Abstract

International Benchmarking Study Berlin-Brandenburg Healthcare Industry Cluster

1. Objective of the study

The healthcare industry in Germany is an important cross-sector industry and makes a significant contribution to the overall economy in Germany. In 2019, the German healthcare industry generated 378.7 billion euro in gross value added. This corresponds to about 12 percent of total gross value added in 2019 (Bundesministerium für Wirtschaft und Energie 2020). Furthermore, around 7.5 million people are employed in the healthcare industry in Germany. Significant to the healthcare industry, in addition to medical care, is the industrial healthcare industry (IGW). This generated about 82.6 billion euro in gross value added in 2019 (Bundesministerium für Wirtschaft und Energie 2020). IGW develops medical devices, pharmaceuticals, biotechnology, and information and communication technology with worldwide recognition. This sub-sector thus makes a significant contribution to the German balance of trade (Hempel 2020).

The Berlin-Brandenburg Healthcare Industry Cluster – HealthCapital is one of the leading international locations in the field of life science, healthcare, and healthcare industry. The unique concentration and networking of science, clinics, and business makes the region particularly strong as a location for the healthcare industry (Berlin Partner für Wirtschaft und Technologie GmbH und Wirtschaftsförderung Land Brandenburg GmbH 2020a; Berlin Partner für Wirtschaft und Technologie GmbH und Wirtschaftsförderung Land Brandenburg GmbH 2020b). The life science sector in Berlin and Brandenburg includes established sub-sectors such as the pharmaceutical and medical technology industries, as well as newer sectors such as biotechnology and the digital health start-up scene (Bundesministerium für Wirtschaft und Energie 2020). The intensive start-up activity and scientific excellence make the region internationally attractive for both venture capitalists and skilled workers. It also makes a strong contribution to developing innovative solutions for tomorrow.

Against the backdrop of global value chains and networks, the international profile and visibility of the location play a decisive role for the future competitiveness and attractiveness of the innovation ecosystem in the capital region. In order to sound out the potential of the healthcare industry in the life science sector in the region, a benchmarking study is needed with an international comparison of the cluster in Berlin Brandenburg with other renowned locations and clusters. Comparative locations are Copenhagen-Skane (DK-SE), London, Cambridge, Oxford (UK), Singapore (SG), and the Boston Area (US). From the numerous existing global top life science clusters, these four were selected in close consultation with the client. It should be emphasized here that the comparative clusters selected are the

world's top clusters in the life science sector, in a sense the Champions League of life science clusters.

The idea of a comparative benchmarking study is not new. As early as 2001, the Boston Consulting Group conducted a survey-based analysis of cluster locations from the field of biotechnology (The Boston Consulting Group 2001). Furthermore, researchers from the Health-TIES project conducted an indicator-based benchmarking study in the field of life science clusters in Europe (Edmunds, Gluderer, Ovseiko, et al. 2019). In addition, there are also already some benchmarking studies that have been conducted on behalf of specific clusters (Medicon Valley Alliance 2020; Siegfried Bialojan 2016; Bagley und Paytas 2017).

The study, which was commissioned by Berlin Partner for Business and Technology, combines the underlying methods of the two studies outlined above into a mixed-method approach in which both an indicator-based index is calculated using quantitative data for all five clusters and qualitative expert interviews are conducted. The findings of these two approaches are combined or linked in the interpretation of the results so that valuable information can be obtained for the Berlin-Brandenburg cluster.

The goal of the study conducted here is to make unused potential visible, in particular potential that could serve to give the Berlin-Brandenburg region a leading international role in the healthcare industry. The results of the study will serve as a basis for medium- and long-term political and strategic decisions. In particular, the greatest weaknesses are identified. In addition, central trends and challenges are identified for all locations considered in order to examine their transferability to the Berlin-Brandenburg Healthcare Industry Cluster at the end. The findings will be used to develop concrete recommendations for action to reverse the major weaknesses into opportunities and strengths for the cluster. Thus, this study can make a valuable contribution to aligning the Berlin-Brandenburg cluster for the future as well as increasing its international competitiveness.

2. Key findings

The index consists of four topic areas in total: "science and research," "corporate Structures," "economic significance," and "funding and support structures." Each topic area is composed of diverse indicators, for each of which a cluster is assigned a rank between 1 and 5. Here, "1" describes the best rank and "5" the worst position in the ranking. Subsequently, an average rank per cluster is calculated for each topic area, as well as an average overall rank across all topic areas. The following figure shows the average ranks per topic area and the overall rank per cluster.

