

## Live Project

### **Cluster formation Olten in the field of Diagnostics**

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We declare that all statements and information contained herein are true, correct and accurate to the best of our knowledge and belief.

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## Management Summary

The project analyzes the diagnostics landscape in Switzerland. Through a representation of the distribution of the different actors in the industry such as firms, suppliers, manufacturers, and service provider, several mappings were created. The firms were identified and divided by competences, size, and region. By means of theoretical background on cluster definition, cluster development, and cluster mapping, the diagnostics field in Switzerland was evaluated. Additionally, comparisons between other famous cluster have been made such as the Silicon Valley. The many advantages Olten provides as a region, may definitely attract companies in the diagnostics field. Nevertheless, all firms within the value chain in the sector have to be included in cluster development, and the initiative should also involve the research institutions and universities. Through the use of Michael Porter's Diamond Model with its four forces (excluding government and chance), the diagnostics landscape was assessed. The national diagnostics market has the potential for high competitiveness as the four forces are clearly visible.

Olten, as a hub for a diagnostics cluster, is absolutely conceivable as the region provides many advantages and benefits towards potential new settlements of diagnostics and related companies through its central location, the low taxes levied by government, or low rental costs.

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## 1. Introduction

### 1.1. Wirtschaftsförderung Olten

The regional business development agency in Olten (“Wirtschaftsförderung Olten” in german) is a private body in the region of Olten, who has the target to revitalize the economy through several initiatives. The business development agency is a non-profit organization and a focal point for business creation, settlement of new companies, and for already established organizations in the region. As the agency is a non-profit organization, the provided services such as consulting, support, and network are free of charge.

The range of services provided by the business development agency has a wide range and some of them are listed below:

- A constant focal point to expert contacts, who have connections to business representatives and authorities
- Creation of links towards numerous networks
- Provision of facts and information of the economic area
- Consulting on site evaluation
- Coaching and support for SME's
- Transfer in know-how especially in the areas of central services, logistics and distribution, life sciences, apparatus construction, marketing for retail business, and real estate development
- Combining the strengths and know-how of companies of the same industry within a center of competence

Furthermore, the business development agency lists and presents the many advantages Olten has as an economic center. On the company's website are several advantages listed, which demonstrate the benefits Olten provides for companies. Some of those advantages of the region are

- Best market for employees

Olten is reachable by the three major cities, Zurich, Basel, Bern, within a timeframe of 45 minutes, and about 1.6 million people as labor force are within this catchment area.

➤ Olten is crux of the matter

The rail and road transport form a point of intersection between the three largest cities in Switzerland. Zurich, Basel, and Bern and their respective airports. The distance to any of the destinations is reachable within 45 minutes.

➤ Excellent cost-benefit ration

The economy of Olten has high productivity, wage costs in line with the market, very attractive infrastructure, and cheap rental costs.

In addition, the business development agency promotes also that the region is growth- and development-oriented, has access to research and knowledge, and has a business-friendly environment.

The agency is currently active in numerous projects such as the Giroud-Olma-Areal, Bahnhof Nord, Aarepark, or Swiss Biolabs. The latter project will be the sole focus in this project work.

### 1.1.1. Swissbiolabs

Swissbiolabs is an association which supports the groundwork and location of organizations in the life sciences field of diagnostics. Within the associations, economic experts, entrepreneurs, scientists, and investor are summoned to build a platform for knowledge transfer and entrepreneurship. Financing, management expertise, searching for partners, mediating in scientific networks, participating in trade fairs and marketing activites are tools provided by the association to its members.

The target of the association is to promote scientific ideas and to establish a hub for young companies in the diagnostics field in the region of Olten.

The idea is to form a diagnostics platform, where science and business have a well foundation for networking. Therefore, the Swissbiolabs association is divided into three segments: swissbiolabs Diagnostic Challenge, Accelerator, and Förderverein.

The Swissbiolabs Diagnostic Challenge is about promoting start-ups and talents. The Accelerator is a “growth program” for start-ups, and the activity within the Förderverein is the building of a diagnostic-ecosystem.

Switzerland has a high concentration of life sciences organization and also especially in the field of diagnostic. There are the leading companies in the industry as well as well distributed SME's and start-ups. Nevertheless, according to the association, cross-linking between the different actors on a national or international basis are nonexistent. Furthermore, promotion of talents, innovations, and start-ups are insufficient supported and promoted in this industry. For that reason, the Swissbiolabs association has itself set the goal to assist talents and business ideas in the field of diagnostics.

Swissbiolabs expects to master the effort through several success factors. First, there is no comparable hub in Switzerland as Swissbiolabs within the specialization on diagnostics. Second, Olten has a very fortunate geographical position in Switzerland. Thirdly, the incubator offers office facilities and access to service platforms. Last but not least, the network to experts, organizations, and specialists in the diagnostic field, and investors build an important cornerstone and open new perspectives for companies.

## 1.2. Goals of the Project

### 1.2.1. Cluster Formation

The goal of the project is to visually represent the diagnostics landscape in Switzerland. The target is that key players are allocated and that the know-how transfer for the aforementioned Förderverein of the Swissbiolabs association is ensured. Through the mapping, actors in the diagnostics field should be clearly identified by means of competences, size, and region. Moreover, events, conferences, and forums have to be listed as well according to their topics and contents.

With the findings from the representation of the diagnostics landscape, the concept of cluster and its focal point will be derived. A recommendation by the project team is desired by the client.

### 1.3. Scope and Limitations

The scope of this project work is limited to secondary research and discussions with actors in the field.

The determination of the data of the numerous actors with the diagnostic field have been performed by online research and the use of already existing databases in the sector. Specific information of the organizations, players, events, conferences, etc. were gathered on the respective homepages or related websites. Limitations existed while gathering the necessary information as not all data are not on a public domain or were not disclosed by the actor.

## 2. Theoretical Framework

### 2.1. Theoretical Concept of Clusters

Clustering is a term, which describes a concentration of organization of the same industry in a particular place and in close vicinity among themselves (The Economist 2009). For the purposes of illustration, banking hubs such as in London or New York constitute a so-called cluster among the many banking firms, which are in close vicinity. Additionally, the region of Basel is a life science cluster, or the Silicon Valley, a well-known computer technology cluster (*ibid.*). In addition, Michael Porter (1990) defined clustering as

“groups of interconnected firms, suppliers, related industries and specialized institutions in particular fields that are present in particular locations”.

First, clusters, in terms of an accumulation of many firms in a specific place in close proximity, create a value for small-sized companies (The Economist 2009). The concept of economies of scale, which is mainly attributed to big and established firms, may in the form of cluster also be beneficial for those small firms. Economists argue that not only “low-taxes” locations are attractive for organizations or start-ups, but that also other factors may be of great value for the question of location. In other words, instead of operating in low cost areas without any proximity to other firms in the same industry, economists go so far as to recommend the little players to seek for its competitors and establish their branch at the same place, even though it might be more expensive. The main reason for this lies in possible cooperation between the companies (*ibid.*). This might be by means of using the located talents in the industry or using the resources of related suppliers within the industry. For example, suppliers of the famous automobile manufacturer Toyota locate their branches near the carmaker.

Clusters have a long past in the economy. Further examples are the Boston Pharmaceutical Cluster, the textile cluster of Prato or the accumulation of lace-makers in Nottingham.

Today, modern clusters in the high-tech industry for instance are located in the nearby environment to famous universities, where they can gain knowledge from research facilities (The Economist 2009). A good example of this is Stanford University and Silicon Valley. Both, institution and organization, are within easy reach.

This illustration shows that clusters did not become obsolete over the years. Instead, the Silicon Valley is growing, and more and more firms find themselves in the computer-technology cluster. As mentioned earlier in this section, young companies are located in this area, even though it is an expensive area and the region is also in danger of earthquakes. Additionally, new companies claim that the most important findings they get in business activities are physical meetings instead of electronic communication.

Nevertheless, some economists argue that proximity of firms in the same industry should no longer be a criterion in choosing one's location. Globalization, progress in technology, and fast transportation make clusters not as important as they were years ago. Put simply, businesses and industries "should by now be above and beyond geography" (The Economist 2009). Those statements, however, seem to be rejected by research.

