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Competitive Industry Clusters Analysis: A Strategy Development Toolkit



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Glossary of Key Terms

Anchor Firm: These are crucial firms that hold a cluster together. An anchor institution acts like a champion firm which can brand the cluster, promote research, induce spin-offs, supply and develop talent, and attract firms from related industries. Ideally it should be a mix of government, non-government and private sector. A healthy mix of firms will be government, academia, R&D, research centers, MNCs, SMEs and startups.

Cluster: Clusters are geographic concentrations of interlinked firms that make up an industry of strategic significance on socioeconomic growth especially on the knowledge, GDP and exports. Some clusters are formed organically and some require strategic government intervention. They come in different forms and often go through a lifecycle.

Cluster Lifecycle: This is the growth trajectory of clusters. It often follows the innovation S-curve in four stages: emerging, developing, maturing and declining or transforming into another cluster.

Cluster Mapping: Cluster mapping describes the quantitative measurement of the presence of clusters across regions within a country or group of countries. It has led to an analysis of economic geography of places, regions, and countries.

Downstream: Those Operations and Services activities for the distribution of finished products.

Healthy Competition: Occurs when different firms compete in obtaining a market share through raising the quality of their products and reducing prices within a legitimate margin that does not go below costs and overall result in an economic growth and market expansion.

Intellectual Property (IP): as per the World IP Organization, it is a category of property created by the mind, such as inventions, literary and artistic works, designs, symbols, images and names used in commerce. It is often protected by laws such as: patent, copyright and trademark to allow people earn a recognition and a financial benefit.

Mergers and Acquisitions (M&A): means the possession of one firm by another firm and results in either a merger which is a combination of both firms under one legal name or an acquisition where there is no change in firm legal name or structure.

Multinational Corporations (MNCs). These firms are often private companies with headquarters in one country but with have significant operations across in the world including manufacturing and R&D. The objective of a cluster is to get the manufacturing and R&D investments in the country.

Networks: These are the relationships across firms and individuals and should be viewed at both national and international level, within the industry and outside the industry. Networks can be both formal and informal. The greater the number of networks, the greater is the opportunity for competitiveness if the networks are unique and exploitable.

Small and Medium Enterprise (SME): means small and medium sized businesses that is often measured by the number of employees, annual turnover and profits (financial performance) and structure of ownership. The definition of SMEs may differ from country to country and the characteristics may change by industry.

Stakeholder: Any entity or person with a significant interest and influence in the firm/cluster, and can be in the form of government, competitors, customers, partners or suppliers.

Startup: privately owned new entrepreneurial initiative where the founders often have some knowledge of the industry and some international networks of significance that can bring in capital, talent or help with exports.

Sticky Knowledge: Means tacit or unwritten knowledge and is recognized as a source of firm's competitive advantage. It requires a significant effort to share or transfer due to its complicated nature or the complexity of associated social processes.¹

Supply Chain: In a supply chain, the organizations involved are associated with the sourcing of raw materials and parts and its conversion into the final product.

Upstream: Manufacturing and Assembly and integration activities needed for production of goods and services.

Value-chain: those activities and services that provide the organization a competitive advantage in the market place like logistics, operations, marketing, and services (after sales services, financing etc).



Introduction

Competitive Industry Clusters are considered a crucial element in driving national competitiveness. Many countries try and 'seed' clusters, and plan for them strategically but the reality is that they often grow organically. While there is knowledge on the key factors needed to seed a cluster, and there exists significant research on the drivers and barriers to clusters, it still seems like a hit and miss strategy. Cluster growth can be evaluated by the level of exports, the contribution of these players to the national economy, the IP registered, the new talent and new startups a cluster brings in or facilitates.

Often clusters are mis-identified. There is an assumption that a collection of players in a similar industry is a cluster, but this is not true. Even if they are located close to each other, this proximity could often develop because of real-estate incentives. The real test is inter-dependency, collaboration and healthy competition – how much of knowledge transfer is there between firms, are the supply chains integrated, is there a free movement of talent? As Prof. Michael Porter reiterates "Clusters represent a new way of thinking about national, state, and local economies, and they necessitate new roles for companies, government, and other institutions in enhancing competitiveness".²

This toolkit is a set of guidelines that can be used by government entities mandated to create strong business ecosystem within their sectors. It is a tool to strategize investments through the concept of clusters. This tool does not use cluster mapping which requires a high level of granular data to focus on identifying geographic footprint of a specific cluster category increasing linkages and spillover between existing clusters.³

Objective

The objective of this tool is to help policy makers evaluate the type and development stage of their respective industry clusters, and help them create a strategy for cluster development and maintenance for the purpose of socioeconomic growth.

Scope

These Guidelines are applicable for Federal Government Entities who intend to increase innovative output and create an economic value within their sectors through strategizing investments based on the current status of the market which is represented through the cluster lifecycle.

Cluster Analysis: An Introduction

A cluster analysis is a process to systemically analyse and review a nation's strategy in creating competitive clusters through a step-by-step analysis of the existing conditions and a review of policy measures to determine the future strategies for growth.

There are three ways to define a cluster or look at the inter-relatedness of firms within an industry, based on the

lens you view it through: macro, meso or the micro lens (see Exhibit 1). For countries whose focus on cluster development, their purpose may be also embedded in other strategic objectives like development of rural areas, creation of employment or exploitation of existing resources.

Exhibit 1: What is a Cluster

Lens	Cluster Concept	Analysis
Macro (national/across regional borders)	Industry linkages in overall national economic structure	Specialization and its recognition in the region, or globally Innovation/tech synergy and state-of-art across mega clusters
Meso (industry)	Inter- and Intra-industry linkages through the supply chain for a single product/service	Industry benchmarking via global clusters Networking, talent movement, and spinoffs (innovation and new firms) Dominant Platform/Standards (regionally/globally)
Micro (firm)	Specialized suppliers around one or two few core firm (inter-firm linkages)	IP and competitiveness Value chain management/analysis Collaborative innovation Strategic Business Development (business models and firm survival)

Source: Adapted from Roelandt et al. (1997) ⁴

Ideally, for this exercise, we view a cluster at the macro-level and look at it as patterns of specialization across the country. Porter defines clusters as “geographic concentrations of interconnected companies and institutions in a particular field”.⁵ However, with the increase in digital services, greater fragmentation of the supply chain, and greater logistics support across the world, there is now an assumption that a cluster is not constrained by geography, at least within the country. In EU for example, clusters do spill across country borders and the vision for 2030 is smart clusters that “work across boundaries and take part in the interregional collaboration leading to more critical mass”⁶. Further, here there is also an implicit assumption that there is free talent movement in the country or region, and that the country has the ability to attract and retain specialized talent from outside the country. The EU has documented 3000 specialised clusters in Europe, accounting for 54 million jobs⁷.

Further, there is an assumption that knowledge is also shared across industries and between and within firms. In some cases, the knowledge is sticky or tacit and more importantly, it can also contribute to intangible assets that are often underexploited - like brands, designs, databases, human capital etc. ⁸



Definition

Tacit information is that knowledge or information that is not written down or codified or easily accessible. It comes from experience. For example, the disadvantage faced by the recent space program is that all the experience of the previous generation was not fully captured as they retired and left the organization. Some of this knowledge has to be recreated. In some cases when talent is not encouraged to stay or trust based relationships do not exist, knowledge sharing is also impacted. Tacit information can be at the individual level, between departments in organizations, across organizations, within the industry, within the country and across countries. AI cannot capture tacit information.

