Pakistan Journal of Humanities & Social Sciences Research
Volume No. 04, Issue No. 02 (December, 2021)

ISSN (P): 2663-9211 (E): 2663-922X
DOI: https://doi.org/10.37605/pjhssr.v4i2.187

Date of Submission: 14th Apr, 2021
Date of Acceptance: 21st Aug, 2021
Date of Publication: Dec, 2021

A QUEST FOR THE INDICATORS FOR PROFITABLE AND SUSTAINABLE INDUSTRIAL CLUSTERS IN DEVELOPING COUNTRIES -A CASE OF PAKISTAN'S INDUSTRIAL SECTOR*

Iffat Batool Naqvi*†, Mahvish Khaskhely‡ & Zahid Ali Memon§

Abstract

In the absence of a uniform industrial and cluster policy in developing countries like Pakistan, a framework for the identification of viable clusters (with a balance of profitability and Sustainability) in an economy is vital to focus resources and policy recommendations on them. This research identified indicators based on a literature survey that define the viability of industrial clusters and prioritized the indicators based on experts' recommendations through the Delphi technique with 0.5 and 4.00 cut-off points for Level of Consensus and Weighted Average respectively. The results reflect that involvement in child labor, environmental impacts of firm's operations, and corroborating with corrupt regimes were considered the most important indicators of a firm's viability considering the sustainability dimension whereas all the measures of centrality and linkages of firm with various actors were rated highly by the respondents followed by

* This research is a part of INGSA research Associate 2019, grant program. https://www.ingsa.org/grant-programme/2019-research-associates/iffat-batool-naqvi/
† *Corresponding Author. iffat.naqvi@faculty.muet.edu.pk Mehran Institute of Science, Technology and Development, MUET, Jamshoro.
‡ mahvish.khaskhely@faculty.muet.edu.pk Mehran Institute of Science, Technology and Development, MUET, Jamshoro.
§ zahid.memon@faculty.muet.edu.pk

innovation and R & D dimensions which were also considered critical. Finally, the limitations and de-limitations are discussed and policy recommendations are made.

Keywords: Industrial Clusters, Delphi Technique, firm's viability, lucrativeness, Sustainability dimensions.

Introduction

Industrial clusters definition by Porter (1998) and Sonobe and Otsuka (2014) have emerged from the concept of a comparatively static notion of Industrial districts driven by Marshall's theory, (1980). Therefore, they both share a strong resemblance with each other indicating common roots of geographical proximity of related and complementary firms and social embeddedness. However, industrial clusters which are an agglomeration of industries that produce either similar (in case of similar products) or complementary (suppliers or support firms) products meanwhile localized in a particular area, draws heavily from the research on regional and global value chains, and competitive advantage and externalities (Becattini, Bellandi, & Propris, 2009). Industrial clusters have been under study by policymakers and researchers because their role is accepted as the source of poverty eradication (Hayami, 1998; Sonobe & Otsuka, 2006; Nadvi & Barrientos, 2004) especially in the context of developing countries. Competitive advantage emerges from the proximate firms that form the cluster and become the engine of economic prosperity by enhancing the local employment, production, innovation, and export for the country or region (Bekele & Jackson, 2006).

The phenomenon of clustering emerged from developed nations like the United Kingdom and the United State of America. For instance, Manchester in the United Kingdom is known for its textile industry cluster, the United States has a shipbuilding industrial cluster in Glasgow, and Information Technology firms are successfully clustered in Detroit and more importantly in Silicon Valley. Such successful agglomerations are emulated by the developing world like Bangladesh, China, and Pakistan in the case of the Textile industry cluster. In fact, in China, approximately 19 industrial clusters are identified which are related to the textile industry absorbing 1.81 million people. (Long & Zhang, 2011). Similarly, India has successfully followed the IT cluster example from Silicon Valley and has IT clusters in Bangalore, Pune, and Hyderabad among other cities. This has resulted in its significant contribution (55%) to global IT services (Rao, 2016).

Industrial Cluster Status in Pakistan

At the time of independence, the country was feeble in terms of infrastructure and industrial base. The manpower lacked technical expertise,

the machinery was either absent or faulty and old. There was a lack of regulatory and support institutions. However, Pakistan was blessed with natural resources and an agrarian economy and had few cotton textile, sugar, and jute mills and tea processing facilities, and cotton and jute were even exported in raw form to be processed abroad (Wizarat, 2002). Therefore, the policymakers in the government felt the need to promote industries and suggest policies suited for infant industries along with implementing favorable trade policies ushering the developmental decade in the 1950s which resulted in improvement in GDP and export. This trend is still prevalent in the country despite its slow pace (Mahmood, Ahmed, & Jaffri, 2016). It has some labor-intensive yet low technology industries including textile, knitwear, plastic items and toys, surgical equipment, and sports goods which promote employment in the country and help in the lowering of poverty (Sonobe & Otsuka, 2006). Among all these industries and clusters, garments and textile is the biggest sector generating low-cost employment (Memon, 2010).

The Inverse Relation between Industrial Clusters in Developing countries & Poverty

According to Nadvi & Barrientos (2004), industrial clusters help in poverty alleviation in developing countries both directly and indirectly. The direct impact comes from the generation of income and employment that clusters initiate which improves the health, well-being, and quality of lives of the workers/ employees engaged in the cluster and indirect impact comes when through the improvement of GDP and local and regional development. It is noteworthy that some clusters have a higher propensity to assuage poverty than others like the manufacturing and labor-intensive clusters, micro, small and medium enterprises employing women, and unskilled labor. This happens because agglomerated economies create a pool for resources, skills, infrastructure, and technologies that are beneficial for consumers, employees, and producers so clusters become a win for all. With regards to cluster stages, the clusters that evolve from the poor incipient stage to the advanced stage have higher evidence of direct benefits like employment generally through competition, collaboration, joint actions capacity building, and technological spillovers like in the case of Sialkot, Brazil, Mexico, and India. However, studies show that in the upgrading process, women and unskilled people lose.