## The Boston Biopharmaceuticals Cluster

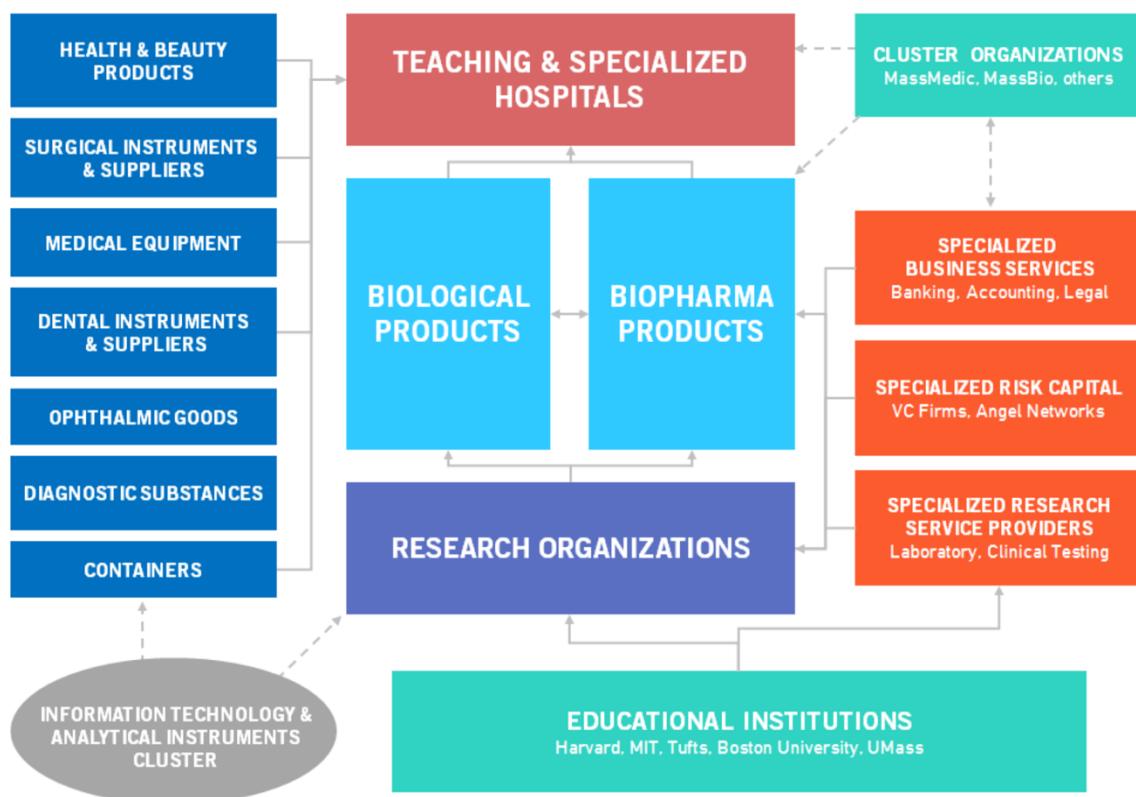


Figure 1: The Boston Biopharmaceutical Cluster (Source: U.S. Clustermapping)

### 2.1.1. Competitive Advantage

This section is focused on competitive advantage of clusters in several industries. Most ideas are extracted by Michael Porter, professor and specialist for Strategy and Competitiveness at Harvard University.

Firstly, to gain a competitive advantage over others in a global economy, Garelli (1997) claimed that through the advances in technology and infrastructure the global economy is increasingly becoming more cross-linked and therefore smaller. As in the section *Theoretical Concept of Clusters* mentioned, researchers suggest a different pattern.

Michael Porter (1998) explained that for an economy to excel globally, local factors play a vital role. Such factors are knowledge, relationship, and motivation.

For that reason, competitive advantage is marked by value creation for the customer and to achieve this state, a whole firm's value chain is key (Porter, 1985). Additionally, improvement, innovation, and change are important drivers to gain a competitive advantage (Porter 1990). In connection with clusters, the possible application and use of resources, exchange of knowledge, and innovation will lead to a competitive advantage to companies in a cluster over international competitors.

As the value chain of firms play a crucial role in possessing an advantage over competitors, the theoretical concept of cluster gets right to the roots of the buyers, suppliers, manufacturers inter-linkages of a firm (Porter 1990). Porter noted that clusters have a high degree of competitive advantage in connection to improvement, innovation, and change. He also argued that the competitive advantage has to be maintained through an ongoing process in the value chain and its inventions. In fact, Porter (1998) mentioned three activities by which clusters positively influence a competitive advantage. Firstly, firms in a cluster show higher output and productivity. Secondly, enhancement of innovation in the environment of the firms, and lastly, the accumulation of new companies within the cluster lead to a stronger cluster, which in turn provide an enhanced environment of linkages and information exchange between the firms.

In the context of competitive advantage, Porter (1990) also mentioned how cluster promote local or regional competitiveness in certain industries. For this, he uses his diamond model for visualization. Michael Porter (1990) developed in his book *The Competitive Advantage of Nations* the so-called Diamond Model. Since world competition increased steadily over the last decades, evolvement of

nations is more important than ever. The Diamond Model tries to explore why some corporations or industries perform better than others. More precisely, how are those institutions able to gain a comparative advantage? According to Porter, four perspectives interrelate to each other, which he called the Diamond Model. Those four perspectives are called: Factor conditions, demand conditions, related and supporting industries, and firm strategy, structure, and rivalry.

The first determinant is factor conditions. The meaning underneath is all about production factors such as personnel, infrastructure or logistics. Jointly, it results in how a nation can compete within a specific area or industry (Porter 1990).

Demand conditions are related to the domestic market. Porter points to the rivalry, which will arise by producing and selling demanded goods in the home-market between corporations. As a result, the higher the demand for goods, the more companies need to rival and innovate to stay competitive. Even though the importance of domestic demand seems to diminish with the on-going globalization, Porter claims that organization can foresee trends in the buying habits of their local customers before going global.

As more related and supporting industries compete on a higher level, domestically or internationally, important inputs and improvements possibilities emerge. Put another way, know-how of related and supporting industries facilitate other companies to innovate and develop.

The fourth determinant is the interplay between firm strategy, structure, and rivalry. A company's success depends on how well organizations are positioned on the market regarding creating, managing, and developing their organizations. Furthermore, competition in the domestic market stimulates an organization's success in the international market.

Now, Porter (1990) argued that through a geographic concentration of firms, interaction between the four factors in the diamond model are encouraged. In other words, Porter claims that clusters on a geographical nature form the business environment of the most competitive industries within a nation. Moreover, he claimed that the interaction within the diamond model is key for developing clusters (*ibid.*). Porter argues that the diamond model leads to a concentration of established firms in a specific place, and it promotes the interplay with the four factors. He added:

“The process of clustering, and the intense interchange among industries in the cluster, also works best where the industries involved are geographically concentrated” (1990:157)

Besides the theory on regional competitiveness, clustering may also be an important policy for small and medium sized firms.

In recent theories on cluster, supply chains of small enterprises have been central issues (Porter 1998). The cluster development changed the business landscape by providing SME's with new opportunities (Hall & Teal 2013). It resulted in higher competitiveness for SME's towards the global players. Similarly, not only may SME's compete with the leading firms, they may also seek for partnership or cooperation. In other words, clusters may provide small and medium sized companies with additional knowledge and business opportunities. Hall & Tail (2013) also argued that with the absence of clustering, SME's find it difficult to obtain necessary information within the industry due to the small size of the firm. They claimed that this lack of knowledge will be solved for SME's through clustering. Additionally, clustering promotes competitiveness, output, growth, and partnership with leading firms to SME's (Bagwell 2008).

### 2.1.2. Cluster Location and Size

This section of the paper assesses several policies of clustering. This includes mainly the geographical aspect of cluster policies.

According to OECD (1997), geographical positioning and extent of regional clusters underlie several factors. Those factors are geography, jurisdiction, population, and sector size.

First, clusters should match the needed size and the necessary proximity to other firms in similar industries.

Jurisdiction refers to the many different legal issues in several geographical divisions. For example, in Switzerland there three instances to consider when assessing cluster directives in different regions.

Population may be crucial for the employee and talent pool as well as the local consumer market. Additionally, the gap between urban and rural may be important, too, and act as another policy to take into account.

Last but not least, all firms, including the very small one's within the value chain, should be considered when measuring or choosing a cluster.

Apart from the aforementioned factors, there is another aspect to take into account when addressing issues facing regional territories. Research by The Department of Trade and Industry (DTI) revealed that especially in the biotechnology industry, vicinity between firms in a cluster are different among nations (DTI 1999). For example, the DTI found out that in the United States, geographical proximity in a cluster already exists, when there is a connection between the firms no longer than one business day. In the UK, the research team concluded that a cluster is characterized by a much shorter distance of about an hour. Additionally, as labor force is an important factor as well, people also influence the cluster to the degree they are ready to travel without change of residence. For this reason, not only location is important for cluster building, but vicinity of labor and businesses, too.

Another aspect in defining and assessing clusters is about breadth and width (Brown 2000:7). For instance, clusters in North Ireland tend to be much “wider” than in other regions. Names of such wide terms for clusters are “engineering” or “business service”. According to Enright (2000), clusters should be narrowed towards more specific areas within an industry. Meaning, that instead of whole sectors such as electronics, small clusters should be developed (Brown 2000:7). Those small clusters can also exist of different but specific components from a number of various sectors (ex. “semiconductors”) (ibid.).

Nevertheless, the assessing and development of clusters have a high dependency on the political and institutional organization within a region or nation (Brown 2000:7). In countries such as Spain or Germany, where autonomy in political and economic issues are rather high, clusters are predominantly directed by local or regional groups or individuals, and simultaneously, those clusters belong to the most developed ones (ibid.). The underlying reason is that a large autonomy promotes a good development of the economy (ibid.).