A cluster specific approach must also be able to facilitate a value-chain approach to the industry of focus using a range of carefully crafted demand- and supply-side policy interventions.⁹ For a value-chain approach, policy makers look for economic gain and must find vertical linkages (within the industry/intra-industry), or horizontal or lateral linkages (across the industry/inter) through formal and informal relationships. ¹⁰



Definition

A value chain and supply chain are closely related. In a supply chain, the organizations are directly involved in the production of the final product or service. They are more associated with the sourcing of raw materials and parts and its conversion into the final product. The value chain is broader and includes those activities and services that provide the organization a competitive advantage in the market place like logistics, operations, marketing, and services (after sales services, financing etc).

Through this process, policy makers in charge of relevant clusters will be able to identify gaps in the existing industry “clusters” and will be able to propose policies that will mitigate these gaps, identify strategic misalignments and bridge any untapped opportunities, either in recent times or in the far future¹¹. More important, clusters evolve and so should the policies associated with them. In the lifetime of a cluster, it is crucial to maintain flexibility in the face of disruptive technologies, which are advancing at an exponential pace. Therefore, cluster strategy maps should provide a better visibility of an industry’s potential convergences, that is a the ability to morph into a transformational cluster that will ensure economic growth. ¹²

This toolkit is best used when the focus is a specific industry cluster. Policy action needs to be context-specific, cluster-specific and evidence-based and there is no one-size fits all strategy. The toolkit will enable the Science Technology and Innovation policy makers to:

- (1) identify of the intra-cluster relationships (linkages and spill-overs) needed to achieve public value goals in their national context .
- (2) understand of the historical development of key stakeholders needed to support a cluster during its formation and growth, cluster type and in what stage in the life-cycle the cluster is to create a relevant strategy for the next stage of evolution.
- (3) make informed decisions to develop policies that strategically drive the increase of: innovative output; productivity; per capita; talent; and knowledge spill-overs by understanding barriers for knowledge management and talent movement, and the culture and funding resources gap for R&D and encouragement of the start-up birth rate.

(4) Most importantly, in a highly competitive world, this tool can also be used to ensure that the creation of a cluster does not compete in the national or global markets with minor differentiation, but rather competes by the creation of a unique value proposition, that is a sustainable, competitive advantage.

(5) Clusters require critical mass to begin organic growth and thrive. This tool can help you artificially “seed” a cluster to give it the push it so requires. ¹³

Data requirements for Competitive Cluster Strategy Development.

Ideally before starting you would need to have access to the following information: (1) Definition of what your cluster is and is not (this is to minimize overlaps with other clusters), (2) Your position in competitive rankings to see your “innovation” efficiency, (3) Access to relevant policies/laws/regulations that may affect cluster development, (4) Knowledge of players or actors in a cluster (existing and potential), (5) data on each player to see role that they can play in growth of the cluster, (6) competitors in a national and global landscape, (7) cluster market potential.

It is indeed important to check that you have all the information mentioned above before starting. If you do not have the information, you will have to decide whether you are ready to conduct this exercise or not. The Institute for Strategy and Competitiveness in Harvard Business School recommends cluster mapping efforts for specific conditions¹⁴ where ideally it should cover a “large number of distinct regions” which are comparable with other regions and have the quality assurance of data.

(1) Define your cluster

Define the cluster by an industry and set some boundary conditions. Some industries maybe too broad for a new or nascent cluster. So for example if you begin with nanotechnology, as an example, you might need to narrow down the field to more specific areas (medicine, industrial applications, robotics etc).

(2) Where do you stand in terms of competitive rankings? Look at the Global Innovation Index and calculate your input-output efficiency ratio.

Input are the factors or resources the country owns or has already developed. It can be calculated based on existing benchmarking studies. Output is those factors determined important from an innovation point of view, that impact global competitiveness. By comparing the input and output, you can determine the inefficiency if any, that exists in the system.

Factors for Input: Tertiary inbound mobility; Researchers, FTE/mn pop; PISA scores; Market Sophistication; State of Cluster Development; Information & communication technologies (ICTs); ICT Infrastructure

Factors for Output: Knowledge Creation; patents by origin; PCT patents; Scientific & technical articles; citations H-index; High Tech Export; New businesses/th pop; Ease of getting credit; Investment; Intensity of local competition; Trade, competition, & market scale; Cultural & creative services exports, % total trade; ICT services exports, % total trade; Ecological Sustainability

How good you at a national level in converting inputs into outputs? Can you drill this information down to the cluster level? For example PISA scores may not be relevant but does the cluster (in totality) have access to talent from universities/schools (internships?).

You may want to look at other competitive factors to see your strengths or barriers in optimizing output. Keep in mind this is indicative only as you may not have access to data. This is a finding in itself.

(3) Relate the cluster to the STI policy or its equivalent and download all related or associated policies/laws/regulations.

Make a list of policies/laws /regulations that you feel relevant for your cluster. This requires some prework. These policies, regulations or laws can be from the fields of (1) STI, (2) Economic, (3) Business setup, (3) Immigration/Talent Management/Employment, (4) Research Funding, (5) Education, (6) Foreign Trade, (7) IP, for example. Identify and see if the policies, laws and regulations are supporting the country vision and strategies and are easily accessible.

(4) Identify all the players in a “cluster”

Based on your definition of a cluster – which ideally is not too broad, make a list of players or actors. This could be government entities, academic institutions, research centres, large MNCs, large domestic firms, SMEs and startups. They must be ideally related to the value chain and supply chain.

(5) You should ideally have granular data on each organization in the (potential) cluster.

This data must look at

- a. Age of establishment
- b. Source of funds (public, private, VC, crowd investments, angel investments, etc).
- c. Number of employees
- d. Scope and specializations from the value chain.
- e. Sales growth (or Budgets if government entity)
- f. Exports markets
- g. Customer markets
- h. Talent sourcing
- i. IP registered and areas of expertise
- j. Investment in R&D
- k. Value chain
- l. Sourcing logistics (domestic/international)
- m. M&A if any

You need to have an idea of the organization's position in the global value. It is even better if you have an idea of how many startups they support that are directly related to the cluster growth, and where these startups are based (domestically and internationally).

(6) Who are the clusters nationally and globally that compete in this sector and their strengths.

Identify three or four to benchmarks countries looking at exports and national strategies, and ensure they have similar national conditions (countries of same or similar size, GDP, FDI or national aspirations). You will need to have an idea of what their anchor institutions are.



Definition

Anchor institutions: These are crucial firms that hold a cluster together. An anchor institution acts like a champion firm which can brand the cluster, promote research, induce spin-offs, supply and develop talent, and attract firms from related industries. Ideally it should be a mix of government, non-government and private sector. A healthy mix of firms with be government, academia, R&D, research centers, MNCs, SMEs and startups.

(7) Market potential for industry segment worldwide and the growth rate.