The report titled ―Industrial Clusters and Poverty Alleviation‖ discusses the concept of cluster mapping including including the mapping of cluster‘s value chain identifying the process of production step by step marking the various stakeholders and support institutions as well the poverty mapping of those identities in the context of gender, ethnicities, and religion. The mappings are done through a mixed-method approach and the findings show the need for policy intervention to enhance the well-being of poor

entrepreneurs and workers in a cluster keeping into consideration the cluster dynamics and its stage for instance the incipient cluster has different and higher needs for intervention for poverty alleviation as compared to developed clusters.

Research Problem

Development is like throwing a ‗pebble in the pond', creating ripples. It needs a vision, a strategy, a policy, a plan, and schemes. One way to spur economic prosperity is to encourage industrial clusters in the region. The economic rationale of clustered development is that investment should be done in strategic sectors, concentrated geographically, since the provision of physical or social infrastructure and services to small, isolated, or dispersed settlements is highly cost-inefficient and the same is the case with industries. But cluster lifecycle suggests that like cities and regions among most other entities, all clusters are not meant to be developed through financial and social investments. So, it is important to propose a framework for the identification of viable and sustainable clusters in an economy with the consultation of industry and policy experts, so that most resources and policy recommendations could be focused on them instead of trying to develop all the industrial clusters without any discretion.

Aim and Objectives of the Research

The aim is the development of a framework of indicators to measure the viability of industrial clusters to help policymakers decide which industrial clusters to promote. This viability framework will be applicable industry-wide with fewer modifications to all micro, small and medium industries individually as well as in agglomeration.

In the case of Pakistan, the aim is to develop a scorecard of the attributes which will help develop and nurture the industries and then evaluate the industries on its basis. There are two Research objectives that will help in the achievement of the aforementioned aim:

1. To identify and accumulate the different constructs/indicators based on a literature survey that will define the viability of the industrial cluster.
2. To ascertain additional indicators based on expert recommendations.
3. To assign weights to the indicators/variables on the basis of experts' recommendations in the form of a scorecard with the weight assigned to each factor (industrial cluster viability scorecard).

Limitations of the Study

This research gives a futuristic glimpse of how the industries and clusters should be analyzed and while providing an aerial view of what can be the performance criteria of successful industries, the study does not deal with a specific case (industry or cluster) where the indicators were applied to evaluate them.

Secondly, Delphi as a technique is subjective by nature, the fact which is mitigated by taking more experts from academia as compared to the practitioners (firm owners) to mitigate the effect of self-interest seeking responses.

Research Contributions

This study makes a valuable contribution in creating a viability framework or criteria that help the policymakers to judge the performance, lucrativeness, and potential of an industrial cluster that is applicable to micro, small, medium, and large industries individually and in cluster form. Moreover, the scorecard or checklist will remain relevant industry-wide however weightage of indicators might change based on the type of industry. Moreover, in the absence of an industrial cluster policy at the national level as reported by (Subohi, 2018), Pakistan‘s share in world export has plummeted from 0.16 in the 90s to a meager 0.12 currently and this figure is alarming when compared to other developing economies in Asia like Vietnam and Bangladesh as suggested by Pakistan Business Council (PBC). Therefore, compiling the set of indicators will guide the policy drafts by providing all the factors of industries and industrial clusters which when improved, will lead to the prosperity of the industries and the clusters.

Conceptual Framework

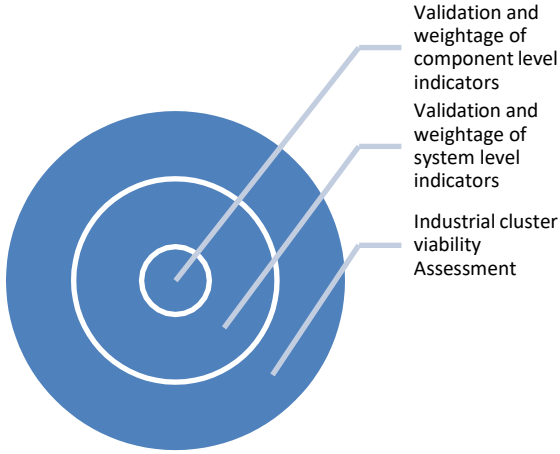

Figure 1: Conceptual Framework
Source: Authors‘ compilation

Component level indicators deal with the specific firm whereas system-level indicators deal with the viability dimensions related to clustered industries. They can be treated separately in case of analyzing a single firm

or industry or both parts can be used to evaluate the viability of those industries agglomerated in a specific region.

Literature Review

Although the concept of industrial clusters is around for more than a century, the researchers have yet to come up with a unified definition of the cluster since theorists from different schools of thought have utilized this concept from divergent viewpoints ranging from industrial districts, agglomeration economies supported by Marshall's agglomeration theory, knowledge spillovers, competitive advantage and dynamic externalities which is precisely the reason of its difficulty in measurement as an empirical concept as suggested by Bekele & Jackson (2006).