To sum up, development in the cluster area may be fostered by national policy-makers and then applied through regional or local actors (ibid.). The difficulty lies in making a smooth transition and implementation of cluster policies through a regional actor, since empirical research does barely exist in this field. Nevertheless, good flow of information and connection between the actors play a vital role.

### 2.1.3. Cluster Development

Since the authors examined the definition of clusters and how it fits in the context of competitive advantage, this section analyzes cluster development, or also called cluster initiatives.

The forming of a cluster happens mostly by “chance” and over time (World Bank 2009:3). Nevertheless, good planning and further undertakings in cluster initiatives can promote and support a growing and stable platform for clusters (*ibid.*). Cluster initiatives in its definition should be considered as the economic development of clusters (*ibid.*).

Cluster initiative, or cluster development, operate in several different areas (Ketels 2003:17). Ketels mentioned that more than half of all cluster initiatives had operations in about five activities out of six (*ibid.*). The six area were “research/networking, policy lobbying, commercial cooperation, education/training, innovation/technology, and investment attraction” (*ibid.*). These findings are consistent with the assumptions and definitions of cluster theory that well performing clusters are dependent on the several areas and they take use of them concurrently. However, Ketels also argued that young clusters had the same number of matching areas as the more established clusters (*ibid.*). This means that cluster initiatives do not increase the number of different activities over time, but in a more intense manner (*ibid.*).

The efforts for cluster initiatives come from the government, businesses, or both (Ketels 2003:17). Businesses are mostly the main actors for the initiatives. However, the government plays also a vital role in the set up, as important financing question might be solved by government or for general assistance. Nevertheless, the cluster facilitator always played an important role in many of the cluster initiatives examined (*ibid.*) The characteristics of the facilitator are most of a guiding nature and has a strong network within the industry.

Ketels argued that cluster initiatives move through four steps (Ketels 2003:18). The first steps are the primary efforts for the initiative, cluster mapping, and launch of the initiative. However, the launch may fail at that time, but it is important to keep track for later efforts. The second step is the strategy formulation. Through an analysis of the competitiveness and cluster, the initiative may be started. On one hand, the analysis is important for needed interventions, and on the other hand, it may create a sense of “belonging” between the stakeholders. Then, action plans can be derived and

activities or events may be organized to network. Thirdly, the action plans should then be implemented. This step is important as the cluster initiative has a more promising future, when the initiative's echo reaches far over its borders (*ibid.*). The last step is all about "post-project sustainability". Organizations of the initiative have to review latest action and may adjust them or organize and implementing new action.

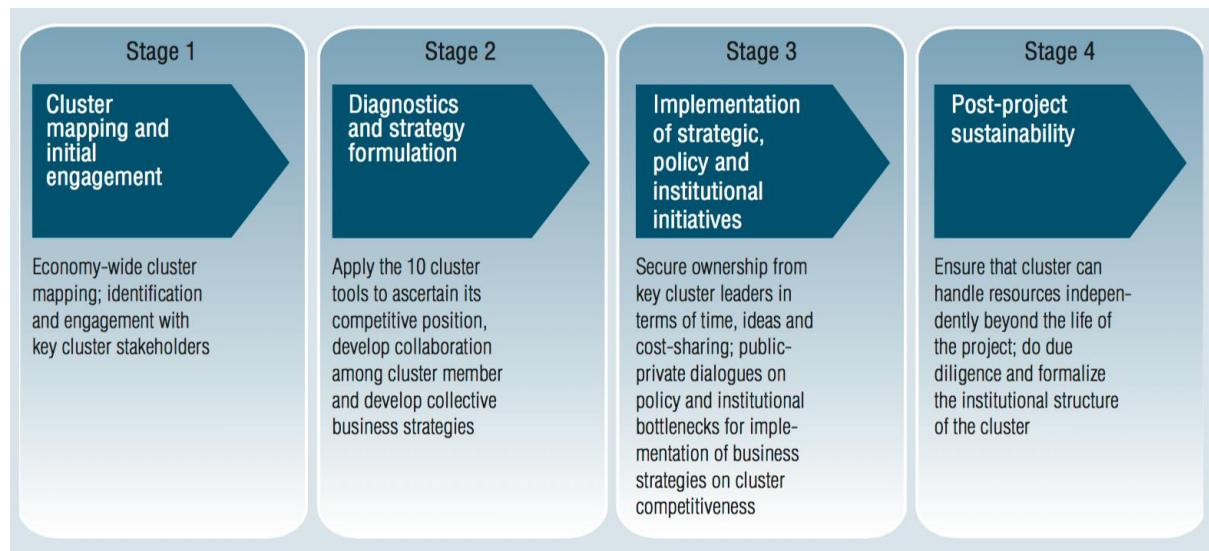


Figure 2: One Approach to Developing a Cluster Initiative (Source: World Bank 2009:4)

Ketels (2003:17) also mentioned the drivers for success and failures. First, cluster initiatives work better when they are focused on already strong and established clusters. In other words, cluster initiatives have shown less success potential for newly build clusters. Additionally, initiatives, which are too focused without any consideration of its business environment have a higher potential for failure.

Second, the parties involved in the initiative may become divided on the real economic drivers and its performance. That conflict is among the most important factors cluster initiatives fail. Moreover, firms are more interested in productivity gain in and innovation in the long run, opposite to the interests of the new established companies. Additionally, government wants to create more jobs rather than higher productivity.

Lastly, the cluster facilitator has to be financed over time. If this is not possible, cluster initiatives are likely to fail over time. However, research suggested that government financing had no negative

impact on the initiatives as long as the companies and the private sector had a large share in the creation and the development of the initiatives. Through financing and providing assistance to the initiatives, government had especially in the beginning of the activity a positive impact.

#### 2.1.4. Cluster Mapping

In this section, the authors focus on cluster mapping, the first step in developing cluster initiatives.

In the first step in promoting clusters, it is crucial to get a complete overview of the respective business landscape (Welfens 2011:182). As already mentioned in the report, regional areas in a country possess different economic priorities and have therefore different forms of competitiveness over other areas. Those advantages in form of higher competitiveness may be locational advantages for instance (World Bank 2009:12). Nevertheless, another important aspect is that areas or clusters are never autonomous. In other words, there are linkages between the regions and clusters. For that reason, it is important to gain an overview of the business landscape through cluster mapping.

The tool “cluster mapping” helps to identify all players, relationships, and related firms on a regional or national level. In sum, the mapping shows a general overview of the whole industry or region, depending on the considerations. Additionally, it constitutes the starting point for applying cluster initiatives and its specific tools.

Next steps in cluster identification are such as market segmentation, SWOT analysis, or Value Chain Analysis (World Bank 2009:12). However, in this research paper, emphasis lies on cluster mapping, an analysis on the industry landscape on a regional or nation level.

Through cluster mapping, business activities and important actors will be identified. Additionally, information about employment, innovation, relationship between the actors, weighting and power of the actors, etc. will be gathered. The World Bank (2009:14) then explains that within this analysis

“specific clusters can be disaggregated to outline the related activities that are graphically organized around related subgroups of: core production and sales, sup- pliers, service providers, educational and research activities, and regulatory bodies.”

Cluster mapping as a tool consists of two major parts.

“First, cluster mapping is based on the mapping of the industrial classification code into clusters. Second, these data allow the mapping of clusters across geographies indicating the locations and perimeters of the nuclei of related economic actors.” (World Bank 2009:15)

The approach of cluster mapping shows the location firms possess in its industry and as well as its concurrent decisions. In other words, a cluster mapping is a useful tool to identify the “sourcing and selling behaviors as well as the business alliances of firms” on a regional or national level (World Bank 2009:15). Through this tool, the relationships among the companies and their operations embedded in a regional area can be derived.

Nevertheless, there are also negative aspects using cluster mapping. On one hand, the extend and general specification of clusters are not always easy to determine, and on the other hand, acquisition of the necessary data can be expensive and time-consuming (*ibid.*).

In regional areas, where enough data exist of firms, secondary research may be applied for the cluster mapping (*ibid.*:16). Meaning, federal statistics / registers may be used for additional information. The gathering of all the data in the end will provide much information about the regional business and also the performance of already existing cluster in the region. It may also give an advice on how the cluster will change or where it will be heading in the future through performance indicators.

As soon as all the necessary data is gathered through primary and secondary data, the cluster can be examined on three criterions on assessing the cluster’s effect on the economy. Size and dominance, specialization, and linkages.

Size and dominance: A cluster and its weighting in the economy can be assessed through analyzing how many employees are appointed in the specific cluster, and how high the reimbursements are to those stakeholders (World Bank 2009:16).

Specialization: An indicator for specialization is when a cluster in a specific region shows a higher degree of specialization than in other areas. This means that the specialized cluster could attract more related companies from other regions (ibid.).

Linkages: Companies, which show a high degree of linkages between “production and sales, suppliers, service providers, educational and research facilities, and regulatory bodies”, form a highly functioning and effective cluster (ibid.).