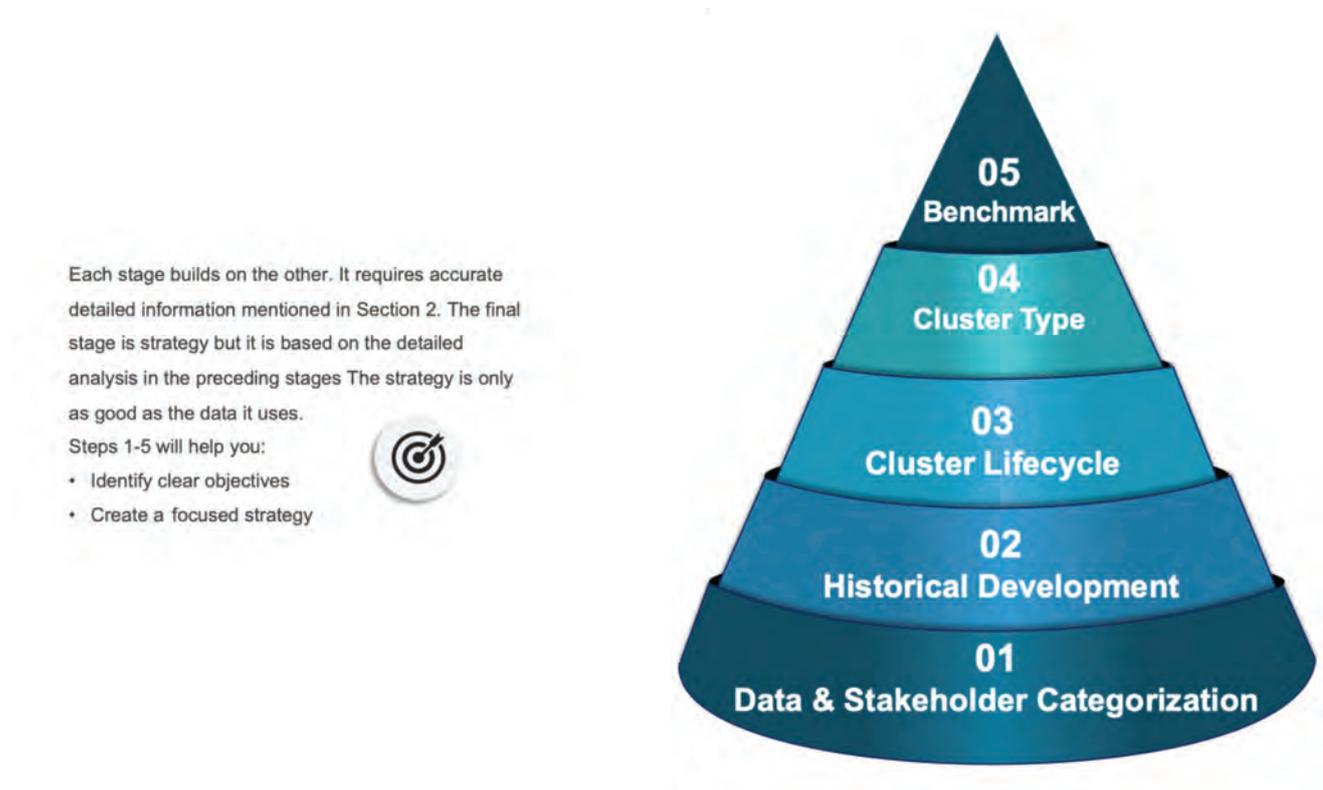
If you cannot find this data - that itself is a key finding as one of the barriers for the cluster strategy. You should be able to find this information in market research reports, national strategies for clusters or you can use substitution proxies.

Competitive Cluster Strategy Development Process.

There are 5 Stages in the Competitive Cluster Strategy Development process (see Exhibit 2):

1. Data & Stakeholder categorization
2. Historical Mapping & Analysis
3. Cluster Lifecycle Analysis and Objective Setting
4. Cluster Type Analysis and Gap Analysis
5. Benchmarking and Gap Analysis
6. Strategy Formulation (this is a tailored solution so will not be discussed but you should have enough details to manage this internally at the end of this exercise).

Exhibit 2: The Five Stage Competitive Cluster Analysis Toolkit



Stage 1: Stakeholder Categorization and Analysis

Having identified your stakeholders, let us analyze them. An additional resource is to look at The International Standard Industrial Classification of All Economic Activities (ISIC),¹⁵ which is a classification of economic activity of firms. This stage requires more analytical work. There are four areas of analysis:

- (i) identifying potential anchor institutions/firms
- (ii) identifying a mix of trading and local firms
- (ii) identifying the minimum number of startups you require for a healthy ecosystem
- (iv) assessing where R&D is based

(i) Find the potential anchor institutions:

Anchor institutions are often large firms that dominate a cluster with a physical branded presence (not to be confused with real estate),¹⁶ or act like a Champion firm which can induce spin-offs, supply and develop talent, and attract firms from related industries.¹⁷ These can be universities, MNCs, non-profit research firms, training institutes, consultancies, service firms or large government entities. While academic organizations are not always considered strong drivers of local collaborations, they can be drivers of international linkages.¹⁸ Anchor tenants must be able to attract related industries in the value chain as the clustering of similar economic activities increases competition that decreases revenue and productivity.¹⁹

(ii) Identify trading and local firms

Those firms that trade and contribute to the industry, often report higher productivity and productivity growth than the average of the economy, accounting for the vast majority of research-driven innovation as reflected by patenting and formal R&D spending.²⁰ So ideally a firm that trades is also doing some manufacturing and R&D within the country.

Local firms that contribute to the local industry are often responsible for employment (new jobs). You need a healthy mix of both types of firms in a competitive cluster. It is important to also see who are the main customers in the domestic market. Ideally you'd like it to be a healthy mix of government and private sector (if business to business).

(iii) Identify the minimum number of startups you need for a healthy ecosystem:

Ideally a cluster should have a minimum number of startups for its long term survival. For example, Toronto states their ambition is to attract 300 startups in space technologies,²¹ Taiwan wants to foster 100 startups in AI.

In addition to attracting startups, policy makers must look at barriers to entry. A study found that a one percentage point decline in the entry rate leads to 1 to 2 percent- age point drag on local annual productivity growth.²² Data from EU and USA indicate that 20% of locations that by design are designated strong clusters account for between 40% and 70% of all employment and wages in a given cluster category.²³

- ▶ How many startups operate in the cluster?
- ▶ What are the systematic barriers for startups to set up, grow and innovate in your cluster?
- ▶ What is the minimum number of startups you need to attract for a healthy ecosystem?
- ▶ How many startups are trading?
- ▶ How many startups are local?

(iv) Access where R&D is currently based

It is critical that you access where local R&D is done. Innovation happens across a range of organizations as shown below in Exhibit 3. Ensure that you have a mix of government, MNC, SME, Startup, R&D centers and Academia in this mix. While some may be directly related to the industry (vertical integrations - upstream or downstream), you may also have support services (horizontal integration).

- ▶ How much IP is being created?
- ▶ How much is funded by the government versus private sector?
- ▶ How many researchers are working in this cluster?
- ▶ How valuable is the IP in the world market?
- ▶ Is the IP leading to spillovers?

Exhibit 3: taxonomy of the globalization of innovation ²⁴

Categories	Actors	Forms
International exploitation of nationally produced innovations	Profit- seeking firms and individuals	Exports of innovative goods Cession of licenses and patents Foreign production of innovative goods internally designed and developed
Global generation of innovations	Multinational firms	R&D and innovative activities both in the home and the host countries Acquisitions of existing R&D laboratories or green-field R&D investment in host countries
Global techno-scientific collaborations	Universities and public research centres	Joint scientific projects Scientific exchanges, sabbatical years International flows of students
	National and multinational firms	Joint-ventures for specific innovative projects Productive agreements with exchange of technical information and/or equipment

Now we are ready to begin the actual analysis!

Step 1: Identify the key stakeholders (at least 25-50) .

Based on the information you have collected, now create a table like that in Exhibit 4, where you will place these stakeholders in Row 1, where S(n) indicates the names of various stakeholders. Ideally this should be a mix of stakeholders - universities, MNCs, non-profit research firms, training institutes, consultancies, service firms, large government entities, SMEs, startups. Use H (high), M (Medium) and L (Low) to indicate the firms/organizations strength in the activities mentioned. This will give you a visual mapping of strengths and weaknesses in your cluster.

Exhibit 4: Example -Analysis of Key Organizations in the Cluster

	S1	S2	S3	S4	S5	S6	...	S(n)
ICON								
Upstream or Downstream	UP	UP	DS	DS	DS	DS		DS
Knowledge	M	H	H	M	L	H		L
Interest	H	H	H	H	L	M		M
Resources	L	M	H	L	X	H		M
Local Alliance	H	M	M	H	L	L		L
International Alliance	H	H	L	H	L	M		H
Power	M	H	H	L	H~M	H		M
Size	L	M	M	L	L	H		M

H: High

M: Medium

L: Large

Upstream: Manufacturing and Assembly and integration activities needed for production of goods and services.