Industrial Clusters in Developing Versus Developed Countries

For the developing countries, initial research on industrial clusters (Schmitz and Nadvi, 1994; Schmitz, 1995) has been on their presence, growth, and how they are different from industrial clusters in developed countries. In their attempt to understand the development of clusters, they argued that industrial clusters in the developing countries have different trajectories since those belonging to developing countries exhibit the characteristics of Industrial districts having small firms at their nascent stage of performing and copying the technologies from the well-established clusters of the developed world (Caniels and Romijn, 2003). Similarly, inter-firm communication and coordination, the linkages with the support institutions are inadequate. The same is the case for localized interactive learning which is limited, experiencing _casual' agglomeration with occasional horizontal linkages, limited cooperation, and weak local institutions.

In the context of Pakistan, despite the presence of a wide range of industrial clusters, only a few are studied. Nadvi (1996) did his seminal work on the Sialkot surgical instrument and later work on the sports goods cluster of Sialkot. Caniels and Romijn (2003) conducted research on the farm equipment manufacturer cluster located in Daska[**], Punjab Lund-Thomson (2013) studied the Kasur tanneries cluster from the perspective of CSR and environmental degradation. These limited studies were conducted only from the narrow perspectives of international linkages, technological capabilities, and CSR, and all these are conducted from the case studies of Punjab province. While, in the case of Sindh province, no research is ever conducted to assess the potential of industrial firms in the geographically

[**] Daska, is a city with a population of around 501,000 in the Punjab province of Pakistan.

wide region of Sindh. In the context of developing countries (Nadvi, 2016), there is an acceptance of the need to design policies that nurture and support cooperative relationships among groups of firms and other agents.

Cluster mapping describes the quantitative measurement of the presence of clusters across regions within a country or group of countries. It is based on common definitions that identify cluster categories as groups of industries that empirically tend to be connected through localized spill-overs and linkages (Ketels, 2017). According to previous research, the cluster mapping method proceeds in three steps: First, cluster categories have to be defined based on some evidence of local relatedness across narrow industries. Second, these definitions are then applied to translate existing industrial statistics into a cluster mapping data set that can be further analyzed. Third, the cluster mapping data set is analyzed to derive insights into the role of clusters in the country‘s economy and competitiveness. This research raises the argument that industrial clusters in developing countries, in general, are agglomerated due to natural resources, specialized local and family businesses. These clusters are dealing with medium and low technologies and are involved in traditional production techniques. Their input resources, processes, skills, and techniques represent unsustainable patterns. There is a need to add a variable of ―*Sustainability*‖ in order to map these clusters for their contribution to regional and national development.

There are two research rationales behind this cluster mapping tool, one is with a perspective of a dearth of empirical research data and the other is a policy perspective. First, there is a serious dearth of the assessment of the potential of the agglomerated firms in the context of developing countries, and the nature and factors of their agglomeration show different natures as compared to developed countries. Even some of the regions that are rich in natural resources and family businesses do not have basic demographic data of these regions. Therefore, traditional mapping tools, as devised by developed country research, cannot be applied. Secondly, the use of cluster mapping data provides evidence for proposing cluster policies at regional policies for sustainable industrial clusters. Currently, in their seminal work, Schot and Steinmueller (2018) describes the two frame of Science Technology, and Innovation policies in the historical context and proposed the third frame (see table 1). They argued that existing R&D and national systems of innovation frames for science, technology, and innovation policy are unfit for addressing the environmental and social challenges. They proposed there is a need for the third framework to open up the process of choice to all stakeholders, including marginalized actors, to provide them a voice and influence over what path are followed in research and its finding. Dutrient and Sutz (2014) also supported the need to work on sustainability and proposed the democratization of knowledge production.

Table 1: Frame of ST&I policies

Policy Frameworks	
Frame 1	Institutionalization of government support for science, Research, and Development with the assumption that this would result in productivity and growth while simultaneously aiding in the private provision of new knowledge.
Frame 2	Emerged in 1980, It received inspiration from Porter's competitiveness which is shaped by the National System of Innovation (NSI) for knowledge creation & commercialization: it included the development of links, and networks in a cluster and also enable entrepreneurship.
Frame 3	A modern thought which added the dimensions of existing social and environmental challenges pertaining to sustainable development goals and calling for change that is more substantial and transformative in nature.

Source: Schot and Steinmueller (2018)

Indicators for the Development of Clusters

Despite numerous studies on the cluster dimensions, there is a dearth of studies regarding indicators for cluster performance with the purpose of cluster development and evaluation over time. However, the policymakers want to know the performance of the cluster and the impact of interventions (DTI, 2005). There is a dearth of studies regarding evaluation and performance indicators for clusters and it is a relatively new topic. However, it is also because cluster performance or evaluation is tricky given the system characteristics and the continuous interaction within the cluster network. Along with quantitative indicators like economic performance which is easier to measure, there are some qualitative measures like social capital which are subjective in nature and difficult to measure.

There have been some studies conducted to establish a performance measurement system like the one conducted by Carpinetti, Galdamez, and Gerolamo (2008) on the basis of the balanced scorecard model. They have drawn a conceptual model taking multiple perspectives of performance like economic and social results (local gross product, workforce, and income), firm's performance (like measures related to growth and competitiveness in terms of financial and non-financial performance indicators) collective efficiency as well as the social capital. (measured by trust, cooperation, and collaboration among cluster members).

Davis et.al (2006) further refined the work of Michael Porter's cluster theory by asserting that it deals with the current condition and it needs to incorporate current performance as well. Therefore, they introduced cluster performance measures like Significance and Interaction which is actually the

diamond framework, and then introduced two other indicators like innovation and growth under the concept of dynamism.