Figure 1: Overview of the ranks of the clusters according to topic areas

	Science/ Research	Corporate structures	Economic significance	Funding and support structures	Total
Boston*	1.6	2.3	2.3	2.0	2.0
London*	1.6	3.8	1.8	1.7	2.2
Berlin Brandenburg	3.2	2.3	4.3	2.5	3.1
Singapore*	4.2	3.5	2.8	3.2	3.4
Copenhagen*	3.8	3.0	3.3	4.3	3.6

*Cluster location abbreviation

Source: WifOR/SNPC 2021, own presentation.

As a result, the Berlin-Brandenburg cluster ranks third in the location comparison with an index value of 3.1, with a good starting position to be able to connect to the two best-ranked clusters in the Boston and London regions in the future. It should be emphasized here that the comparative clusters selected are the world's top clusters in the life science sector, in a sense the Champions League of life science clusters.

With an overall ranking of 2.0, the Boston cluster region is the undisputed leader in international cluster comparisons. The cluster's pioneering position can be explained by its history. The cluster has grown organically and functions as its own ecosystem, in which social networks, among other things, play a major role. The topics of "science and research" and "funding and support structures" therefore perform particularly well.

The London (UK) cluster region ranks second behind the Boston cluster region with a score of 2.2 and has a similar structure to the US cluster in terms of its history. The cluster's strength lies in its ecosystem, which offers diverse venture capital potential, among other things. As a result, the cluster is particularly strong in the topic areas of "science and research" and "Funding and Support Structures," but also in the area of "Economic Significance."

The Berlin-Brandenburg cluster is characterized by a place in the good midfield of the international "Champions League" of life science clusters with a clear upward trend. The average rank across all topics in the index calculation is 3.1. As a location, the cluster is internationally known in the life science scene and offers quite a bit of potential. The cluster is particularly strong in the subject areas of "corporate structure" and "funding and support structure." Weaknesses of the Berlin-Brandenburg cluster are particularly evident in technology transfer. The cluster has strengths above all in the area of support structures and alliances that have been formed between the companies or institutions in the cluster. While the Boston cluster region focuses on two main areas of biotech and life sciences (cancer and rare diseases) and has proven expertise in these fields, the Berlin-Brandenburg cluster is very diverse and broadly positioned with seven topic areas. This has its advantages, but also some disadvantages. The cluster location offers tremendous potential, among others in the area of the start-up scene, whereby the diversity of different industries among the start-ups

enables a great advantage for the emergence of innovations at the interfaces. The attraction for venture capital investors could be expanded to strengthen the position and become the unique selling point of the location. The aim should be, among other things, to further strengthen the economic importance of the site.

In the case of the Singapore cluster, it has been shown that it has played a supporting role in the Asian region in the past. However, the future of the cluster is currently unclear, as Chinese life science clusters are becoming increasingly important as locations and could displace the Singapore cluster, especially in its role as a "meeting point and gateway to China." In terms of the index, the Singapore cluster comes in fourth and thus penultimate place with an average rank of 3.4. However, it should be noted for this cluster that data on some indicators were not available. Thus, the ranks within the individual topic areas for this cluster can only be interpreted with caution.

The Copenhagen cluster region is particularly important in the Scandinavian region. In an international comparison, however, it does not have the same weight as, for example, the Boston or London clusters. This becomes clear when looking at the index, as this cluster ranks fifth and thus last with an average rank of 3.6. The cluster was not able to occupy leading positions in any of the topic areas, which illustrates that over time the other clusters have literally "outranked" the Greater Copenhagen Region cluster.

Science/Research

The focus of the topic area is the university and scientific environment of the clusters. The indicators "excellence initiatives," "scientific publications," "research institutions," and "scientific staff" are the most important of these. In addition to the university environment, however, the innovation aspect also plays an important role in this topic area.

An examination of the overall rankings in the "science and research" topic area shows that the clusters in the Boston and London regions are frontrunners, with some distance the other clusters. Both clusters have an overall rank of 1.6. The Berlin Brandenburg cluster, with a rank of 3.2, and the Copenhagen cluster region (3.8) are in the middle. The Singapore cluster is in last place with an overall ranking of 4.2 in this topic area.

In conclusion, it can be said that the Berlin-Brandenburg cluster is already well positioned in terms of the indicators "patents," "research institutes," and "excellence initiatives." The cluster has some catching up to do in terms of the indicators "scientific publications" and "scientific authors."

Corporate structures

Overall, the "corporate structure" topic area is made up of four individual indicators. The indicators in the topic area "corporate structure" thus make it possible to quantitatively record qualitative characteristics such as innovative strength and competitiveness.