Downstream: Those Operations and Services activities for the distribution of finished products.

Step 2: Code the organization based on your analysis using the following icons is seen in Exhibit 5

This will let you see visually whether you have a healthy mix of types of organizations in your cluster.

Exhibit 5: Stakeholder Classification Icon

	Government
	Semi-government
	Funding Entity
	Private entity
	Academic institute and/or R&D
	Branch/representation office
	Virtual private entity
	Virtual Academic institute of private entity
TEXT	Indicate program names which was developed in the UAE
	Other interconnected Cluster

Legend:

Shape: type of organization

Size: the size of the entity.

Step 3: Assess each stakeholder for the following factors

- i. Is it a contributor to upstream or downstream manufacturing OR a horizontal service/product provider? For an industry, backward linkages are directed towards suppliers; while the forward linkages are directed towards consumers. A forward linkage is created when investment in a particular project encourages investment in subsequent stages of production. A backward linkage is created when a project encourages investment in facilities that enable the project to succeed. ²⁵
- ii. Are they knowledge producers? Rank High (H), Medium (M) or Low (L). The assumption is that they also share knowledge - if not you may want to separate this as knowledge producers and knowledge sharers.
- iii. What is the level of interest they have in the policy making process and in the industry? Rank High (H), Medium (M) or Low (L).
- iv. What is the level of power they have in the policy making process and in the industry? Rank High (H), Medium (M) or Low (L).
- v. Do they have a large number of local alliances? Rank High (H), Medium (M) or Low (L).
- vi. Do they have a large number of international alliances? Rank High (H), Medium (M) or Low (L).
- vii. How large are these organizations (1) Employees (2) Revenue (3) Profits (4) IP? Rank High (H), Medium (M) or Low (L).

Step 4: Now based on this analysis - identify the anchor institutions for your cluster.

In some cases you have existing anchors, in some cases you might have to identify potential anchors. This means you will need to strategize what are the inputs for making them into anchor institutions.

Choose wisely as they fill a big role. Ideally make sure they represent different categories of stakeholder (s they are all not government or startups)

Step 5: Identify Gaps in your strategy (What is Missing?).

Brainstorm and put this on a Strategy board. Form the existing anchor companies what strategies/policies can be implemented to help them develop more? What categories are missing – what policies and strategies can be created to help them join the cluster?

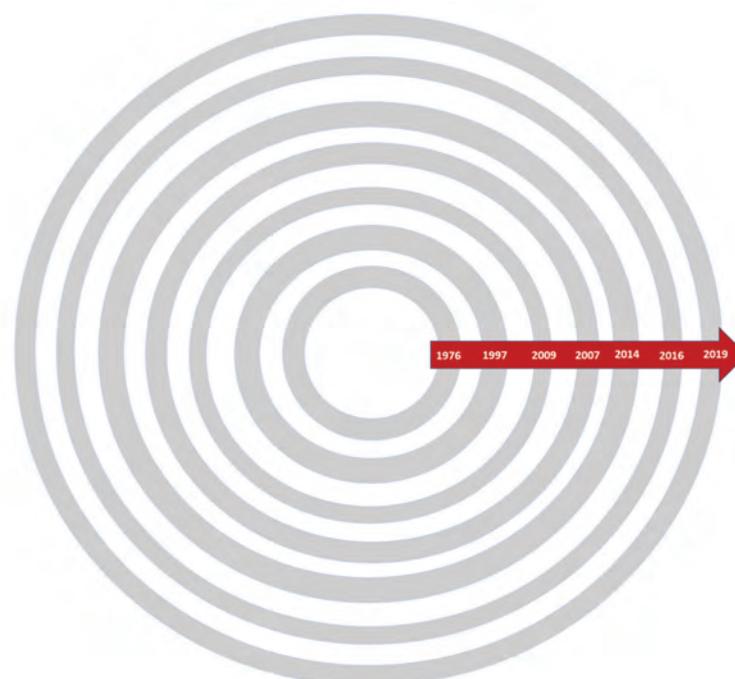
Stage 2: Historical development of the cluster

It is important to understand the historical development and progress of any cluster. This helps in tracking spin-offs, mergers and acquisition, sales/funding relationships (that support the growth of the cluster), knowledge movement and talent movements. It can support policy makers in making informed decisions on how to move forward with the development of the cluster, and whether the cluster was a rebirth from an existing cluster or is currently declining. In the image below, each ring represent a time frame, starting from the middle to the edge. Based on the establishment date, entities are placed into each ring with the corresponding timeframe. Merger and acquisitions of companies are represented by arrows into a new time ring.

Step 1. Determine the time period for each circle (10 years, 5 years, 2 years).

A good way to determine the time period of an organic cluster is to use the anchor institution as a baseline. The historical timeline is best represented as shown in Exhibit 6. The arrows show the mergers, acquisitions and spinoffs of new firms with time. This analysis will give you a visual understanding of inter-connectedness or linkages or networks of the cluster. Draw the rings and set a timeline (see Exhibit 6). This is for the local/national level.

Exhibit 6: Historical Representation of the Cluster



Step 2. Take the firms identified in Exhibit 4 (S(n)) and the legend identified in Exhibit 5.

Ideally write the firm name in the icon (see example, Exhibit 7).

Clearly write the characteristics or assumptions next to it.

Exhibit 7: Example

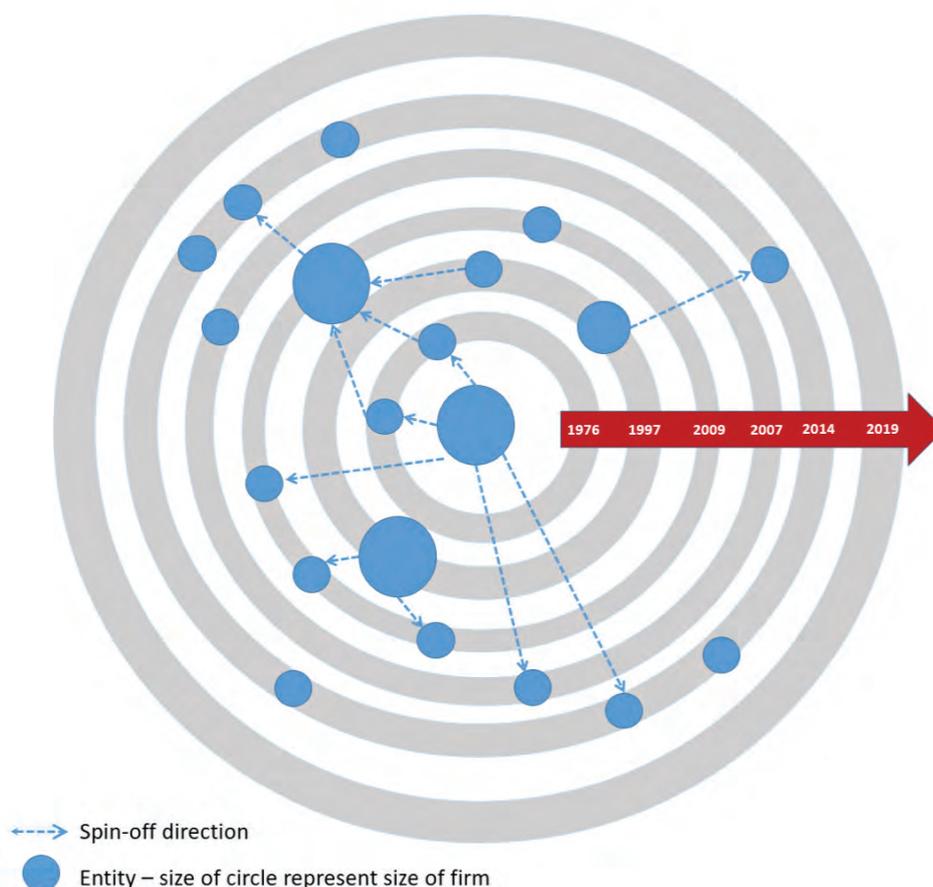


GxB represents a semi-government entity, its size depicts its budget since it is not revenue generating.

