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Governance framework for performance measurement of a regional digital ecosphere

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Abstract: The area of interest is a regional digital ecosphere constituted by digital tech startups as a regional platform for learning and matchmaking, and the addressed research question is: How to govern a private-public funded initiative for performance measurement of a regional digital ecosphere? And more practical, how to orchestrate this in a governance framework? This is framed with theory on ecosystems, digital disruption and digital transformation, and the concept of a digital ecosphere. The research method is action research. Qualitative semi-structured thematic interviews in selected digital tech ecosystems have been conducted including interviews of their innovation managers, key employees, and entrepreneurs from digital tech startups. Moreover, the digital ecosphere has been mapped with key numbers. The contribution is a governance framework for a digital ecosphere, that can be leveraged by digital tech ecosystem innovation managers, industry partners, and policymakers in a private-public partnership setup.

Keywords: Digital disruption; digital transformation; digital ecosphere; digital tech ecosystem; governance; private-public partnership; innovation managers.

1 Interdependence of a regional platform and marketing activities

Digitalization is important to governments. Denmark is no exception, and in 2018 the private-public partnership Digital Hub Denmark was launched to be a digital frontrunner in Europe by 2023 leveraging technologies such as AI, IoT, and Big Data. The private partners are The Danish Chamber of Commerce, Confederation of Danish Industry, and Finance Denmark, and the public partners are the Ministry of Industry, Business and Financial Affairs, Ministry of Higher Education and Science, and Ministry of Foreign Affairs of Denmark. The public and private partners approximately fund the partnership with 90 % and 10 %, respectively; however, all partners have an equal vote in the board of directors with an independent chair.

Digital Hub Denmark is founded with two obligations regarding a national platform and marketing activities, where Denmark is the region. The national platform regards matchmaking (better access to ideas, competencies, and cooperation) and learning (learning portal for commercial application of new technologies), and marketing regards marketing of Denmark and increased attraction of talents, investors, and customers. As illustrated in Figure 1 these obligations are interdependent, as the national platform can be utilized for marketing activities and the marketing activities can be utilized for the growth of the national platform.

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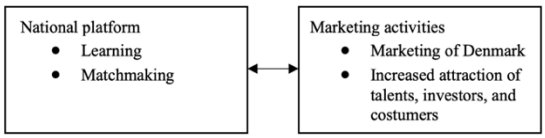

Figure 1 Interdependent national platform and marketing activities.

At first, the national platform was designed as an online platform for matchmaking and learning; however, when I started as Digital Hub Denmark Professor in 2019 it quickly became clear, that the proposed digital platform solution would not supply the goals of matchmaking and learning. The design did not support a solution, where different key stakeholders would engage, because there were no value proportions for content suppliers such as digital tech start-ups with new digital transformative solutions.

As Digital Hub Denmark Professor I have a special research obligation to support exponential growth leveraging digital disruptive technologies. And as Thought Leader in Digital Hub Denmark, I started with no platform for this task. To this end, my point of departure was a real-world problem; to establish such a platform for learning and matchmaking. I suggested that the national platform was not a digital solution, but a network of key stakeholders working closely together with shared agendas for making Denmark a digital frontrunner. This national platform is the area of interest of the research addressed in this article.

2 A national platform as a digital ecosphere

During 2020 the national platform was formed as Denmark's Digital Ecosphere (Rosenstand 2020, Rosenstand & Kristensen 2021). This digital ecosphere is constituted by seven digital tech ecosystems: FinTech (Financial), HealthTech, Robotics, CreaTech (Creative), PropTech (Property), AgroTech (including FoodTech), and EdTech (Educational). To combine and cultivate the digital tech ecosystems of the digital ecosphere, an ecosphere canvas was developed, which is illustrated in Figure 2.