Then there are other performance indicators for instance those that are identified through French ―Pôles de Compétitivité‖. The new factors that are discussed here include:

1. Research and Technology activity (Annual expenditures and employees involved in the projects selected by the cluster, coming from enterprises and public research organisms, number of projects selected, number of patents, Involvement of actors, exportations and national position, Ability to involve enterprises in the cluster Exportation and Position of the cluster in the national economy regarding its main field of activity).
2. Growth of the added value of clusters' (SME members compared to other SMEs of the same size and activity Global evolution of employment, especially SME)
3. Outcomes with respect to R&D projects, Infrastructures development, Skills development, Partnerships, International development, SMEs' development.

Criteria for the Development of Industry-Related Indicators

In order to identify and select the indicators for quickly assessing the industrial clusters; like in the case of identifying the indicators of sustainability, the authors like Bossel (1999), Veleva and Becker (2001), and Patlitzianas et.al (2008), discussed the reliability of the information like availability of valid and accurate data, which can be measurable and reproducible as well. The information should also be identified through an open process that involves the participation of stakeholders, and the stakeholders are given an option to identify the additional set of indicators on the basis of their expertise. The identification of indicators can be done through a bottom-up or top-down approach as mentioned by Lahtinen et.al (2014). They are two different methods for the identification of indicators. In the former, indicators are identified deductively, where they are shortlisted by the expert or researcher deliberation and preferably supported by literature review. In the bottom-up identification, the indicators are generally identified through the participation of different local stakeholders depending on the category of the firm (micro, small, medium, large) as put forward by Kurka and Blackwood (2013). Moreover, such identification can be done through a mixed manner whereby the main indicators are selected through a top-down approach and a bottom-up approach is adopted to get additional indicators as discussed by Chee, et al. (2010). Furthermore, the indicators can be evaluated qualitatively as well as quantitatively and the selection process needs to be easy and quick for that the indicators need to be defined clearly and they should be easy to understand.

Moreover, the indicators should be such that they could be measured qualitatively as well as quantitatively, the process of their selection should

be quick for which the indicators need to be clear and easy to understand. Finally, the indicators are taken holistically

The disadvantage of using the quantitative approach in the selection of indicators is the consumption of more time in acquiring the necessary information to perform analysis as compared to the qualitative approach (Kinderyte, 2010). The disadvantage of the quantitative technique is precisely the advantage of the qualitative technique since it is easier to use, and it is generally geared towards the creation of ideas instead of only analyzing the current ones (Kinderyte, 2008). In many studies such as done by Veleva and Ellenbecker (2001) and Patlitzianas et al. (2008), several other details related to indicators is also taken into account for instance the calculation period, the extent of applicability in an organization ranging over its product line, its life cycle, etc., the unit of measurement of various indicators like quantity in kilogram among other units, profitability in percentages or dollars for example.

Literature Gap

The literature of cluster performance measurement is limited and has an inadequate mention of the new framework involving transformative change. Thus performance and viability indicators are not much discussed by the existing body of knowledge and the indicator related to sustainability is not integrated with these performance variables. There is no single, exhaustive framework that discusses and prioritizes (gives weightage) the various indicators derived from literature at the component level and system level through the transformative lens of sustainability measures.

Research Paradigm and Design

The nature of this work is exploratory in nature and in terms of approach, this research adopts mixed-method since the first objective involves analysis and interpretation of knowledge derived from the text dealing with various indicators for the firms and industries. The second part is dealt with qualitative indicators which are scrutinized by the researchers, scholars, and industry experts that are taken in the sample and given weightage so it is a mixed-method technique.

Methods, Procedures, and Techniques

Table 2: Systematic Literature Review Process leading to Delphi Technique:

Literature Review Technique

A systematic review of the literature is being conducted as a technical procedure so that it can be referred to and replicated in future studies (Ridley, 2008). Literature is in the process of collection from national and international publications in English and focuses on scientific articles only. The time frame is between 1976 till present (approximately 50 years).

The keywords/phrases that are being inserted in the databases include ‒industrial cluster performance measurement‖, ‒**Indicators** for **sustainable industrial clusters**‖ ‒**measurement** of sustainability in industries‖, ‒**Delphi method** for industrial indicators‖, ‒industrial cluster-**profitability, performance, R& D, Innovation."**

Such keywords or phrases should appear in the title, abstract, or keywords. The researched literature covers national and foreign journals from *Science Direct, Wiley Online; and Scopus. The access months range from February to May 2019.* Once the article gathering from these resources is complete, the articles are shortlisted which deal with the variety of

indicators for measuring the firm's overall performance. Indicator-related tables are gathered, which could be with or without the index.

The identification of indicators for all aspects of viability is currently in process and the scientific journals of science direct are being analyzed. For instance, the articles by Heggestad & Rhoades (1976), discusses Firm stability indicator, Klein (1998) and Santos & Brito (2012) discussed firm's performance indicators, Azapagac & Perdan (2000) and Feil, Quevedo & Schreiber (2015) discuss the sustainability indicators of industries. These indicators are in the process of collection and compilation after which they will be ready for the next phase of Delphi Analysis.

Delphi Technique

The analysis of the indicators cut-off assessed by the 08 researchers was based on statistics, analysis of Weighted Average (WA), and the level of consensus (LC). These analyses are validated by Miller (2001) when he says that all studies using the Delphi method are satisfied with these tests. Thus, the environmental and social dimension indicators that had LC = 0.7 and WA = 4.5, and the indicators of the economic dimension that had LC = 0.5 and WA = 4.2 were selected to compose the set of indicators used to rapidly measure the micro and small furniture companies. These cut-off parameters are validated by Salmond (1994) indicating that the LC can range from 0.5 to 0.8, thus indicators can be validated at the first round as long as there in a desirable LC in the answers. Furthermore, Scarparo et al. 2012) point out that the LC is a decision of the researcher, and that there is no standard rule for its determination. It is important to mention that the Delphi method is not a decision-making tool, but a tool for analysis; therefore, it does not aim to reach a definitive answer, but simply to assist in developing possible solutions.