Step 3: Arrange the firms along the historical timeline.

The oldest firm (ideally should be an anchor) should be in the centre. Ideally it should be a large MNC (hopefully of national origin or at least with an R&D office based in the cluster), an academic institution or a government institution. It will not be an SME or a start-up (see example, Exhibit 8). The other firms will be arranged around the anchor firms. Ideally cluster firms that have relationships with each other are closer to each other for Step 4.

Exhibit 8: Arrangement of Anchor firms along the Historical Timeline



Step 4: identify the relationships between stakeholders

Connect the various stakeholders with arrows (see Exhibit 9). The arrow points in direction of the spillover (that is A → B means A gives resources (money, time etc) to B. The money could be for sales, or funding. Funding agreements have a different icon. Virtual organizations are not based physically in the cluster but maybe important in the running of the cluster. For example - an export portal dealing with a market may be an important part of the cluster to encourage international sales.

Exhibit 9: Icons for Relationships

TEXT	Indicate program names which was developed in the UAE
	Spill-over direction
	Funding Agreement is involved
	Digital relation

Legend:

Arrow direction indicates the direction of influence between the firm A B means, A is influencing B

Thickness of the arrow indicates the volume of spill-over and strength of relationship.

A cluster is enclosed in a dotted circle which indicate a boundary

Step 5: Gap analysis

This exercise is a visual one. Look at the historical mapping you have done and see the checklist below. It will give you an idea of the healthiness of your cluster. Look at Exhibit 10. What is missing – put this on your brainstorming board.

- ▶ Is there a healthy relationship between players (free moving of talent, money, spinoffs?)
- ▶ Is the relationships showing synergy (do they reinforces each other and is the competition healthy to help the cluster grow in the competitive market or is it unhealthy competition?)
- ▶ How many new startups are being funded?

Exhibit 10: Health Cluster Initiatives

A Brookings report ²⁶ found that the most successful cluster initiatives are:

1. focused on establishing a robust ecosystem, not quick job gains
2. were initiated by the private sector - industry-driven, university-fuelled, government-funded
3. the most successful and potentially transformative cluster initiatives are in regions willing to stake a claim to a unique and legitimate strength (calculated bet)
4. championed by passionate, dedicated leaders

Stage 3: Identify the cluster life-cycle stage

Clusters are very fluid and dynamic, often evolving over time where the driver is innovation and collaboration, contributing to economic growth. To create a strategy, you need to know where you are and where you want to be. There are four stages of a cluster life-cycle which ideally needs different policy measures to help it evolve ²⁷.

Step 1: identify Stage of Cluster Lifecycle

This stage of analysis is to identify which stage of the lifecycle you are in and which policies you may have to focus on in addition to the ones you have identified before.

Cluster Lifecycle Stage: Emerging

Activities within a cluster, at this stage, do not have any critical mass, no economic impact nor strong relationships. The cluster is not recognizable and consists of firms that are on the trajectory of future development, and considered ahead of their time. Therefore, there is a high demand for R&D activities that might require funding.

Cluster Lifecycle Stage: Developing

Activities are more noticeable with rising profitability, and cluster boundary is more visible. The driver of economic progress in this stage is the agglomeration economies which creates positive externalities and spill-overs. The agglomeration economies and anchor firms drive the spin-off rate higher, also creating new employment opportunities. The level of heterogeneity of knowledge is high, which encourages interdisciplinary backgrounds and innovation.

Cluster Lifecycle Stage: Maturing

In this stage, the boundary of the cluster is well defined and related to a particular business. The level of competitiveness in the cluster is high, hence the rate of firms entering the cluster is lower than the previous stage which cause a lower growth rate as well. The heterogeneity of knowledge is low and high specializations is often seen.

Cluster Lifecycle Stage: After maturity

This is a cut-off stage leading either to the collapse of a cluster (decline), or its transformation. The collapse can be triggered when a cluster becomes unconsciously incompetent and is competitively not viable or when new opportunities present themselves and they are able to pivot.

a. Decline:

The level of spill-over and innovation is low and the cluster is shrinking, in terms of employment opportunity and number of firms. The cluster size is decreasing due to the exit of firms to more competitive clusters. The cluster cannot adapt to the disruptive effect of changes and fast-changing market needs, especially since the knowledge base is too homogenous and the cluster is over-specialized. It is also known to have strong dependency on non-firm entities such as government for compensatory support and focus is increasingly on lobbying.

b. Transform:

This stage starts during the early decrease of cluster size, and then the cluster re-gains attractiveness through transforming and renewal to a developing stage again.

The below (Exhibit 11) is an assessment tool of a number of indicators that are used to identify which stage the subject cluster is in and can be used as a guide:

Exhibit 11: Factors determining Cluster Life Cycle

	Indicator	CLC stages				
		Emerging	Developing	Mature	Transforming	Declining
Innovation and entrepreneurship	R&D Investment	High	Mid/Low	Low	High	Low
	VC Investment	High	Mid/Low	Low	High	Low
	Start-up birth rate	High	Mid/Low	Low	High	Low
Size	Number of Employees	Low	Medium	High	Medium	Mid/Low
	Number of firms	Low	Medium	High	Medium	Mid/Low
Spatial significance	Specialization	Low	Medium	High	Medium	Mid/Low
Cooperation	Intensity of network activities	Low	Medium	High	Medium/high	Medium
Variety	Heterogeneity of knowledge	High	Mid/High	Low	Medium/High	Low

Source: Pronesti, G. (2018)²⁸

Step 2: identify Factors for Transformation

Based on the stage of the lifecycle, you can now identify factors for transformation. Clusters do not leapfrog stages though the rate of growth can be accelerated.²⁹ The main areas are

1. Cooperation
2. Entrepreneurship (startups, finance, talent)
3. Innovation (R&D, market innovation, talent etc)
4. Variety of startup organizations (downstream, upstream and with horizontal and vertical linkages)
5. Size
6. Spatial Significance

Step 3: Identify some policy interventions depending on the stage you are in

The recommended policies for each stage are mentioned below

Emerging Stage: Recommended policies

There might be a requirement for government intervention through creating investment plans and creating attractive business environment regulations: employment laws, transfer, intellectual properties, commercial company laws, company incorporation laws, tax, residency regulations and visas.

Developing Stage: Recommended policies

with rising profitabilities and greater opportunities, policies need to focus on ease of business, knowledge transfer, and policies to facilitate employment of talent. Market development strategies are needed at the domestic and international level (trade policies and through international diplomacy and partnerships).

Maturing Stage: Recommended policies

Government intervention might be required on the operation and services level (downstream). Innovation is still needed at the service level which will be driven by competition. Since the knowledge at this stage is very homogenous and specialized, an emergence of experts can be noticed. Governments may tap this opportunity by encouraging exports of services and knowledge internationally.

After maturity clusters: Transform Stage: Recommended policies

Governments should consider the following factors to impose intervention, if needed, in order to renew a cluster which is at the edge of declining:

- Ensure the presence of inter-cluster activities by creating demands from other clusters and encourage the positive externality effect. The knowledge and spill-overs are heterogeneous to firms in other clusters, which may increase innovation rates.
- The creation of an entrepreneurial environment and incubators for new innovative novel ideas.
- Facilitate access to funds, through SME banks and development of reforms related to getting credit indicators and insolvency regulations.