The Berlin-Brandenburg cluster and the Boston cluster region occupy, and share, first place on average across all indicators in this topic area. The Copenhagen cluster region and the Singapore cluster are ranked in the middle in the overall "corporate structure" rankings, and the London cluster region is ranked last.

The excellent performance of the Berlin-Brandenburg cluster in the "IGW companies" and "start-ups" indicators as well as in the "biotech/pharmaceutical companies" indicator, where Berlin-Brandenburg ranks well as the second-placed cluster, behind the Copenhagen cluster region, show the stable top position of the cluster for IGW in Germany.

Economic significance

The "economic significance" topic area is made up of a total of four individual indicators. The focus here is primarily on aspects such as monetary considerations. This includes, for example, venture capital and the sales generated by all companies included in the cluster. Furthermore, labor forces as well as the population are examined more closely in order to evaluate the cluster as a center of attraction for skilled workers and to assess the relevance of the cluster within the cluster region.

If the results of the individual indicators in the topic area "economic importance" are combined in an overall rank for the respective cluster, it becomes clear that, on average across all ranks, London is in first place with a value of 1.8. Boston follows behind with an average rank of 2.2, as does Singapore with an average score of 2.8. However, the assessment of Singapore in this topic area must be viewed with caution, as data for the cluster were not available for two of four indicators. Copenhagen receives an average score of 3.3 in this topic area, and Berlin Brandenburg is slightly behind in last place with an average rank of 4.3. The poor rating for the Berlin-Brandenburg cluster listed here is mainly due to the last ranks in the indicators "venture capital" as well as "gross value added."

Funding and support structures

The topic area "funding and support structures" is made up of a total of six individual indicators. In this case, both the monetary support based on government funding opportunities and the non-monetary support for network formation by the cluster itself are evaluated. This is because in addition to providing information about financial support opportunities, the clusters should above all fulfill the task of better networking their member companies with one another and promoting collaboration. This includes the degree of networking between science and academia, as well as between science and industry, and certain technology transfer facilities.

If we look at all the indicators in this topic area and calculate the mean value for each cluster, we obtain information on how the clusters generally perform when looking at the topic area as a whole. It is clear that, on average across all the indicators considered, the London cluster occupies the best position with a value of 1.7. The Boston cluster follows behind with an average rank of 2.0. The Berlin-Brandenburg cluster ranks third with 2.5 and is thus in the midfield. Behind it is Singapore in fourth place with an average rating of 3.2 and Copenhagen, somewhat behind, in last place with 4.3. For Singapore, however, it must be noted that no data are available for three of the six indicators. Therefore, Singapore's performance can only be interpreted with caution.

Interviews with experts and analysis of the environment to derive recommendations for action

The four categories of the index (science/research, corporate structures, economic significance, and funding and support structures) also formed the framework for the expert interviews and were supplemented with additional aspects to round off the international classification of the Berlin-Brandenburg cluster in the context of this study. The results of the expert interviews support the statements of the index comparison and represent a generalized overview of the experts' opinions, so that cluster-specific characteristics from a practical perspective were also included in the study.

A total of twelve experts were selected by the project advisory board and Berlin Partner, so that each cluster being compared was represented by at least two experts. The selected experts have several years of professional experience in the field of building a cluster or ecosystem for the industrial healthcare industry.

The results of the expert interviews were first assigned to the predefined topic areas: "science and research," "corporate structures," "economic significance," and "funding and support structures." This served as a supplement for the quantitative index of the study.

The approach to the further analysis of the expert interviews, the creation of a SWOT analysis, and the formulation of recommendations for action was based on the induction principle in order to be able to identify important characteristics of each cluster on the basis of the empirically obtained subjective findings. A further qualitative analysis of relevant studies, reports and scientific articles helped to classify the experts' subjective assessments and to support the experts' statements with further information.

Over the course of the interviews, in addition to the four topic areas used exclusively for the index, an additional six thematic focal points emerged which are of importance for the further development of the Berlin-Brandenburg cluster. The following areas were defined: **Translation and technology transfer, digitalization, strengthening the ecosystem, internationalization, financing and start-up activity, networks and collaborations.** The experts' statements can be divided into these additional six topic areas, and later also the recommendations for action derived from all the findings.