The following example of a cluster mapping of a life sciences cluster may be of further help for a schematic representation:

“The cluster map for the Life Sciences Cluster in Cambridge, Massachusetts in the United States uses a generic structure of all activities that might be present in an economic nucleus of this type. It then uses quantitative data to differentiate activities by the relative strength of the location in this activity, for example, by looking at the location’s share of national employment. The data indicate the clear focus on research and devices with weaker positions in manufacturing but also an impressive breadth across a wide range of activities that have linkages to life sciences. Because of this analysis and further discussions with cluster participants, efforts were started to enable the location to gain manufacturing sites nearby. The analysis had shown that while Cambridge was to remain a research hub, this function increasingly required to have the first production line within close proximity to allow tight contacts between researchers and engineers as the manufacturing of the substances was scaled from laboratory to industrial size.” (World Bank 2009:16-17)

The US Cluster Mapping Project is also heavily researching cluster policy. Together with the Institute of Strategy and Competitiveness of Harvard Business School, new algorithms were elaborated to assess specific “sets” of clusters and evaluating which are “best” (U.S. Clustermapping). The objective of the project team is to conduct further research cluster policy as well as in the industry, provision of data and research, and exercise influence “business, policy, and innovation in the United States” (ibid.).

## 2.2. Diagnostics in the Field of Life Sciences

Diagnosis is part of many different fields in life science. The list of life sciences seems never ending. It covers all branches of science which include the scientific study of living organisms. This does not only include human lives but also plants, animals and microorganisms. Most aspects of life sciences are overlapping, and diagnostics can play a role in several fields. Our focus lies in medicine and its branches. Medicine is the applied science of the diagnosis, treatment, and prevention of disease.

Medical diagnosis is of major significance nowadays. In-Vitro diagnostics is the largest contender and is estimated to reach more than \$70 billion in sales by the year 2022 (EvaluateMedTech 2016). This equals 13.4% of all sales in the MedTech industry. Diagnostic imaging, another relevant part of diagnostics, is predicted to reach sales of \$50 billion (*ibid.*). This upward trend can be explained by the recent high demand of individual therapy and the displacement of the analysis to the place of the treatment (Point-of-Care). Furthermore, there is a demand for a better cost control within the health care system. In-Vitro diagnostics plays a significant role when it comes to this cost control. By decreasing the amount of follow-up diseases, shortening the average visiting time in hospitals and avoiding unnecessary treatment, it can lower the costs exquisitely. Hence, diagnostics will be of great importance to create a sustainable health care system in the future (swissbiolabs 2016).

Diagnostics covers a wide range of fields and technologies within the health care system. In the following sections, we will briefly describe five different categories of diagnostics and point out their significance in regard to our project.

### 2.2.1. In-Vitro Diagnostics

As described before, In-Vitro diagnostics is the most important appliance of diagnostics. It is a crucial basis for objective information and better disease management and patient care. “In modern healthcare, in vitro diagnostics go far beyond simply telling a doctor whether a patient has a certain disease or not. Today, they are an integral part of decision-making along the entire continuum of a patient’s health or disease, enabling physicians to make full use of IVDs along the healthcare value chain” (Roche 2017). The following Figure shows that diagnostics is part of the whole healthcare value chain, unlike for example pharmaceuticals which are just part of the treatment.

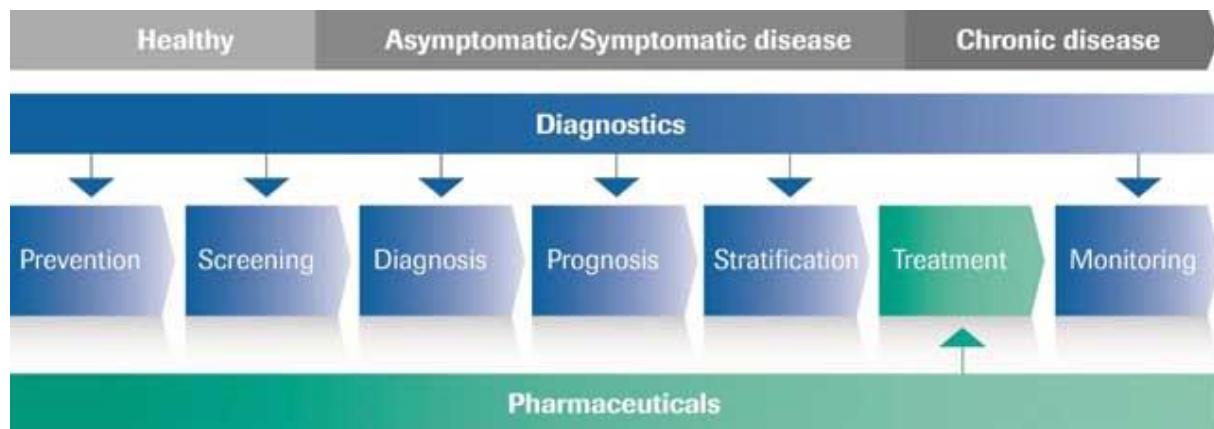


Figure 3: Healthcare Value Chain (Source: Roche 2017)

For a long time, In-vitro diagnostics have influenced more than 60% of clinical decisions, even though it only accounted for 2% of total healthcare expenses. Thanks to in-vitro diagnostics, laboratories can be the reliable partners that doctors need. Its diagnoses allow doctors to make “right decisions for their patients at the right time” (Roche 2017). Furthermore, it leads to better control over people’s health and it encourages payers and policymakers to invest in the right solutions for patients.

### 2.2.2. Diagnostic Imaging

Diagnostic imaging, or also medical imaging, is the part of diagnostics which visually presents the interior of a body for clinical analysis. It allows insight into parts which are hidden behind skin and bones. Most common examples of diagnostic imaging are the radiology technologies such as x-ray radiology or magnetic resonance imaging (MRI). New systems and software enable doctors to identify diseases at an early stage and therefore control the therapy precisely (swissbiolabs 2016).

### 2.2.3. Companion Diagnostics

Companion diagnostics are diagnostics which are in direct relation with therapeutic drugs. It plays an important role in personalized treatment, i.e. when a patient is treated individually. It is common in cancer treatment (swissbiolabs 2016). Companion diagnostics are often in-vitro devices “which provide information that is essential for the safe and effective use of a corresponding drug or biological product. The test helps a health care professional determine whether a particular

therapeutic product's benefits to patients will outweigh any potential serious side effects or risks" (U.S. Food & Drug Administration 2017).

#### 2.2.4. Point-Of-Care Diagnostics

The purpose of point-of-care diagnostics is to provide fast and useful information at the place of treatment, i.e. in the hospital, at a medical practice, at the pharmacy or even at a patient's home (swissbiolabs 2016). "Rapid care centers are now commonplace in many pharmacies and mobile diagnostics applications are allowing the consumer to take their health into their own hands" (International Molecular Medicine Tri-Conference 2017). An example is the process of measuring blood glucose. Recent trends show that also non-invasive controls can be practiced at home rather than in a medical practice. Portable heart rate measuring instruments are an example of such practice (swissbiolabs 2016).

#### 2.2.5. Laboratory Automation & IT

Laboratory automation is a process which seeks to improve and optimize technologies in the laboratory. The purpose is to increase the efficiency and quality of any applications. The usage of the high amount of patients' data (Big Data) helps doctors to suggest accurate treatment (swissbiolabs 2016).

### 2.3. Diagnostics in Switzerland

The Swiss diagnostics market is dominated by the three main concerns Roche Diagnostics, Siemens Healthcare and Abbott Laboratories. Together they make up for a market share of 40%. In addition to these key players, there are several Swiss companies who do business internationally, such as Ypsomed, Bühlmann Laboratories and Sensile Medical. Besides all these companies, there are also a bunch of Start-ups in the diagnostics field, and several research centers (swissbiolabs 2016).

Despite the great know-how in Switzerland, the main axis of the Diagnostics Community in Europe lies between Vienna, Munich and Mannheim. National and international networking to strengthen the players and foster talents and ideas is not practised sufficiently. Therefore, swissbiolabs sees the chance for Switzerland to become an important player within the European Diagnostics Community in the future.

### 3. Methodology

#### 3.1. Approach & Software Choice

In order to create an overview of all suppliers and manufacturers in the fields of diagnostics in Switzerland, we were asked to create a database containing all relevant information. We decided to put our work into a well structured Microsoft Excel sheet. This allows further users of the database to easily adapt content and add further entries. Furthermore, it is a tool which allows the user to filter and organise the contents. Using the different functions of Microsoft Excel, the end user will be able to sort the lists by each entry, e.g. by the size of the company.

Using other programs such as Microsoft Access was considered, however, to keep it as simple as possible for the end user, we decided to work with Microsoft Excel. Microsoft Access could have been a more favorable solution if we connected the company database with the event database. In the process of our work, although, we realized that there is no need to create such links.