Step 4: Gap Analysis

You might have identified some additional gaps. Add to your brainstorming list.

Stage 4: Identify the Cluster Type

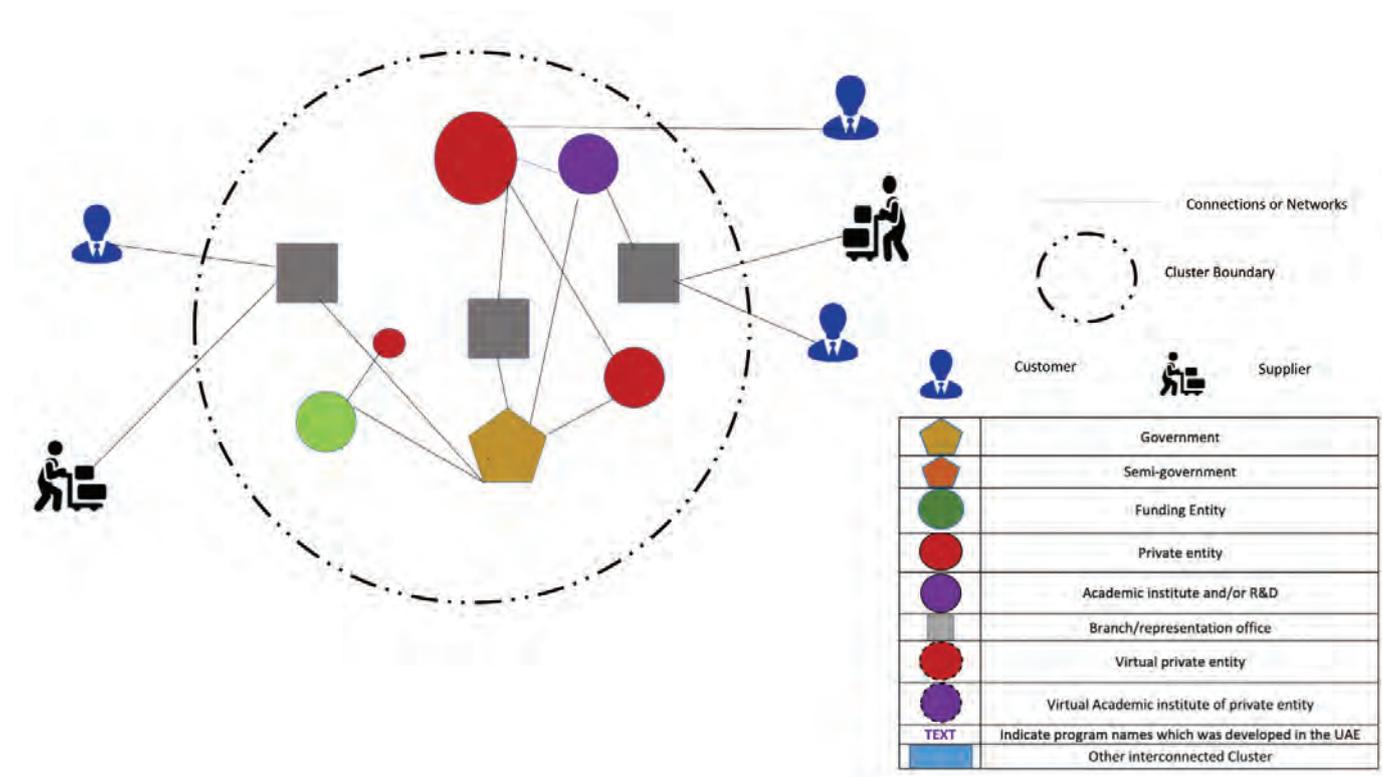
Understanding the type of cluster is important to make informed strategic decisions related to the nature of activities, relationships and spill-overs, influence, customers and other behaviours. Many scholars study the classifications of clusters.³⁰ In this tool, four categorizations are identified based on the cluster structure. Each has unique characteristics:

Step 1: Identify the type of Cluster Model³¹ you operate

1. The Marshallian model:

It is characterized by the stable and well-structured inter-firm relationships between many types of stakeholders who share a geographic proximity. The cluster consists of equal-size local firms, and public and private actors, with high strength bi-directional interfirm cooperation and co-location. This is a healthy place to be for a cluster.

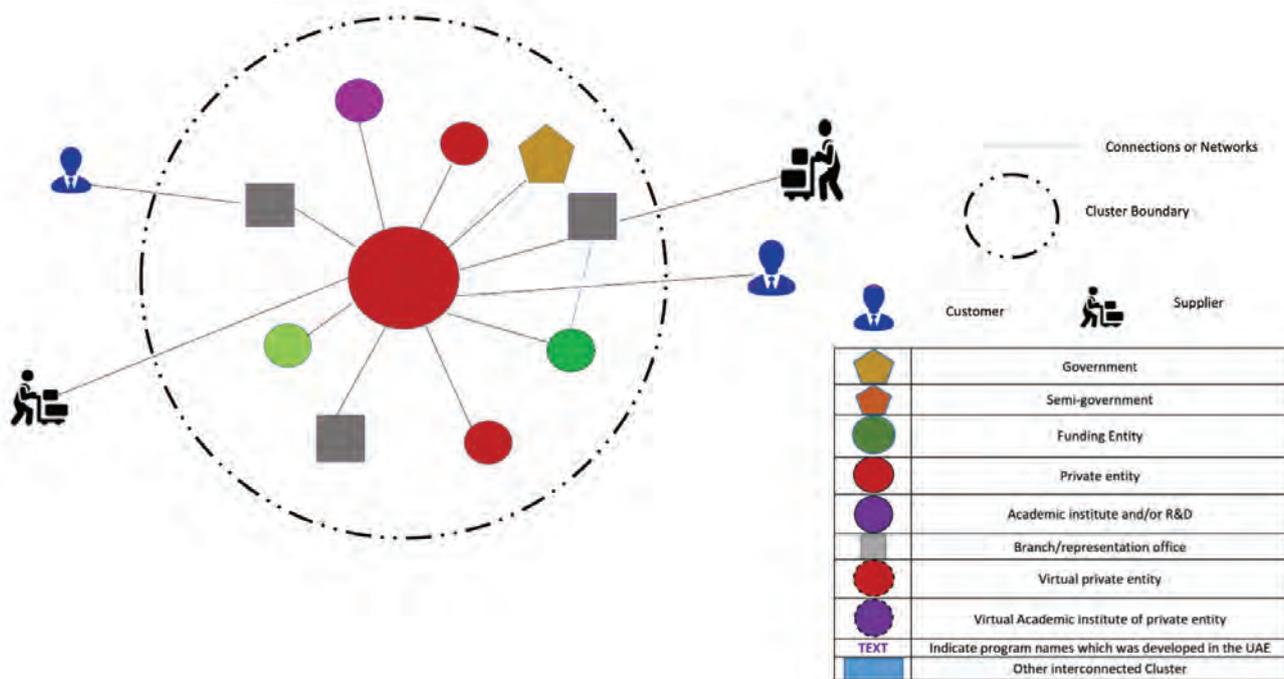
Exhibit 12: The Marshallian Model³²



2. The Hub and Spoke model:

This model is characterized by being a very dynamic cluster that consists of a centralized large firm, acting as a hub, which interacts with small firms in the cluster, as spokes. The centralised large firm, the Hub, has an established and significant market power where mostly all spokes are directly connected to the Hub, and the Hub interacts with firms out of the cluster. Long-term, it is difficult to sustain and a high risk for the cluster strategy.