3. Recommendations for action

Based on the basic SWOT analysis, the environment analysis, and the findings from the practice-oriented expert interviews, a total of 53 recommendations for action were formulated. From a further focused consideration, the following 20 recommendations for action emerge—as a kind of essence. The other 33 recommendations for action should also be considered. All recommendations for action can be assigned to a total of six focus areas:

TRANSLATION AND TECHNOLOGY MOVEMENT	FINANCING AND START-UP ACTIVITY	DIGITALIZATION	
• Tech transfer professionalization • Establishment of innovation units at clinics • Improvement of the implementation of innovations • Incentives for entrepreneurial thinking in academia (entrepreneurship).	• Improvement of start-up financing • Improvement in tax treatment of venture capital • Focus funding on high-risk technologies (bridging the gap); innovation fund • Venture capital through funding institutions (including increasing the share of public funding for VC).	• Investments in clinic IT • Better access to research and care data • Implementing the digital transformation in the State of Berlin	**Corona lessons learned**
STRENGTHENING THE ECOSYSTEM	NETWORKS AND COLLABORATIONS	INTERNATIONALIZATION	
• Settlement of important players in the industry (companies, NPOs, and scientific institutions) • Cluster focus: Content focus on personalized medicine, digital health, and global health • Improve permeability between science and industry (talent/skilled workers)	• Expanding and leveraging the capital region network • Improving cooperation between the various departments • Improving cross-border collaboration • Making greater use of alumni networks	• Use the World Health Summit as an anchor event, e.g. for the focus topic of public health. • Make greater use of Berlin as a brand for external presentation, including via Berlin offices in the target markets US and China.	

Translation and technology transfer

On the part of science and research institutions, entrepreneurial thinking should definitely be more strongly developed in order to also meet the requirements of industry. By professionalizing technology transfer through scouting, mentoring, training, and bundled services for the innovative research projects, but also for the newly founded start-ups, a successful technology transfer as a business model could also emerge for the research institutions. Overall, however, the large number of research facilities, more are already in planning or under construction, with the interlocking and networking with the care sector and with the economy shows promising future prospects for the Berlin and Brandenburg healthcare economy-oriented science. In the future, a strong scientific landscape will continue to be of great importance for the healthcare industry cluster. On the one hand, it already exerts an enormous attraction on young people and other talent, and on the other hand, it is an important discussion, networking, and innovation partner for business and healthcare.

Financing and start-up activity

A major focus for the further development of the cluster should be on the framework for VC funding recognized and established at the federal level as well. The increase of the start-up rate in Germany in the life science and biotech sector as well as the acceleration of translation depend, among other things, significantly on the venture capital financing framework: on the one hand for the capital providers and on the other hand for translational research. It is therefore essential to create a sufficient capital ecosystem for biotech and life science companies in addition to a well-established research and science framework.

Digitalization

With regard to the processes of digitalization in the healthcare sector, it can be stated that well-positioned funding and support structures are available in Berlin Brandenburg for the model projects for medical (digital) care, which can also be further expanded in rural areas. The biggest challenge in this case, however, is to bring the urgently needed digital infrastructure in the clinics and research facilities up to date so that innovation ideas can be implemented more smoothly from a technical point of view. One building block for this can be, for example, the German government's Hospital Future Act with its funding program. Furthermore, the use of patient data for research purposes must be improved and digital platform approaches expanded.

Strengthening the ecosystem

To further strengthen the solid, strongly science-oriented ecosystem, additional activities are to be added to attract new companies, as well as scientific institutions and non-profit organizations. An additional focus of the cluster on personalized medicine, digital health, and global health would appear to be a good approach. Greater professional permeability between science and industry is advisable and promotes mutual understanding of the respective requirements.

Networks and collaborations

The Berlin-Brandenburg location is strongly positioned with its collaboration and network structures, demonstrating its gravitational pull for new stakeholders: The collaboration between Charité and Vivantes, existing facilities for basic and applied research, internationally recognized events in the field of healthcare such as the World Health Summit, and the spatial proximity of all stakeholders also to state and federal politics represent an

already well-functioning innovation ecosystem. Further optimization of administrative collaboration, especially in the area of healthcare management, could further promote the growth of the cluster.

Internationalization

The Berlin-Brandenburg location remains very attractive for new settlements on an international scale, including for non-profit organizations such as the WHO's new pandemic early warning center, which is scheduled to start up in the fall of 2021.

"Berlin as a brand" presented externally can continue to be seen as a great advantage in the context of the further development of the healthcare cluster and can be used in the future to further strengthen the region. The recommendations for action assigned to the "internationalization" topic area are aimed at further strong external positioning of the location as a magnet for healthcare talent with a targeted focus.

Summary

The study has impressively shown the strengths, potential for improvement, opportunities, but also risks for the stakeholders of the Berlin-Brandenburg cluster. The Berlin-Brandenburg cluster has the potential to expand its existing strengths in a targeted manner and, based upon the results and recommendations for action, to address its opportunities and challenges in an equally targeted manner. This puts it on par with other leading healthcare clusters internationally. In addition, the activities in the cluster can also generate additional positive effects for the entire German healthcare location and position it for the future.

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