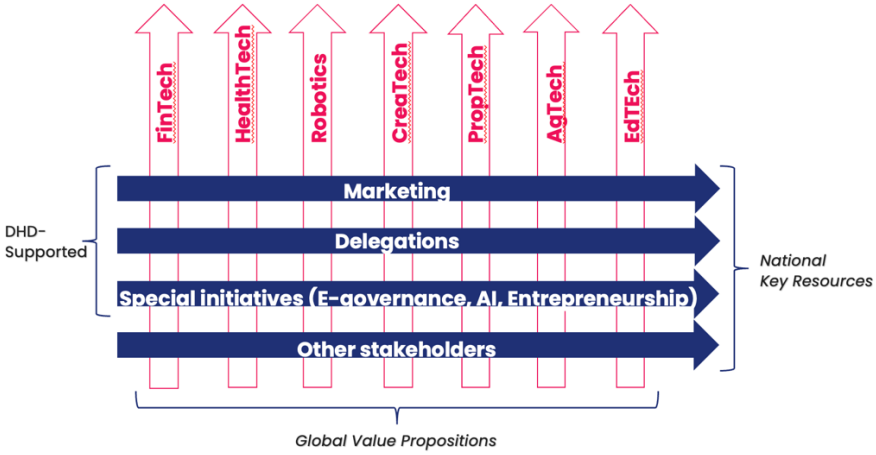

Figure 2 Ecosphere canvas. Elaborated in Rosenstand (2020).

The ecosystems in Denmark's Digital Ecosphere are all organized as not-for-profit associations with a professional board of directors, and innovation manager as typically CEO, and a secretariat. The ecosystems organize digital tech startups designed for fast growth with (potential) exponential business models. An initial mapping of the Danish digital ecosphere summed up with approximately 1,000 digital tech startups with 10,000 employees with approximately 20 % yearly growth of both startups and employees. A criterion for these startups is that more than 70 % of the revenue is generated from sales of digital solutions that offer domain-specific digital transformation - not sales of hours (Rosenstand & Kristensen 2021).

The digital tech startups in the digital ecosphere all share a value proportion of digital transformation leveraging digital disruptive technologies. To this end, disruptive technology can be leveraged by an entrant business to move up-market from a foothold in a down-market niche position, and then as the disruptive technology develops take significant market shares from incumbent companies that leverage inferior technologies in their offerings compared to the disruptive technology (Christensen et.al., 2015). Digital disruptive technologies develop with an exponential price-performance, where the performance doubles frequently, e.g., every year. Thus, performance will increase by approximately a factor thousand, million, and billion over ten, twenty, and thirty doublings, respectively. To this end, AI, IoT, and Big Data are digital disruptive technologies, all drawing on the price-performance development of digital calculation per constant dollar, which approximately has doubled every year since the end of the 19th century (Kurzweil 2005). Thus, digital disruptive technologies have a much faster disruptive innovative potential than disruptive technologies that are not digital (Lundgaard & Rosenstand 2019).

The suggested understanding of 'digital ecosystems' differs from the typical use of the term in the digital domain, as 'digital ecosystems' normally regard the digital platform economy. The ambition is to cultivate exponential growth of digital tech startups leveraging digital disruptive technologies. To this end, the mentioned digital tech ecosystems should benefit from the comprehensive startup-scene, in the selected market verticals, illustrated with the global value proportions in Figure 2. Ecosystems can be reconfigured for success through separating, combining, relocating, adding, and subtracting ecosystem elements (Adner 2012, p. 190-191). Therefore, I have defined ecosystems as a value network of stakeholders. For an ecosystem to be sustainable all stakeholders gain more value than any of them would be able to do without the ecosystem (synergy) (Rosenstand 2020). The general characteristics for 'digital business ecosystems' are well described for a fully decentralized architecture: "*No single point of failure or control [...] should not be dependent upon any single instance or actor; equal opportunities for access for all; [and (ed.)] scalability and robustness*" (Nachira et.al. 2007, p. 12). It can be argued, that because of the digital disruptive enablers of democratization, demonetize, and dematerialize (Ismail 2014) that these reconfigurations are rapidly becoming more flexible and thus digital tech ecosystems have a higher eco-system efficiency than non-digital eco-systems.

The term 'ecosphere' is inspired by open-closed systems in biology. At MIT Museum in Boston, USA I experienced a mini ecosphere for the first time, as a hermetically sealed spherical glass container with one balanced ecosystem inside (scrimps, vegetation, water, air, CO2 etc.); however, open to energy in form of light that enter and exit as transformed energy. Another example of a biological ecosphere is Earth with multiple interdependent ecosystems with evolutionary growth, where sunlight enters and transformed energy exit in form light, heat, technology and life. Similar, the exponential growing Danish Digital

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Ecosphere has seven digital tech ecosystem inside; however, it is open to talents, investors, and customers entering and digital transformation exiting the ecosphere as a value proposition. This is illustrated in Figure 3.