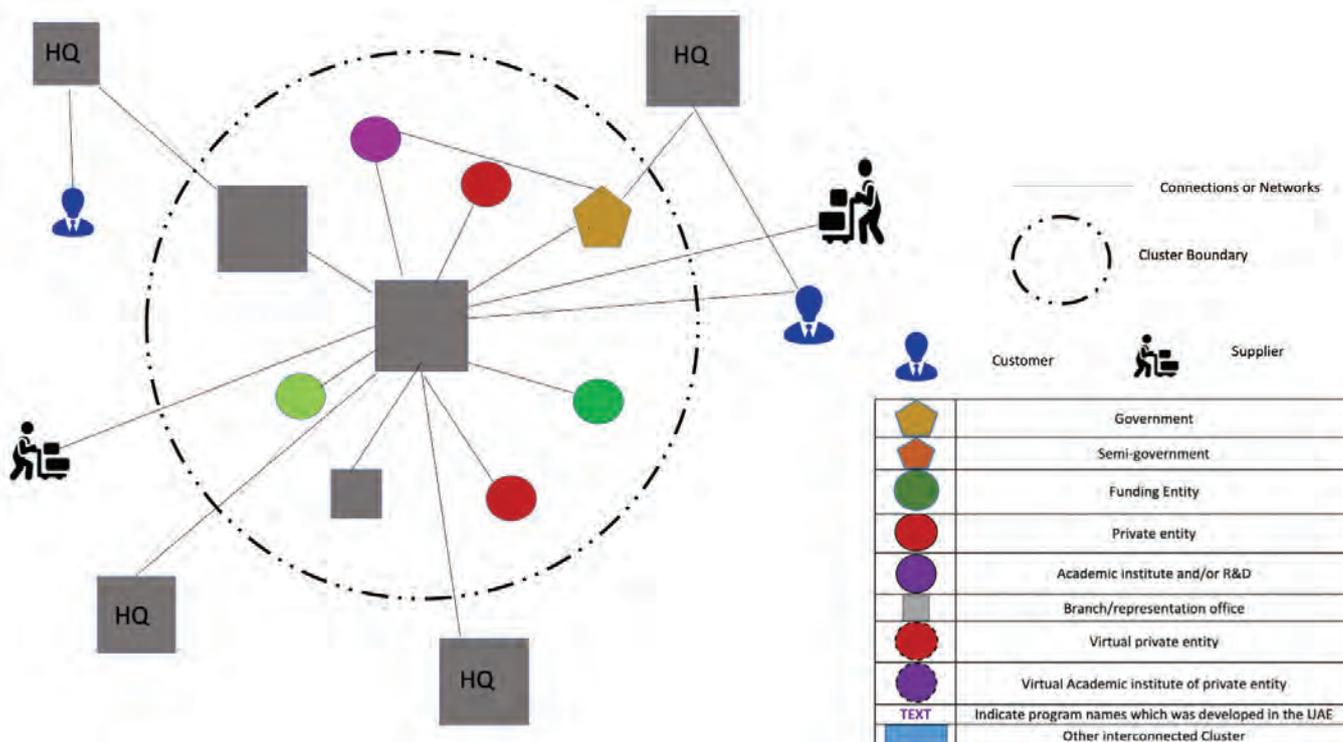
Exhibit 13: The Hub and Spoke Model ³³



3. The Satellite Model:

This cluster model consists of high concentrations of branch offices of large firms out of the cluster, which influence the local firms in the cluster. The relationship between entities in the cluster barely exists, however, a quasi-linear relation is often seen between the cluster insiders and the outsiders. This may be a reality when the cluster acts more like a sales or logistics center, reexporting orders or collating sales. There is no real R&D happening here. The objective for policy strategist is to get the cluster to become independent and grow. One method is to have policy interventions to attract R&D and manufacturing and encourage inter-firm linkages.

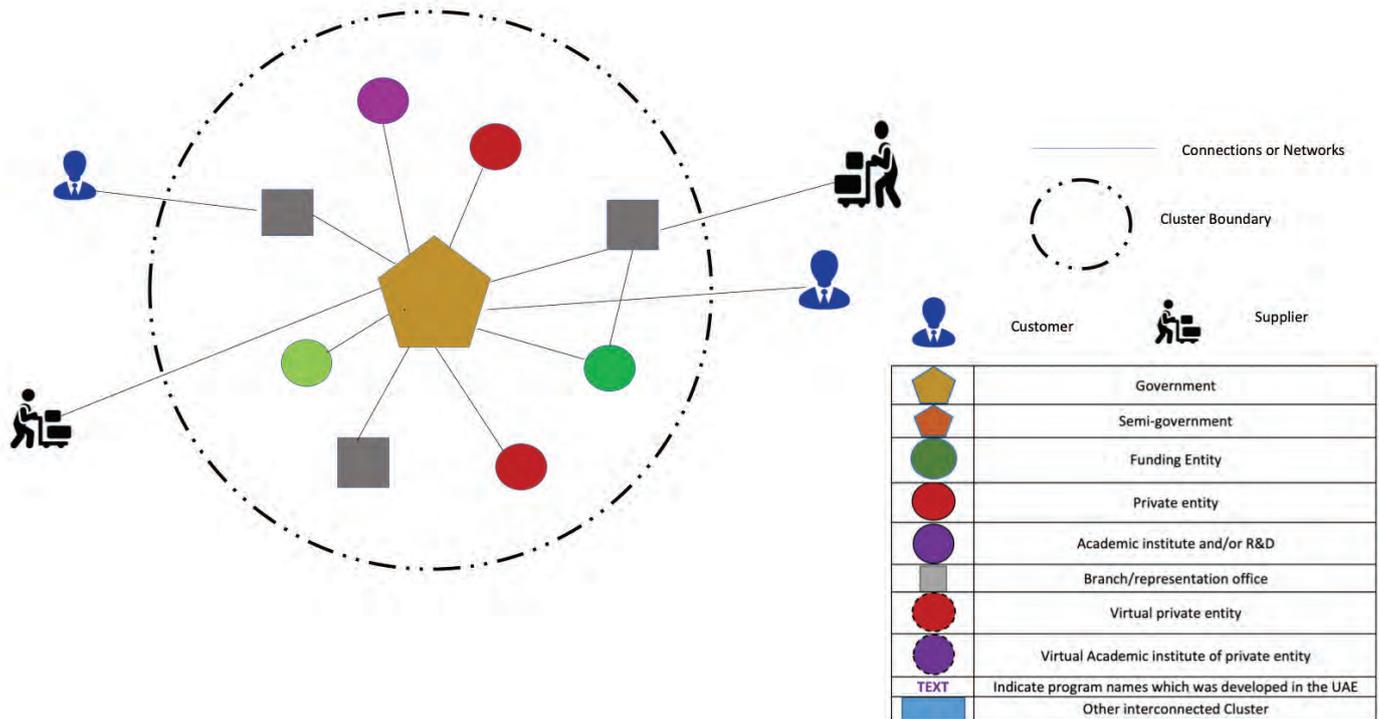
Exhibit 14: The Satellite Model ³⁴



4. The State Centered Model:

This type of cluster is centered on a government, or non-profit organization, where small firms are gathered around and surround the cornerstone. The cluster is populated by state firms. This works in highly sensitive sectors or long-term strategic sectors (space is one example). The problem always is long term sustenance of the cluster and hence you require a clear public value, R&D and export strategy.

Exhibit 15: State Centered Model ³⁵



Stage 5: Benchmark

For this stage of analysis we look at the international landscape. Look the international clusters you have identified. Take one or two countries and use your information to do an analysis with what data you have on the Anchor Institutions, Lifecycle stage and type of cluster model.