Sampling

The survey respondents were 8 researchers from different areas of knowledge especially industry, Industrial clusters, Economics, Policy, and Innovation. The validation of the number of respondents is justified because Wright and Giovinazzo (2000) state that this number can vary but should observe a minimum of three participants; like in the studies by Choi and Sirakaya (2006) and Hugéet al.(2010), where the respondents were 25 and seven, respectively. Data was collected through non-probability sampling through purposive sampling technique and snow-balling as well.

Data Analysis

This section deals with the analysis of data. Firstly, these indicators were presented to eight researchers mainly working in the domain of Economics, management, and industrial clusters and they were requested to rate their importance in the evaluation of the firms and industries working

under as agglomerations or clusters. Their responses were measured on the Likert scale where 5 stands for very important, 4 stands for important, 3 stands for desirable, 2 means those items which are not a priority when considering the viability of a firm or cluster, and 1 stand for those items that are redundant and hence easily disposable which means that they are the indicators which although are discussed in the literature or emerged through expert deliberation but according to these randomly selected experts/researchers such items are not effective in analyzing the holistic performance of the cluster.

1. Profitability:	**2. Stability**	**3. Growth**	**4. Innovation and R & D**
i. Return on Asset	i. Seasonality /volatility of the business/industry	i. Market-share	i. Presence of R& D Department
ii. Return on Equity	ii. Export	ii. Asset growth	ii. New Product Development
iii. Return on Investment	iii. Entry Barriers	iii. Net revenue growth	iii. Process Improvement
iv. Return on Sales	iv. Knowledge Transfer Within a firm	iv. Net income growth	iv. Increase in R & D expenditure in last 5 years
	v. Source of competitive Advantage	v. Number of employees growth	
	vi. Change in the firm‘s Business model		
5. New Business Formation	**6. Sustainability of firms and cluster**		
i. Initiation of Firm/Cluster Spin-off since establishment:	**a) Environmental Impact of firms**	**b) Environmental Efficiency:**	**c) Financial Indicators:**
ii. Increase in the No. of firms in the cluster	i. Level of pollutants emission	i. Input factors renewable or non-renewable	i. Number of current or potential environmental lawsuits
iii. Increase in Employment in cluster	ii. Generation of solid waste	ii. Use of recyclable materials	
	iii. Contribution global warming	iii Product warranty of the product or service (durability)	
	iv. Contribution in		

	human or land toxicity.	
	d) Human Capital Indicators:	**e) Ethical Indicators of firm/cluster on sustainability:**
	i. approx. yearly staff turnover of the Firm/cluster?	i. Social, technological or cultural issue which can harm the business.
	ii. Approx. yearly expenditure on health and safety of the Firm/cluster?	ii. Involvement of firm/cluster in community projects.
	iii. Approx. yearly expenditure on staff training & development on staff training & development of firm/cluster.	iii. Involvement in child labor.
		iv. Collaboration with corrupt regimes.
7. Centrality Knowledge Generators (Presence of following entities)	**8.Knowledge Application Entities**	**9. Openness**
i. Training Institutes	i. Direct and indirect competitors	i. Number and amount in rupees (estimated) of capital investment in joint venture with others
ii. Research and development facilities		
iii. Academia/ Universities		
iv. Chamber of Commerce & Industries		
v. Govt. Institutes like SMEDA		

Table 3 – Main indicators obtained from a review of scientific articles on Firms and clusters activities and expert deliberation.

Dimensions	Indicators	Likert Scale Results					Level of consensus	Weighted Average
		5	4	3	2	1		
1.Profitability:	1. Return on Asset	3	5	0	0	0	1.00	4.5
	2. Return on Equity	2	5	1	0	0	0.90	4.1
	3. Return on Investment	5	3	0	0	0	1.00	4.6
	4. Return on Sales	3	4	1	0	0	0.90	4.25
2. Stability	1. Seasonality /volatility of the business/industry	2	5	0	1	0	0.90	4
	2. Export	0	2	4	2	0	0.25	3
	3. Entry Barriers	1	4	2	1	0	0.60	3
	4. Knowledge Transfer Within firm	4	3	0	1	0	0.90	4.25
	5. Source of competitive Advantage	4	3	0	1	0	0.90	4.25
	6. Change in the firm‘s Business model	2	1	4	1	0	0.40	3.5
3. Growth:	1. Market-share	7	1	0	0	0	1.00	4.9
	2. Asset growth	3	4	1	0	0	0.90	4.25
	3. Net revenue growth	3	4	1	0	0	0.90	4.25
	4. Net income growth	6	2	0	0	0	1.00	4.75

	5. Number of employees growth	2	1	3	2	0	0.40	2.8
4. Innovation and R & D	1. Presence of R& D Department	5	2	1	0	0	0.90	4.5
	2. New Product Development	4	3	1	0	0	0.90	4.4
	3. Process Improvement	7	0	1	0	0	0.90	4.75
	4. Increase in R & D expenditure in last 5 years	3	3	2	0	0	0.75	3.75
5.New Business Formation	1. Initiation of Firm/Cluster Spin-off since establishment	3	2	1	2	0	0.60	3.75
	2. Increase in the No. of firms in cluster	2	5	1	0	0	0.90	4.1
	3. Increase in Employment in cluster	6	1	1	0	0	0.90	4.62
6. Sustainability of firms and cluster	**a) Environmental Impact of firms:** 1. Level of pollutants emission	5	2	1	0	0	0.90	4.5
	2. Generation of solid waste	5	1	2	0	0	0.75	4.3
	3. Contribution in global warming	5	1	1	1	0	0.75	4.25
	4. Contribution in human or land toxicity	4	2	1	1	0	0.75	4.1
	b) Environmental Efficiency 1. Input factors renewable or nonrenewable	1	5	1	0	0	0.75	3.5
	2. Use of recyclable material	3	3	2	0	0	0.75	4
	3. Productive warranty of the product/services (Durability)	1	3	2	2	0	0.50	3.5