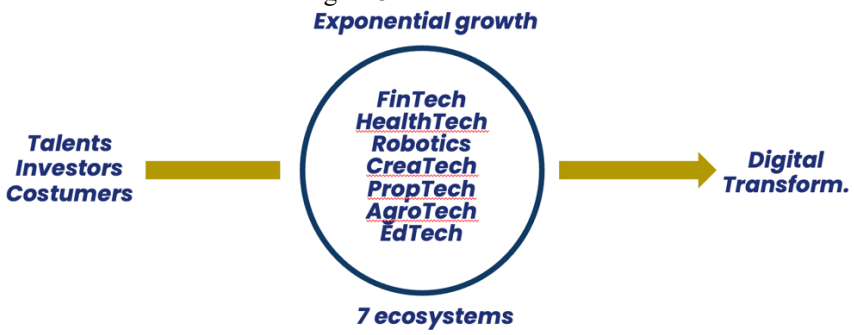

Figure 3 The Danish Digital Ecosphere

With the above-mentioned growth rates of 20 % of the Danish Digital Ecosphere, we are looking at doubling of digital tech startups and employees with a frequency of approximately four years. Consequently, resulting in approximately 2,000, 4,000, and 8,000 digital tech startups and 20,000, 40,000, and 80,000 digital tech jobs over 4, 8, and 12 years, respectively. We are truly at the exponential knee of entering the digital era, if, and this is the big 'if', the digital ecosphere can attract, cultivate, and retain enough talents, investors, and customers. It is well known that the market for these key players, the digital ecosphere's energy supply, is highly competitive and of strategic importance on a global scale. To this end, Digital Hub Denmark's other obligation; marketing activities, is utilized (c.f. Figure 1).

To orchestrate the Danish Digital Ecosphere, Digital Hub Denmark has since November 2019 hosted common meetings where topics of shared interest have been discussed with the innovation managers of the digital tech ecosystems; mainly regarding marketing towards talents, investors, and customers as the three most important market stakeholder groups. During 2020 it has become clear, to support and manage the marking and growth of the Danish Digital Ecosphere continuous performance measurement of business data of digital startups is essential to support (1) the workplaces of the future, (2) digital transformation of business in general, and (3) more digital startups in the digital ecosphere. All in all, a data-driven approach, which from a technical point of view is quite solvable; however, from a governance perspective is quite challenging. The digital tech ecosystems have the competence to ensure the quality of business data, e.g., assess the growth potential of a domain-specific digital business model. Moreover, the ecosystems are themselves data-driven organizations, and as such, they have the best competence to collect domain-specific data from relevant digital startups, where the startups trust that data will be handled with the necessary confidentiality. To this end, the ecosystems do not simply share the data in a common database, and therefore the specific innovation management problem at hand is a need for common performance measurement of the digital ecosphere, in a situation, where the digital ecosystems cannot immediately share the data for this. To this end, the following research question is formulated:

How to govern a private-public funded initiative for performance measurement of a regional digital ecosphere? And more practical, how to orchestrate this in a governance framework?

The methodological approach is action research, where the research is driven by rationalities that drive practice (Mathiassen 1997). Qualitative semi-structured thematic interviews in the seven selected digital tech ecosystems have been conducted during 2020 including interviews with the innovation managers, key employees, and entrepreneurs from digital tech startups. Moreover, key numbers have been collected from each ecosystem and documented in a whitepaper (Rosenstand & Kristensen 2021). One result is an approved wishing list from the ecosystem's innovation managers, where the need for shared performance measurement of the digital ecosphere is acknowledged. This need and the obstacles for it have been debated at meetings with the ecosystems' innovations managers hosted by Digital Hub Denmark, which is documented in meeting material, agendas, and minutes.

3 Governance framework for a digital ecosphere

The first five meetings with the ecosystems' innovation managers started as what we termed a 'coffee club', clearly indicating an informal structure. However, the need for a formal governance structure emerged out of shared agendas, especially the agenda of sharing data. The first step was in autumn 2020 to include the seven innovation managers in Digital Hub Denmark's advisory board; where they together with key stakeholders from tech startups, incumbent digital tech business, governmental institutions, and universities discuss and form ideas for Digital Hub Denmark's board of directors. The second step was in spring 2021 to establish the Steering Committee for Denmark's Digital Ecosphere constituted by the seven digital tech ecosystems represented by their innovation managers (c.f. Figure 2 and 3). Digital Hub Denmark host the secretariat for the steering committee, and one of the innovation managers (form PropTech) was appointed as chair of the committee by the innovation managers. Digital Hub Denmark's CEO and Thought Leader (me) participate as permanent members of the Steering Committee.