Step 1: Compare you cluster with your international benchmarks (take the top 20 firms of your benchmark and map)

1. Anchor Institutions and relationships
2. Lifecycle
3. Type of Cluster Model

Step 2: Where do You want to be? Therefore what gaps are there to getting there? Add to the list.

Based on the comparative analysis, you have a further idea of what is missing.

Step 3: Gap Analysis

Based on your analysis: What is missing? Add this to your brainstorming board.

You are now in a position to work on a strategy intervention.

Stage 6: Deep Insights from your potential Cluster Anchors

With this information as a background, invite a group of 20 stakeholders (a mix of policy makers, cluster anchor tenants and SMEs). Work on exploring pain points on issues of why the barriers you have identified exist. These can be in terms of spillovers of talent, money, knowledge, IP and sales. If the cluster is a State-Centered Model or in the decline, - this is better done through interviews.

This will give you an index of pain points that you can now map with best practices from the benchmarks for policy interventions. Check your assumptions through a focus group with the targeted group. This will allow you to prioritise policies. From now onwards, you can collect granular data on your cluster and conduct cluster mapping exercises³⁶ to compare performance of the industry, employment, trade, domestic market growth, and help highlight regional specialization.

Additional Material

Below are example of popular cluster tools in the US and EU to get you started:



Cluster Portal is used by Select USA, a part of the US International Trade Administration, to attract foreign investors. The data generated for the portal has enabled research that has led to the adoption of cluster-based programs, like the SBA cluster program. Available: <https://clustermapping.us/cluster>

1 United States:

The cluster map in the US is used by government entities, private entities and policy makers, where data is publicly available to conduct cluster analyses to measure competitiveness. The US



2 European Union:

There exists two main cluster tools that generate data for the European Union. It is often used by industry for the process of creating smart specialization. These tools:

- European Cluster Collaboration Platform: <https://www.clustercollaboration.eu/>
- Cluster Observatory: <http://www.clusterobservatory.eu/>



References

1. Szulanski, G. (2003). Sticky Knowledge: Barriers to knowing in the firm. Available at: https://books.google.ae/books/about/Sticky_Knowledge.html?id=dAiOieL-uZEC&printsec=frontcover&source=kp_read_button&redir_esc=y#v=onepage&q=sticky%20knowledge&f=false
2. Porter, M. E. (2000), Location, Competition, and Economic Development: Local Clusters in a Global Economy. *Economic Development Quarterly*, 14 (1), 15-34.
3. Ketel, C. (2017), Cluster Mapping as a Tool for Development, Institute for Strategy and Competitiveness Harvard Business School.
4. Roelandt, T., den Hertog, P., van Sinderen, J., and B. Vollaard. (1997). "Cluster analysis and cluster policy in the Netherlands", Paper presented at OECD Workshop on Cluster Analysis and Cluster Policies, Amsterdam, Netherlands, 9-10 October.
5. Porter, M.E. (1998). "Clusters and the New Economics of Competition," *Harvard Business Review*, November-December.
6. EU (2019), A vision for the European industry until 2030. European Commission. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs.
7. EU (2020), Internal Market, Industry, Entrepreneurship and SMEs, Available: https://ec.europa.eu/growth/industry/policy/cluster_en
8. OECD (2011). New sources of growth: intangible assets. Available: <http://www.oecd.org/sti/inno/46349020.pdf>
9. Feser, E. J. (1998). Old and new theories of industry clusters. *Clusters and regional specialisation*, 18, 40.
10. Ibid.
11. Porter, Michael E. (1990), *The Competitive Advantage of Nations*. Free Press: New York; Ketels, C. (2017). "Cluster Mapping as a Tool for Development", Institute for Strategy and Competitiveness Harvard Business School. Available on: https://www.isc.hbs.edu/Documents/pdf/Cluster%20Mapping%20as%20a%20Tool%20for%20Development%20_%20report_ISC%20WP%20version%2010-10-17.pdf [Access on: 29 March 2020]; Franco, M. & Esteves, L. (2020). Inter-clustering as a network of knowledge and learning: Multiple case studies. Available on: <https://www.sciencedirect.com/science/article/pii/S2444569X18300714?via%3Dihub> [Access: 29th March 2020]; Pronesti, G. (2018), *Life Cycle of Clusters in Designing Smart Specialization Policies*. Springer. Available on: <https://ebookcentral.proquest.com/lib/mbrsg-ebooks/detail.action?docID=5608263> [Access on: 2 April 2020]
12. Archibugi, D., Filipetti, A. (2015). *The Handbook of Global Science, Technology, and Innovation*, John Wiley & Sons. Available on: <https://ebookcentral.proquest.com/lib/mbrsg-ebooks/detail.action?docID=4038218> [Accessed on: 27 March 2020]
13. Ketels, C. (2017). "Cluster Mapping as a Tool for Development", Institute for Strategy and Competitiveness Harvard Business School. Available on: https://www.isc.hbs.edu/Documents/pdf/Cluster%20Mapping%20as%20a%20Tool%20for%20Development%20_%20report_ISC%20WP%20version%2010-10-17.pdf [Accessed on: 29 March 2020];
14. Ketel (2017). Ibid.
15. UN Statistics: The International Standard Industrial Classification of All Economic Activities (ISIC), Available: <https://unstats.un.org/unsd/classifications/Econ/ISIC.cshhtml>
16. Donahue, R., Parilla, J. and McDearman, B. (2018). Rethink Cluster Initiatives. Brookings, Available: https://www.brookings.edu/wp-content/uploads/2018/07/201807_Brookings-Metro_Rethinking-Clusters-Initiatives_Full-report-final.pdf
17. Donahue et al (2018). Ibid. Delgado, M., Porter, M. E., & Stern, S. (2010). Clusters and entrepreneurship. *Journal of economic geography*, 10(4), 495-518.

18. Phlippen, S., & van der Knaap, B. (2007). When clusters become networks.
19. Chhair, S. & Newman, C. nd. Competition, and Spillover Effects: Evidence from Cambodia. Africa Growth Initiative at Brookings. Available: https://www.brookings.edu/wp-content/uploads/2016/07/L2C_WP11_Chhair-and-Newman-1.pdf
20. Ketel (2017). Op. cit.
21. Kirby, J. (2018). Canada's next breakthrough is AI commercialization. MaRS, Available: <https://www.marsdd.com/magazine/canadas-next-breakthrough-is-ai-commercialization/>
22. Alon, T., Berger, D., Dent, R., & Pugsley, B. (2018). Older and slower: The startup deficit's lasting effects on aggregate productivity growth. *Journal of Monetary Economics*, 93, 68-85.
23. Ketel (2017), Op. cit.
24. Elaboration on Archibugi and Michie (1995), Op. cit.
25. Hirschman, A O, 1958, *The Strategy of Economic Development*. Yale University Press, New Heaven, CT.
26. Donahue, R., Parilla, J. and McDearman, B. (2018). Rethink Cluster Initiatives. Brookings, Available: https://www.brookings.edu/wp-content/uploads/2018/07/201807_Brookings-Metro_Rethinking-Clusters-Initiatives_Full-report-final.pdf
27. Pronesti, G. (2018), *Life Cycle of Clusters in Designing Smart Specialization Policies*. Springer. Available on: <https://ebookcentral.proquest.com/lib/mbrsg-ebooks/detail.action?docID=5608263> [Access on: 2 April 2020].
28. Pronesti, G. (2018). Ibid.
29. Pronesti, G. (2018). Ibid.
30. Cruz and Teixeira identified two approaches for cluster classifications which are: based on spatial proximity elements, and the other one is based on knowledge/network elements.
31. Pronesti, G., (2018). Ibid.
- 32-35. Adapted from Pronesti, G. (2018). Ibid.
36. Ketel (2017). Op. cit.

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