	c) Financial Indicators: 1. Number of current or potential environmental lawsuits	1	5	1	1	0	0.75	3.75
	d) Human Capital Indicators 1. approx yearly staff turnover of the firm/cluster	1	4	2	1	0	0.60	4.1
	2. approx yearly expenditure on health and safety of the firm/cluster	1	5	1	0	1	0.75	3.6
	3. approx yearly expenditure on staff training & development of the firm/cluster?	3	2	2	0	1	0.60	3.75
	e) Ethical Indicators of firm/cluster 1. Social, technological or cultural issue which can harm the business	4	2	0	1	0	0.75	3.75
	2. Involvement of firm/cluster in community projects	2	4	2	1	0	0.75	4.25
	3.Involvement in child labor	6	2	1	0	0	1.00	5.12
	4.Collaboration with corrupt regimes	3	5	0	0	1	1.00	4.5
Centrality	**Knowledge Generators (Presence of following entities)** 1. Training Institutes	7	1	0	0	0	1.00	4.8

	2. Research & Development facilities	4	3	1	0	0	0.90	4.3
	3. Academia/ Universities	4	4	0	0	0	0.75	4.5
	4. Chamber of Commerce & Industries	4	4	0	0	0	1.00	4.5
	5. Govt. Institutes like SMEDA	5	1	2	0	0	0.75	4.4
	Knowledge Application Entities 1. Direct and Indirect competitors	3	4	0	1	0	0.90	4.1
Openness	1. Number & amount in rupees (estimated) of capital investment of firm in joint projects with other firms	2	5	1	0	0	0.90	4.125

Table 4: Indicators analyzed through consensus employing Delphi Method

Dimension	Indicators	Likert Scale Results					Level of consensus	Weighted Average
		5	4	3	2	1		
1. Stability	1. Export	0	2	4	2	0	0.25	3
	2. Entry Barrier	1	4	2	1	0	0.60	3
	3. Change in the firm's Business model	2	1	4	1	0	0.40	3.5

In this study, the researcher has marked the cut-off points as greater or equal to 0.5 for the level of consensus and greater or equal to 4 for the weighted average when there are 5 points Likert scale. According to these criteria, the items that were highlighted and discussed in a focus group include the following. These redundant indicators range from table 5-9.

Table 5: Dimension: Stability

1. Number of employees growth	2	1	3	2	0	0.40	2.8

Table 6: Dimension: Growth

1. Increase in R & D expenditure in last 5 years	3	3	2	0	0	0.75	3.75

Table 7: Dimension: Research and Development

1. Initiation of Firm/Cluster Spin-off since establishment.	3	2	1	2	0	0.60	3.75

Table 8: Dimension: New Business Formation

b) Environmental Efficiency 1. Input factors renewable or nonrenewable	1	5	1	0	0	0.75	3.5
3. Productive warranty of the product/services (Durability)	1	3	2	2	0	0.50	3.5
c) Financial Indicators: 1. Number of current/potential environmental Lawsuits	1	5	1	1	0	0.75	3.75

d) Human Capital Indicators 1. approx yearly expenditure on health and safety of the firm/cluster	1	5	1	0	1	0.75	3.6
2. approx yearly expenditure on staff training & development of the firm/cluster?	3	2	2	0	1	0.60	3.75
e) Ethical Indicators of firm/cluster 1. Social, technological or cultural issue which can harm the business	4	2	0	1	0	0.75	3.75

Table 9: Dimension: Sustainability of firms and clusters

These tables show that the most indicators for firms and cluster viability are trimmed from the sustainability indicator and there are three dimensions from which no components/indicators are excluded (profitability, centrality, and openness) which reflects their importance or relevance in the researchers/experts opinion in terms of assessing the firm and clusters performance holistically. Once discussed in a focus group with the experts after the first round of Delphi, it has consented that these indicators are considered redundant only for the infant firms, industries, and industrial clusters and once they attain growth and maturity in terms of years of establishment then the importance of the currently redundant indicators like export, and sustainability among others start to amplify.

Findings and Discussion

The scientific community has been paying due attention to industrial clusters on account of their dynamism, and the synergies which are created within them (Caruso et al. 2020). The modern clusters combine innovation and territorial development to enhance their competitiveness of not only the individual clusters but also their region and country as well (Kostygova, Sidorova, & Vikhrova, 2019). Hence, the aim of this research was to identify

and select the set of indicators or criteria to evaluate a firm and its pertinent industry or cluster‘s overall performance to identify thriving clusters. In fact, for nations like Pakistan which lacks a comprehensive and inclusive national industrial policy, the purpose was to compile and put forward all the indicators which define the holistic performance of firms and industries and are important for their promotion and their contribution to GDP. Similar attempts are being made for cluster evaluation in several industries like manufacturing and agriculture-based to assess their potential (Ruiga et al. 2020). Then, Fahmy et al. (2021) proposed a generalized and systematic decision support tool to quickly identify and evaluate symbiosis opportunities in industrial clusters. Further, Shakib (2020) employed system dynamics to evaluate the policies for cluster development.

