution and the local government and thus generates co-competition between partners by coordinating ecosystem activities.

Another important capability of the hub firm is to govern and grow the ecosystem and oversee the creation and extraction of value for actors of the joint value creation. According to our case analysis we find that contract management, progress monitoring, co-creation and integration of values are associated with this capability. In ecosystems, joint asset ownership, e.g., intellectual property right sharing with ecosystem partners, is particularly effective at joint problem-solving arrangements and innovation appropriability enhancement (Dhanaraj and Parkhe, 2006), so that self-interested motives can be aligned with common interest. In our case, formal contractual arrangements have been adopted in the interest of the ecosystem participants which sets rules for the distribution of joint value outcomes.

This, however, limits to some extent the openness of the ecosystem, representing a bureaucratic barrier to the inclusion of additional ecosystem participants. TechQuartier oversees the contract management as the orchestrating hub and formally manages the ecosystem participants. The case of FBDC shows that progress monitoring is another important task of the hub firm, yet not an easy one. There exist several tensions, including the need for efficient operation vs. member involvement, the conflict between individual and whole interest or the equilibrium between complexity and high coordinating costs (Tiwana, Konsynski, and Bush, 2010). Thus, actions need to be selected carefully to motivate the key contributors and stimulate collaboration. It is fundamental to the hub firm to support the creation and integration of innovation outcomes to further grow the ecosystem. According to our case analysis, these actions can be manifold, ranging from promotional activities (e.g., fairs and exhibitions, social media presence) to acceleration formats (e.g., hackathons) or coordinating the relationships with local governments or related public initiatives.

# Conclusion

The prominence of digital business ecosystems in today's economy raises questions about how to support collaboration between multiple, diverse stakeholders and, in the narrower sense, emphasises the importance of ecosystem orchestration to make the digital business ecosystem flourish. Not every company is in a position or has the capabilities to be an orchestrator. You cannot unilaterally choose to be the orchestrator, but rather you need to be accepted by the other players in the ecosystem. The orchestrator should occupy a central position in the ecosystem network and have the ability to coordinate effectively. As stated earlier in this article, the orchestrator should be perceived as a fair choice by the other members, not as a competitive threat. Ecosystem orchestrators, such as TechQuartier, build ecosystems, encourage others to join, define standards and rules, and act as a mediator in cases of conflict. Nonetheless, one has to face the limitations both inhibited by the chosen orchestrator as well as the ones imposed by the environment of the ecosystem. In case of the FBDC this means (1) legal restrictions that bound the scope of the ecosystem; (2) a lack of resources e.g., manpower and capabilities e.g., technological expertise of the hub firm and the ecosystem partners; and (3) the restrictions imposed by the limited external funding scope led to part of the initial value proposition being externalized into a new sub-project. In front of the Gaia-X backdrop the safeFBDC project in its light-house-project function is already on a good way to accomplish the vision of a joint standard through its interdisciplinary structure and the joint approach from the ecosystem. Finally, it is important to mention that a successful ecosystem not only needs orchestrators, but also contributors to create something new and valuable. At best, these should be innovative and have the capability to lead the ecosystem to new perspectives and products.

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