#### 3.2. Data Collection

The contents of our database are all gathered from internet research and therefore are secondary data. In order to not get lost in a too broad selection of diagnostic companies, we mainly resorted to already existing databases in the diagnostics field. The sources of these databases are linked in the database file. For each company from these lists, we decided whether we would include them or not. For each company included in our database, we then did internet research to complete all data required. Most information is found on the companies' websites. In some cases we had to use other instruments, such as the commercial register of all Swiss companies.

#### 3.3. Creation of Mapping

The mapping is created with an online tool offered by [www.mapcustomizer.com](http://www.mapcustomizer.com). This simple program allows us to present each entry on a map by Google Maps. Different entries can be filtered, i.e. it allows us to only show certain companies, such as SMEs or Start Ups. Therefore, using this tool, we can create different mappings which show the spread of Swiss diagnostic companies. Additionally, using this program, no license is required. We created an account for the end user, which makes it simple and easy to access at all times.

For simplicity matters, we decided to only enter one location per company into the database. Therefore, if a supplier has different locations in Switzerland, such as warehouses or other storage areas, only the address of the company's headquarters is included in the database and hence shown on the map.

In addition to the previously mentioned tool, we have also worked with a different webpage, named [www.easymapmaker.com](http://www.easymapmaker.com). This tool has the advantage that the end user can filter the map directly in the browser. Entries can easily be sorted by field of activity, diagnostic category and size (Startup, SME, big corporation). The mapping is accessible through the link [www.easymapmaker.com/map/diagnosticsswitzerland](http://www.easymapmaker.com/map/diagnosticsswitzerland) with the password "olten". Changes can be made with the same login details we created for [www.mapcustomizer.com](http://www.mapcustomizer.com). Since both tools have their advantages and drawbacks, we decided to include both in our paper and let the end user decide which tool is more favorable to work with. Figure 4 shows an example of how the easymapmaker-tool can be used with filters and which information is visualized based on our database.

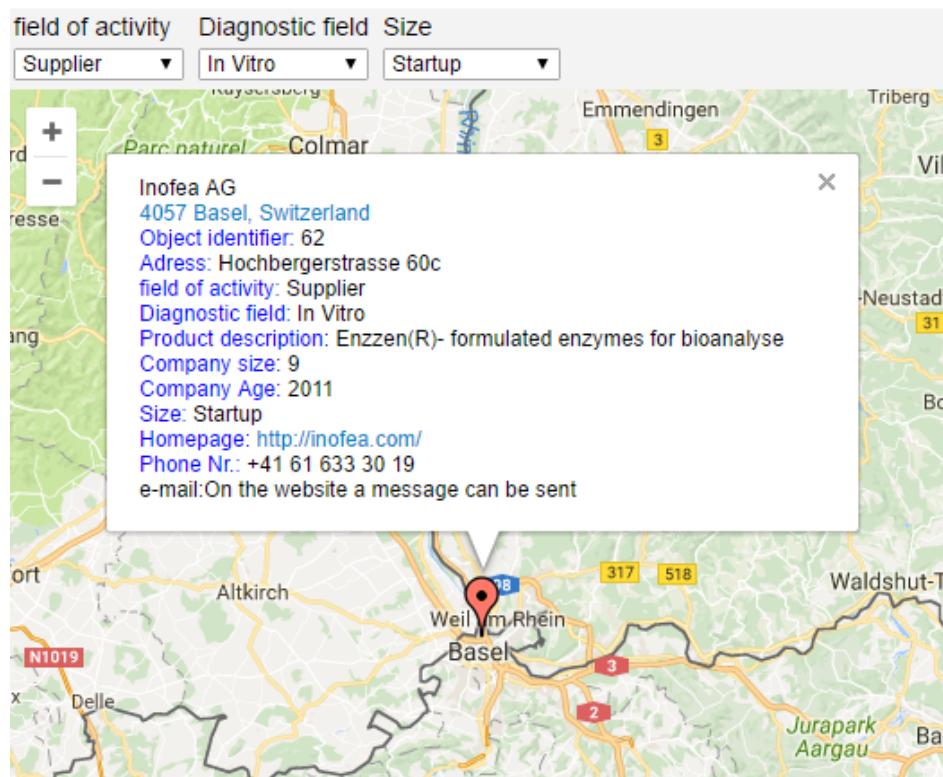


Figure 4: Example of Mapping-Tool Output

### 3.4. Interviews

In addition to secondary data and internet research, we spoke to Prof. Dr. Daniel Gygax and Mrs. Nila Pia Rähle, both of swissbiolabs. Both being experts in the fields of diagnostics, we took the chance to talk to them about our project. This on one hand led to a better understanding of diagnostics from our side, on the other hand, they both gave us useful inputs to improve our work. The better idea about the theory helped us to simplify the process of internet research. Since both of them have worked in the diagnostics field for many years, they could provide us with important contact persons as well as already existing databases which could be of significance for us.

### 3.5. Database Creation

To keep the database clearly arranged and informative on one hand but not too complex on the other hand, we tried to include as specific data as possible. Apart from the obvious contents, like the company name, its location and contact data as well as website, we included certain informative data about the companies' field of activity. We specified the field of activity, i.e. if the firm is a supplier, manufacturer, developer or offering diagnostic services. Furthermore, we assigned each entry to the five fields of diagnostics which will be described in the theoretical section of the paper. To give the end user a short idea of what each company is practising, we included the column "product description". As the name suggests, this is a brief description of either the products which are manufactured or distributed, or the service which is offered. Wherever possible we included data about the company's size and age. Deriving from these figures, we could then assign each company to one of our four main categories which we came up with. The four categories, SMEs (small-medium-sized companies), Start-ups, big corporations and institutions have the purpose to make it easy for the end user to filter the data. It is possible to only show entries of one or several categories. Furthermore, it makes it possible to create our mappings according to the categories.

#### 3.5.1. Challenges

During the creation and completion of the database we faced different challenges. Most companies do not only operate in diagnostic areas. Diagnostics is often only a small part of an enterprise. It was then difficult to decide on whether to include these companies. Furthermore, the allocation to just one of the five diagnostics fields was challenging and not always clear. On one hand because

we are no diagnostics experts and on the other hand because one company often offers products from different categories.

Another difficulty in doing the research was that some companies do not share all information online. Especially a company's size and year of establishment are information which are not always found easily. It was also not always possible to find appropriate contact person details. We then decided to only include the contact details available on the websites, mostly a telephone number and e-mail address. Moreover, specific contact persons may change in the course of time which would lead to an outdated database.

### 3.6. Events

The events database was not integrated in the company database, because the events which we have found show no specific connection to the companies. We included the following events: Roche Diagnostik, 6. Zürcher Diagnostik Kongress Zürich, Swiss Symposium in Point-of-Care Diagnostics HES-SO Valais, Innovation Landscape Micro & Nano Reinach, IFAS Fachmesse für den Gesundheitsmarkt Messe Zürich, Euroanaesthesia Genf, ILMAC Messe Basel and finally the 49<sup>th</sup> International Diagnostic Course Davos. Since the location of the events tend to switch regularly, we did not include the events in the mappings. Nevertheless, eight events are picked out which could have an interesting impact on further proceeding regarding the visitation of those events. Those events focus mainly on the medical part of diagnostics but as well on the overall general medical aspects.

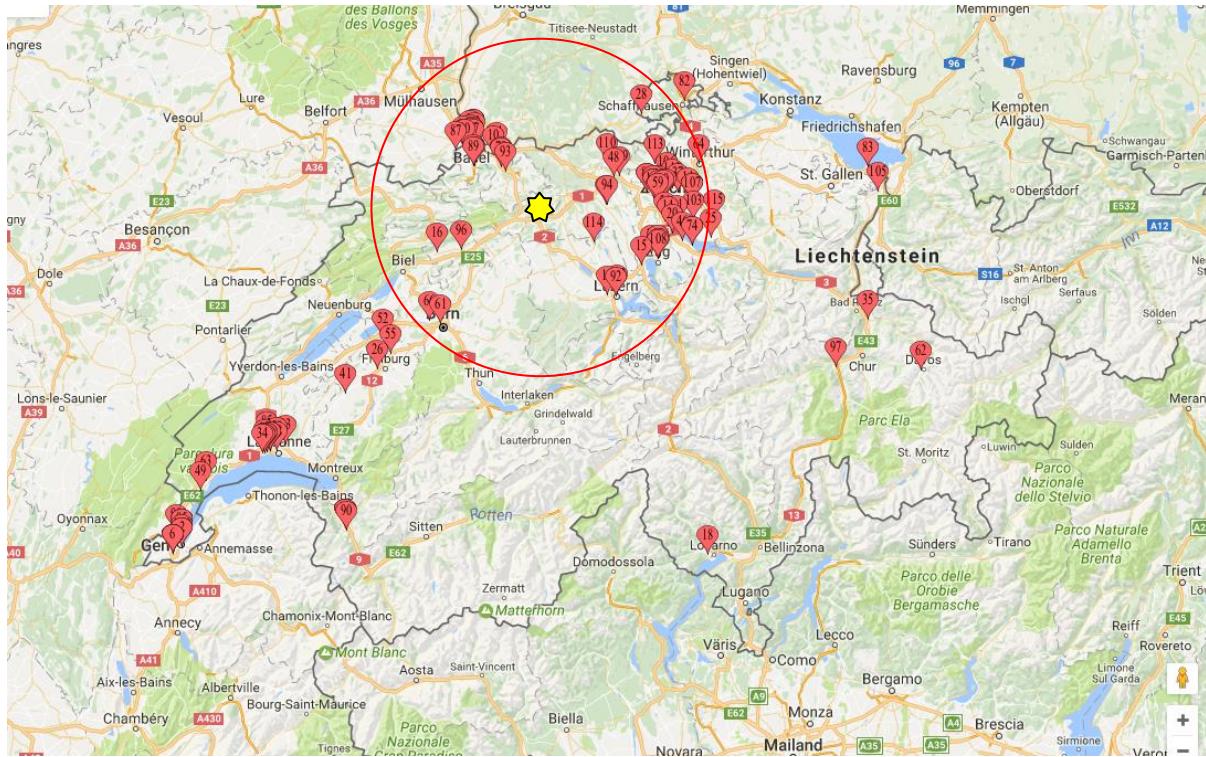
#### 4. Results and Discussion

In this section, the authors will analyze the created mappings of the diagnostics landscape. The project team produced five different mappings. As requested by the contracting party and for analysis' reasons, the mappings were divided into distinct areas:

- a. Mapping including all big corporations, SMEs, and start-ups in Switzerland
- b. Mapping showing only big corporations in the diagnostic field
- c. Mapping showing only SMEs in the diagnostics field
- d. Mapping showing only Start-ups in the diagnostics field
- e. Mapping showing full catchment area of diagnostics field with a comparison to the Silicon Valley cluster

Each mapping will briefly be described and analyzed.

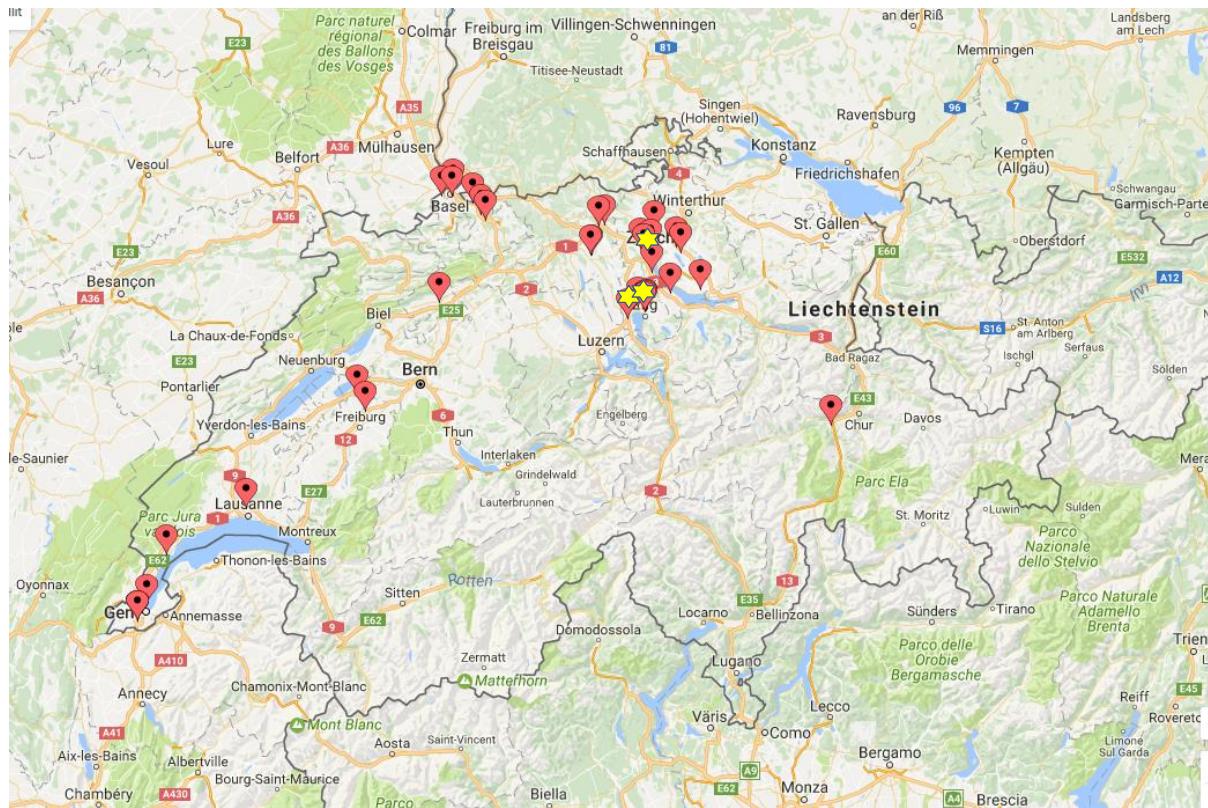
#### 4.1. Diagnostics landscape in Switzerland



Mapping 1: All big corporations, SMEs and Start-ups

Mapping 1 shows all entries of our database, i.e. all big corporations, SMEs, start-ups and institutions. Most companies are located in the regions of Zurich, Basel or around Geneva / Lausanne in the Western part of Switzerland. A few individual companies are settled in the regions of Berne / Fribourg and Lucerne. Clearly, the largest settlement of diagnostics companies lies in the city of Zurich. Around 40% of our entries lie within 20 kilometers from Zurich. Basel hosts around 20% of all companies, and so does Geneva / Lausanne. No enterprises are located in or around Olten. However, Olten lies in the center of the clusters Basel, Zurich and Berne. The circle on mapping 1 shows a radius of 70 kilometers from Olten. This equals approximately one hour of a car drive or train journey. The public transport axes between Berne, Basel and Zurich all cross the train station of Olten. Moreover, the highway route to travel within these destinations all pass through the region of Olten. A journey from Zurich to Berne would take considerably longer than just travelling to Olten. The city of Lucerne, which hosts a few diagnostics companies as well, lies within the radius, too. Berne, which is the center of a successful Med Tech cluster (Capital City Area), does not necessarily have a better location than the Olten region. It is closer to the Western part of Switzerland but around 120 kilometers away from the city of Zurich.