Hence, to meet the objectives, in the first part of this study, the dimensions and their indicators were selected through a combination of top-down and bottom-up approaches. This was done through deliberation with two experts, and the dimensions like profitability, stability, growth, sustainability, innovation, and R & D, centrality, and openness were identified along with their relevant indicators. All these dimensions were independently mentioned in the scientific articles found at Science Direct while discussing the various aspects of the firm and its industry‘s performance. However, none of the articles dealt with all the dimensions at once. They mostly discussed one aspect of the firm/cluster for instance their profitability, growth, or Innovation among others. This study, on the other hand, makes an attempt to create a checklist of dimensions on the basis of which the firm and its cluster can be evaluated from different angles and the on its basis, policy formulation regarding the promotion and support of certain industries can be decided. The term which is used for the holistic performance in this research is viability.

In the second part, these dimensions and indicators are presented to eight researchers from the domain of policy, industrial clusters, innovation, and economics who rated them on the Likert scale, 5 being the most important criteria in considering the viability of the firm, industry, and cluster and 1 being redundant. The questionnaire was analyzed through the Delphi method where the level of consensus and weighted average played an important role to discard some gathered indicators within a particular dimension. The acceptable level of consensus was kept at 0.5 and above as a conservative measure on the basis of past literature and the researcher‘s discretion. The cut-off point for the weighted average was kept at 4.00 and above.

On the basis of these criteria, certain indicators were deemed redundant for micro and small industries and clusters by the researchers taken as samples. These indicators include export, entry barriers, and change in the firm‘s business model which are taken from the dimension of Stability. From the Growth dimension, increase in the number of employees was

considered insignificant whereas from the indicator of Research and Development, increase in Research and Development in last 5 years was considered unimportant. This is in contrast to the findings of the study conducted by Mo, He, & Yang, (2020) where R and D have a significant role in regional development. Similarly, in the new business formation dimension, firm/cluster spin-off was dropped because of low LC and WA. From the dimension of sustainability and sub-dimension of environmental efficiency, whether the firm and industry are utilizing renewable or non-renewable input resources were considered insignificant in evaluating the firm's environmental performance which was unexpected since environmental efficiency has received high LC (0.7) and WA (4.6) in the study of Feil, Quevedo, & Schreiber (2015) in which all indicators of environmental efficiency were successfully selected for measuring the sustainability of furniture firms. One reason for this difference can be the fact that these indicators were presented to scholars for prioritizing from a generic point of view without specifying the type of industry (agro-based, industrial/technological, natural resource-based, IT-based among others) and the size of the industry (micro, small, medium, large) so the indicators that are selected are from a general perspective.

Similarly, the human capital indicators of sustainability dealing with annual expenditure on employee health, safety, and training are not considered important in assessing the firm and cluster's viability. One reason could be the lack of direct linkage of the former with the latter. This complements the findings of Enzmann and Moesli (2022), in which it is asserted that developing and post-colonial economies have less concern for developing their human capital which is often at the risk of being substituted by machines. The same is the case with ethical indicators of a firm/cluster. It has also been dropped out on basis of low LC and WA and the reason might be the fact that the researchers who were the sample for this research all belonged to a developing country and they might be far from convinced that the ethical indicators should be there to assess firm's or clusters overall performance directly. The reputation of the firm/cluster might be affected but there is no direct link like the government condones cement manufacturing, leather tanning firms/factories among others despite having high ethical implications. Finally, one of the most critical points of consensus in the follow-up focus group which emerged was the fact that the redundant indicators are for the initial stage of the firm/cluster lifecycle. Once they attain growth, these indicators start to assert themselves for instance, in the initial years of the establishment of the firm, export is not a primary concern. Instead, the firm/industry in the developing country focuses on meeting the regional/ national demand efficiently but once it is stable and growing, it becomes only logical for it to expand its market share in the global market.

Additional Indicators

There was an option at the end of each dimension in which the researchers were encouraged to include indicators other than those mentioned in the questionnaire. As a result, the additional indicators that were identified by the experts included input prices fluctuation, output price fluctuation, exchange rate, taxes on inputs and profits under the dimension of stability, free cash flow per share and operating profit margins, net profit, and cash flow in profitability dimensions. The number of customer growth was included as an additional indicator of growth and under centrality, the availability of input resources and transportation network was advised to include. Finally, under the ethical dimension of sustainability, gender equality and diversity were suggested to be included.

Conclusion

Policymakers and the relevant authorities need to decide which industries and industrial clusters to develop and promote through investment and favorable policies but what should be the criteria on the basis of which they can evaluate their performance. While we speak of performance, profitability or sustainability should not be the only criteria to measure viability. In fact, this study suggests that the present and future/potential dimensions of performance should both be considered- as suggested by the term ‗viability' so that the performance could be measured multi-dimensionally. This led to the identification of various dimensions and their related indicators through expert deliberation and systematic review of the literature. Once the dimensions like profitability, stability, growth, innovation and R & D, sustainability, centrality, new business formation, and openness were identified and gathered in the form of the questionnaire, eight researchers from various fields of expertise were asked to rate them in order of importance on the Likert scale. The responses were analyzed through the Delphi technique followed by a round where the level of significance and weighted averages were applied to prune or select the most important indicators for measuring the performance of firms and clusters exhaustively.

Involvement in child labor, environmental impacts of firm's operations, and corroborating with corrupt regimes were considered the most important indicators of a firm's viability considering the sustainability dimension among the ethical indicators whereas all the measures of centrality and linkages of the firm with various actors were rated highly by the respondents followed by innovation and R & D dimensions which were also considered highly important. The findings of this study coincide with Michael Porter's model of Industrial clusters in which he provided that in order for firms to be categorized as a cluster, they should have competition and collaboration among firms, support institutions for the firms, demand conditions, and

factor conditions (the source of competitive advantage), all of which are highly rated by the respondents for analyzing the firm's and cluster performance.