According to Figure 1, two workgroups was appointed under the steering committee. One for marketing activities termed 'Marketing workgroup', with marketing representatives from the seven digital tech ecosystem, and Digital Hub Denmark's Head of Communication as secretary and manager. The other workgroup regards the National Platform, and because of the focus on performance measuring this group was termed 'Data processing workgroup'. As stated above the data processing is a delicate issue for the data-driven digital tech ecosystems. On the one hand, the ecosystem innovation managers protect their data and do not want to share them; and on the other hand, they all acknowledge that sharing some specific data is a key to the growth of the Danish Digital Ecosphere. Therefore, some of the digital tech ecosystem's innovation managers (initially) prefer to participate in the workgroup for data processing; however, some digital tech ecosystems have appointed a specialist to the workgroup; moreover, I and the steering committee's chair participate in these meetings for its departure.

The governance framework for a digital ecosphere with the Danish Digital Ecosphere and Digital Hub Denmark as an example is outlined in Figure 4 with Figure 1 embedded: The organizational units of the digital ecosphere (c.f. Figure 2 and 3) have a blue overlay. The line between the ecosphere steering committee and the private-public partnership's advisory board is dotted because there is no formal relationship. The advisory board is not governing the steering committee, and the steering committee is not represented as such in the advisory board; however, all the innovation managers in the steering commit-

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tee is also in the advisory board. Members of the advisory board are recommended by the private-public partnership's CEO and formally approved by the board of directors. To this end, the advisory board recommends actions to the board of directors. The arrow from the national platform to the marketing workgroup indicates that data and activities in the digital ecosphere are curated for marketing activities, the selected data and activities are used for marketing which the arrow from the marketing group to the marketing activities indicates. The arrow from marketing activities to the data processing workgroup indicates that the marketing activities are expected to generate a need for new learning and matchmaking activities, and thus a need for more data, which the arrow from the data processing workgroup to the national platform indicates. Formally the marketing group and the data processing recommend decisions to the steering committee.

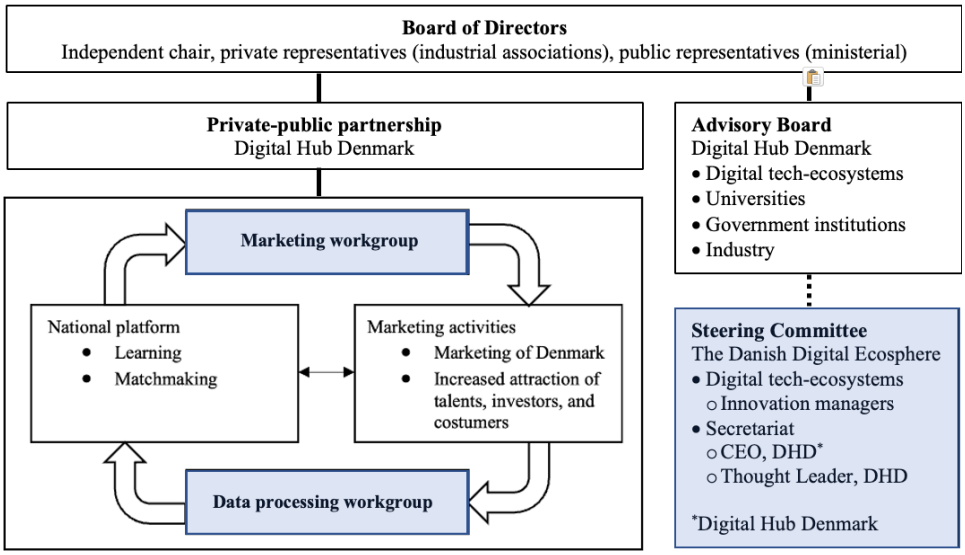

Figure 4 Governance framework for a digital ecosphere of digital tech ecosystems

Before the governance setup, a one-pager with premises for cooperation in the steering committee was agreed on through an iterative process. This one-pager is specific for the Danish Digital Ecosystem, here it is abstracted to governance principles with examples cited from the agreed one-pager:

- The digital ecosphere is constituted by several selected digital tech ecosystems as well as national digital tech startups not covered by the selected digital tech ecosystems.
- The steering committee is constituted by the selected digital tech ecosystems and two members from the private-public partnership. The steering committee elects a chair between the digital tech ecosystem's innovation managers and the private-public partnership is the secretariat for the steering committee's activities and convenes meetings with a draft for agendas and minutes.
- A shared goal. E.g., "*We co-brand Denmark as an ESG-nation with focus on sustainability – especially the green agenda*".