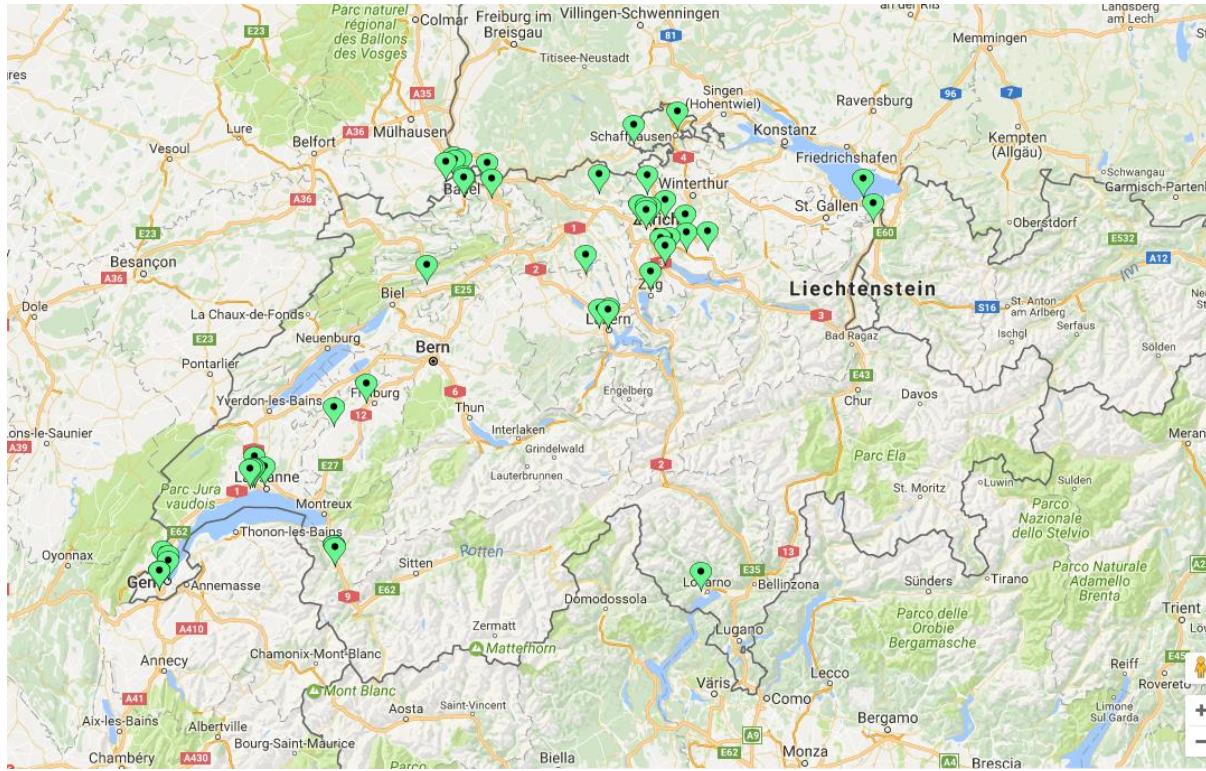
#### 4.1.1. Big corporations



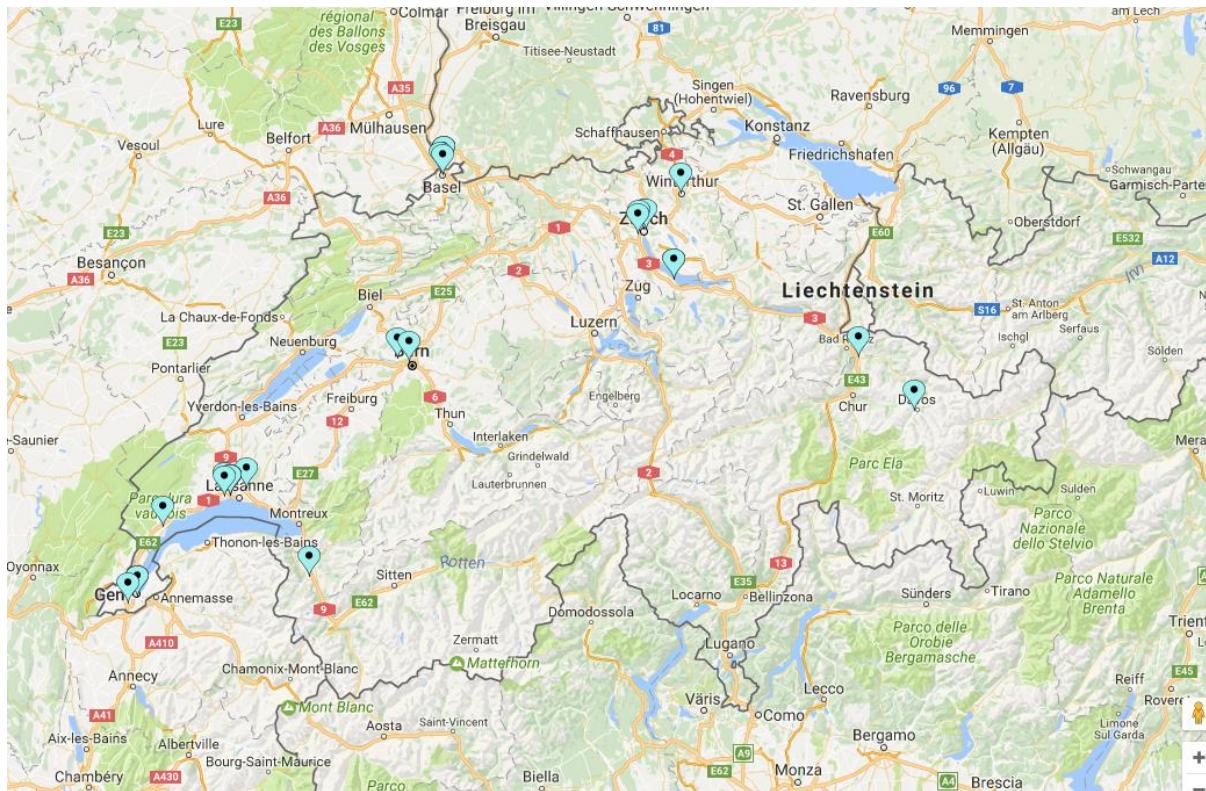
Mapping 2: Big corporations

Mapping 2 shows the locations of all big corporations, the large players in Switzerland. The authors considered 27 of our entries as big corporations, most of them doing business internationally. The mapping shows a similar spread to what we have seen in mapping 1, with all companies included. Zurich hosts most of the big players, followed by Basel and Geneva. The three stars, visible on the map, represent the three biggest global players in the diagnostics field: Roche Diagnostics, located in Zurich and Siemens Healthcare and Abbott Laboratories, both located around Zug.

#### 4.1.2. SMEs and Start-ups



Mapping 3: SMEs

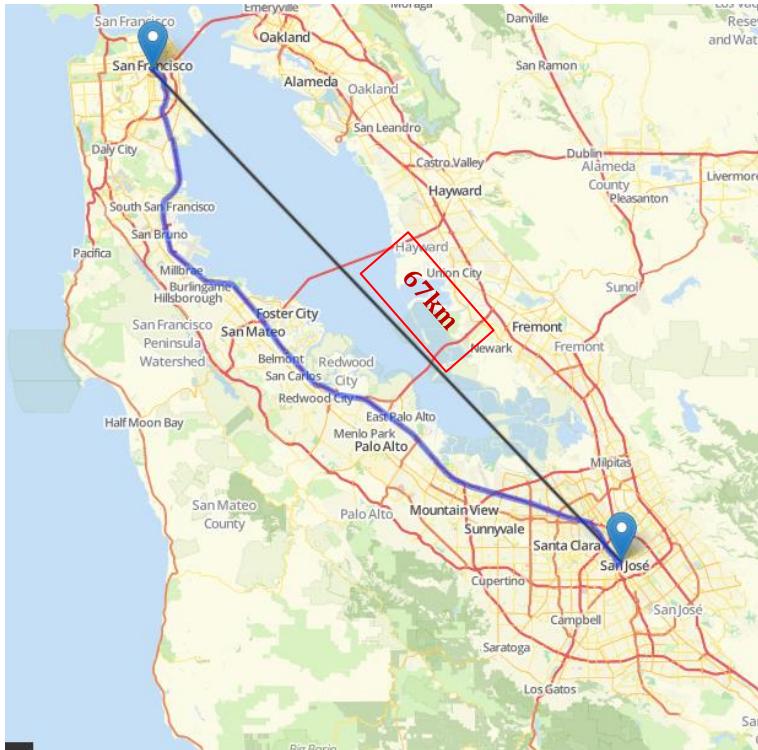


Mapping 4: Start-ups

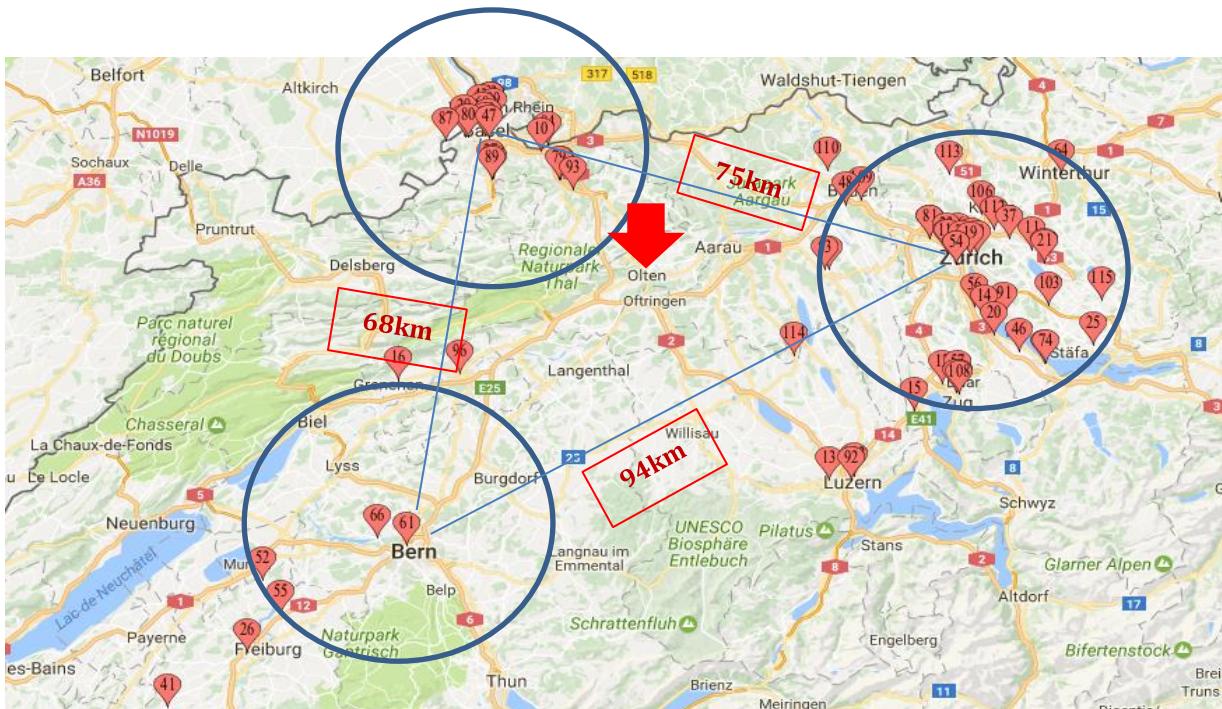
Mapping 3 and mapping 4 show the spread of the SMEs and Start-up companies. The project team included 30 Start-ups and 63 SMEs. A similar spread can be observed, with most companies being located in the usual areas. However, a considerably high amount of almost 50% of all Start-up companies settled down in the French speaking part of Switzerland. In the theoretical section of the paper, it was described, that start-ups tend to settle close to big players, rather than in unknown areas. This can be confirmed by analyzing the mappings.

With the online tool [www.easymapmaker.com](http://www.easymapmaker.com), more aspects can be analyzed. Not all possible maps are discussed in this section, since most map provide a similar outcome. The filtered maps show that all categories of diagnostics (In-Vitro etc.) are spread all over Switzerland. There is no location which hosts a considerably high amount of companies of one diagnostics field. The same counts for the different field of activities (manufacturers, developers, suppliers, service companies).

## 4.2. Switzerland compared to Silicon Valley



Mapping 5: Dimensions of Silican Valley, California US



Mapping 6: Dimensions of Switzerland

Mapping 5 shows the dimensions of the famous cluster Silicon Valley in San Francisco and puts it in relation with the distances in Switzerland (Mapping 6). Silicon Valley is host of most of the world's largest firms such as Google, Facebook or Apple. The scope of the whole cluster is 67 kilometers of airline distance, or 77 kilometers when driven by car. These distances are comparable with the dimensions in Switzerland between the areas of Zurich, Basel and Berne, as the airline distances on Mapping 6 show. The radius of each circle around the three cities is 25 kilometers. Olten, situated in the middle, lies within less than 70 kilometers away from each city.

## 5. Conclusion

The region of Olten has many advantages of its location as well as other economic benefits. First, Olten is highly attractive for employees as the three major cities, Zurich, Basel, and Berne, are reachable within a timeframe of 45 minutes. 1.6 million people are within this catchment area. Olten is a pivot point too, as rail and road transports are mostly redirected through the city. The three Swiss airports are also easy to reach. Other attractive advantages of Olten are its high productivity, fair wage costs for firms, or the cheap rental costs. Additionally, taxes levied by government to both companies and individuals are comparatively low to other regions. There is a pool of highly qualified labor force and good connections to teaching and research facilities.

All the mentioned characteristics of the benefits of the region of Olten, a cluster formation in the field of diagnostics seems to be reasonable. According to OECD (1997), geographic location, jurisdiction, and population are important factors for developing clusters. Olten possesses a favorable location as a central hub between the major cities, the population in form of labor force is in close vicinity and easy reachable for commuters, and Olten offers low taxes. The listed incentives and advantages constitute added values for possible settlements of firms.

Another important aspect is the required proximity between the firms in the possible diagnostics cluster. As Switzerland is a relatively small country, the question arises, if specific cluster is either necessary or desirable. However, research seems to reject this assumption, instead it weights a high success potential of clusters particularly in the area of close proximity between the actors.

Michael Porter (1990) mentioned that firms who compete in a cluster are among the most competitive in the industry. Furthermore, he relates the Diamond Model and its interplay of the forces an inevitable measurement for successful clusters in several industries.

Factor conditions are apparent. Through the central position of the region of Olten, a lot of talents and workforce are available in the nearby environment. Accessibility through the different mode of transports – train, car, and air travel – is ensured, too. Furthermore, through the mapping of the diagnostics landscape of Switzerland, related and supporting industries were identified. Porter (1998) stated the importance of a company's value chain as well as the factors of improvement, innovation, knowledge, and relationship as crucial characteristics for the set up or development of a

cluster. Cooperation and linkages between the firms, suppliers, manufactures, and services are clearly visible within the diagnostics field in Switzerland. Rivalry between the firms exist and demand conditions are and will play an important role in the diagnostics field, as the market volume of in-vitro diagnostics is expected to grow until 2022 by \$ 70 billion.

The formation of a cluster in the field of diagnostics in Olten would also provide SME's and start-ups with necessary knowledge and business opportunities as clustering promotes competitiveness, output, growth, and partnership with leading firms in the industry (Bagwell 2008).

A cluster in the region of Olten in diagnostics will definitely influence the economic activity in a positive way. Theories on the topic suggest a high competitive advantage of cluster over other economic sectors.

To a successful implementation of the cluster formation, not only specific firms in the diagnostics field should be attracted, but the whole value chain. This means that also small companies, who produce small supplements, have to be included in the network of firms, suppliers, manufacturers, and services.

Another crucial issue is the close connection to research as well as university institutions. Ketels (2013:17) mentioned the several areas clusters operate at the same time, including research/networking, and education/training. The illustration of Silicon Valley and its close connection to Stanford University shows the importance, research institutions have for organizations. Switzerland enjoys a high density of universities, which have to be necessarily integrated into the cluster development.

Through our creation of a database and mappings of the diagnostics landscape in Switzerland, the authors conclude that there is a high potential for a cluster formation in the region of Olten. The area has attractive forces such as its central location, low taxes levied by government, or low rental costs may attract many firms, suppliers, manufacturers, and service providers in the field of diagnostics.

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## 7. Appendix

### 7.1. Project Mandate

Kurzbezeichnung	Wirtschaftsförderung Region Olten/Clusterbildung / Schwerpunktthema im Bereich Diagnostics				
Projekt-Nr.	3-16.W-PA-3567/01				
Auftraggeberchaft	Wirtschaftsförderung Region Olten Herr Blaser Urs Frohburgstrasse 1 4600 Olten	Telefon G:	+41 62 296 88 08	Telefax:	+41 62 296 88 09
Themeneingang	Mittwoch, 25. Mai 2016				
Working title	Cluster formation in the field of Diagnostics				
Ausgangslage/Problemstellung	<p>Im November 2015 wurde der Förderverein Swissbiolabs gegründet. Swissbiolabs setzt sich interdisziplinär aus Mitgliedern aus den Bereichen Gesundheit, Wirtschaft und Wissenschaft zusammen. Unternehmer und Vertreter aus Wissenschaft und Forschung haben sich das Ziel gesetzt, wissenschaftliche Ideen zu fördern und Jungunternehmen in der Region Olten anzusiedeln. Die Idee, eine Plattform für Diagnostik zu gründen, um Wissenschaft und Unternehmen besser zu vernetzen, basiert auf drei Säulen: Swissbiolabs Challenge, Accelerator, Förderverein.</p> <p>Der Schweizer Markt ist geprägt von Global Playern und Hidden Champions. Die drei globalen Unternehmen im Bereich der Diagnostik sind Roche Diagnostics, Siemens Healthcare und Abbott Laboratories mit einem Marktanteil von ca. 40%. Die Schwerpunkte und Geschichte der Unternehmen spiegeln die Vielfältigkeit der Diagnostik wider. Darüber hinaus gibt es zahlreiche Schweizer mittelständischen Unternehmen die global agieren, wie z. B. Ypsomed, Bühlmann Laboratoires oder Sensile Medical. Und last but not least besitzt die Schweiz hervorragende Universitäten und Institute, die u.a. an den Diagnostik Themen der Zukunft forschen. Allgemein wird damit gerechnet, dass im Bereich Diagnostik in den nächsten Jahren zahlreiche neue Anwendungen in Startups entstehen.</p> <p>Mit Swissbiolabs gilt es, die Chancen unternehmerisch zu nutzen und am Wirtschaftsstandort Olten einen Schwerpunkt (Cluster) im Bereich Diagnostic aufzubauen und die entsprechende Diagnostic Community zu bilden.</p>				
Zielsetzung	<p>Mit dem Diagnostic Schwerpunkt (Cluster) soll der Wirtschaftsraum Olten gestärkt werden und durch deren Kompetenz in einem Wachstumsmarkt, Neuansiedlungen von Unternehmen fördern. Der Diagnostic Schwerpunkt (Cluster) ist ein Netzwerk von Herstellern, Zulieferern, Dienstleistungs- und Forschungsunternehmen in der Wertschöpfungskette Diagnostic / Life Sciences aus der ganzen Schweiz. Das Ziel der Projektarbeit ist es, die Diagnostik-Landschaft der Schweiz übersichtlich darstellen zu können, so dass die Schlüsselpartner und das Netzwerk für den Know-how Transfer für den Förderverein Swissbiolabs definiert werden können. Durch eine Art Landkarte können die Partner nach Kompetenz, Grösse und Region grafisch dargestellt werden. Gleichzeitig sollen die verschiedenen Veranstaltungen, Konferenzen und Foren nach Thema und Inhalt dargestellt werden. Mit den daraus gewonnen Erkenntnissen sowie der vom Projektteam erstellten Empfehlungen, wird das Konzept Cluster / Schwerpunkt Diagnostics erstellt.</p>				
Themenbeschreibung	<p>Damit der Förderverein Swissbiolabs sich im nationalen Diagnostik-Markt verankern kann, müssen die wichtigen Schlüsselpartner definiert werden. In einem ersten Schritt werden mit Internetrecherchen Hersteller, Zulieferer, Dienstleistungs- und Forschungsunternehmen und Institutionen und andere mögliche Netzwerkpartner zusammengetragen und nach verschiedenen Gesichtspunkten gegliedert. Anschliessend wird anhand von Recherchen eine Übersicht über alle Aktivitäten und Veranstaltungen erstellt und mit mittels Interviews deren USP eruiert.</p>				