- A vision. E.g., "*The vision is to make Denmark an attractor in the global digital tech ecosystem cycle – including (1) increase net inflow of digital talents, (2) attract more international costumers for digital transformative solutions, and (3) more and bigger investments to digital tech startups*" (Rosenstand 2020 for elaboration).
- A mission. E.g., "*The mission is to stand together and accelerate the exponential transgression to the digital era*".
- A strategy. E.g., "*the strategy is to contribute to (1) the future's digital workplaces, (2) growth in Denmark, and (3) Digital transformation*".
- The cooperation's success is measured by growth – including e.g., "*(1) International marketing of the digital ecosphere*, *(2) attraction of talents, investors, and costumers to the digital ecosphere, and (3) more digital tech startups in the digital eco-sphere".*
- An important means is co-mapping of the cohesive ecosphere, where data provides an overall picture for marketing. E.g., "*via DealRoom, AngleList, PichBook, CrunchBase, and Startup Genome*".
- The steering committee sets up workgroups. Including one for marketing and data processing.

The steering committee of the digital ecosphere is formally regulated. This is done by bilateral GDPR compliant (for Europe) data process agreements between each digital tech ecosystem and the private-public partner regarding identical ecosystem data content. The digital tech ecosystems are data owners, and the private-public partnership is the data processor. To this end, the digital tech ecosystems have the right and duty to instruct the data processing including the use of data for marketing.

The private public-partner invests in the cooperation and pays the digital eco-systems for active participation as well as collection and curation of data. Moreover, the steering committee has agreed on a roadmap, e.g. *"(Q1) steering committee formally constituted, (Q2) data processing agreement signed, (Q3) data curation and collection started (first version), and (Q4) marketing of data – including ecosystems, startups, and digital transformative solutions".*

With the ambition of the marketing goal in the roadmap, the data processing workgroup has agreed on a minimal dataset for marketing. The criteria for companies are a broad definition of digital tech startups:

- Regional registered startup and scaleups
- Max 10 years old *or* venture capital or IPO to scale up within the last five years.
- The digital must be a significant element in the business model and the companies digital transformative value proposition must leverage digital disruptive technologies. Thus, the companies are designed for fast growth. The assessment is qualitative.
- Company founded in the region, *or* they have main activity in the region.

The following data categories must follow a digital tech startup:

- Regional register number
- Company name

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- URL
- Logo
- Tech vertical. E.g. "*select between: FinTech, HealthTech, Robotic, CreaTech, PropTech, AgroTech, or EdTech*"
- Sub-verticals delivered by each digital tech ecosystem.
- ESG-impactor? And if yes: (1) Which of the 17 SDG categories, (2) Does the startup contributes to CO2 reduction as a significant element of the business model? And if yes: (3) What is the core of the ESG assessment? (optional).
- Accumulated investments for each digital tech vertical.
- In addition, categories can be collected from publicly accessible databases.

The implications of this governance framework have not impacted yet; however, the intentions are formulated. The outlined governance framework is a suggestion on how to orchestrate governance of a private-public funded initative for performance measurement of a regional digital ecosphere. Including how to orchestrate the inherent digital tech ecosystems and their innovation managers. To this end, the research adds understanding to the body of knowledge within ecosystems whit a special focus on digital ecosystems. Moreover, it adds to the understanding of the concept and use of the digital ecosphere.

The practical implications are probably limited to regions based on a democratic society model. In regions, where data is owned by the government and not by individuals and/or companies, the issue of sharing in a private-public initiative might not even be an issue.

4 Conclusion

The area of interest in this research article is a digital ecosphere as a platform for learning and matchmaking, and the addressed research question is: How to govern a private-public funded initiative for performance measurement of a regional digital ecosphere? And more practical, how to orchestrate this in a governance framework?

This has been framed with theory on ecosystems and digital disruption and transformation as well as my earlier research on the concept of a digital ecosphere. The research method is action research, and the action has just begun. To this end, more research on how the digital ecosphere and the governance of it evolve and can be more efficient is needed.

The contribution is a governance framework for a digital ecosphere, that can be utilized by digital tech ecosystem innovation managers, industry partners, and policymakers as a private-public partnership.

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