Recommendations and Areas of Future Research

This study highlights that firms and industrial clusters should be developed and assessed on the basis of a complete portfolio instead of considering only one or a few criteria. This can give a holistic picture of the current performance of the firm and its future prospects. Such a checklist can be used by the firms or policymakers and government institutions alike while assessing the firm's performance and potential. This study makes a valuable contribution in compiling various dimensions and indicators for the firms and clusters' performance from the literature and short-listing them on the basis of their respective importance. However, the Delphi technique applied in this study should be taken as a guideline and it is recommended to repeat this exercise whenever a particular industry and firm size is in question to improve the checklist's customization and accuracy.
Repetition or increasing the rounds of the Delphi technique will also invite additional, more pertinent additional indicators within the discussed dimensions.

References

Azapagac, A; Perdan, S. (2000). Indicators for Sustainable Development for Industry. *Trans IChemE* **78**.*Part B. 243-261.*

Becattini, G; Bellandi, M; Propris, L. (2009). *Handbook of Industrial Districts.* Edward Elgar Publisher.

Bekele, G; Jackson, R. (2006) Theoretical Perspectives on Industry Clusters. West Virginia: Regional Research Institute West Virginia University.

Bossel, H. (1999) Indicators for Sustainable Development: Theory, Method, Applications—A Report to the Balaton Group. International Institute for Sustainable Development (IISD), Winnipeg.

Caniels, J; Romijn, A. (2003). Agglomeration Advantages and Capability Building in Industrial Clusters: The Missing Link. *The Journal of Development Studies* **39** (3): 129-154.

Carlsson, B. (2007). Innovation Systems: A Survey of the Literature from a Schumpeterian perspective. Elgar companion to neo-Schumpeterian economics, 857.

Carpinetti, L.C.R; Galdámez, E.C; & Gerolamo, M.C. (2008). A measurement system for managing performance of industrial clusters: A conceptual model and research cases. International Journal of Productivity and Performance Management.

Caruso, N; Oña, M; Gazabon, D; & Signes, A. (2020). Identifying Endogenous and Exogenous Indicators to Measure Eco-Innovation within Clusters. Sustainability 12(15), 6088.

Chee, Tahir; Darton, R C. (2010). The process analysis method of selecting indicators to quantify the sustainability performance of a business operation. *Journal of Cleaner Production* **18.**

Choi, H; Sirakaya; E. (2006). Sustainability indicators for managing community tourism. *Tourism Management* **27** (6).

Enzmann, P; Moesli, M. (2022). Seizing opportunities: ASEAN country cluster readiness in light of the fourth industrial revolution. Asia and the Global Economy Vol 2(1), 100021.

Fahmy, M., Hall, P., Suckling, I., Bennett, P., & Wijeyekoon, S. (2021). Identifying and evaluating symbiotic opportunities for wood processing through techno-economic superstructure optimization – A methodology and case study for the Kawerau industrial cluster in New Zealand. Journal of Cleaner Production Vol 325, 129494.

Feil, A; Quevedo, D; Schreiber, D. (2015). Selection and identification of the indicators for quickly measuring sustainability in micro and small furniture industries. *Sustainable production and Consumption* **2.**

Hayami, Y. (1998). Toward the Rural-Based Development of Commerce and Industry: Selected Experiences from East Asia. Washington DC: World Bank Economic Development Institute.

Heggestad, A; Rhoades, S. (1976). Concentration and Firm Stability in Commercial Banking. *The Review of Economics and Statistic* **58** (4).

Hugé, J; Le Trinh, H; Hai, P. H; Kuilman, J; Hens, L. (2010). Sustainability indicators for clean development mechanism projects in Vietnam. Environment, Development, and Sustainability, 12(4), 561-571.

Ketels, C. (2017). Cluster Mapping as a Tool for Development, Institute for Strategy and Competitiveness, Harvard Business School.

Kinderytė, L. (2008). Analysis and Comparison of Methodologies for Corporate Sustainability Assessment. Environmental Research, Engineering & Management, 46(4).

Kinderytė, L. (2010). Methodology of sustainability indicators determination for enterprise assessment. Environment Resources Engineering Management. 52 (2).

Klein, S. (1998). Firm Performance and Board Committee Structure. *Journal of Law and Economics*.

Kostygova, L; Sidorova, E; & Vikhrova, N. (2019). Modern Clusters and Assessment of their innovative Development. Entrepreneurship and Sustainability Issues Vol 7 (1), 603-614.

Krugman, P. (1991). Geography and trade. London: MIT.

Lähtinen, K., Myllyviita, T., Leskinen, P., & Pitkänen, S.K. (2014). A systematic literature review on indicators to assess local sustainability of

forest energy production. Renewable and Sustainable Energy Reviews, 40, 1202-1216.

Long, C., & Zhang, X. (2011). Cluster-based industrialization in China: Financing and performance. *Journal of international economics*, *84*(1), 112-123.

Lund-Thomsen P. (2007). Assessing the impact of public-private partnerships in the Global South: the case of the Kasur tanneries pollution control project. Market, Business and Regulation Programme Paper no. 4, Geneva, United Nations Research Institute for Social Development (UNRSID).

Mahmood, K; Ahmed, R; Jaffri, N. (2016). Urban Development and Industrial Clustering in Pakistan: A Study Based on Geographical Perspective. Journal of Basic & Applied Sciences.

Malmberg, A; Maskell P; (1991). The elusive concept of localization economies – Towards a Knowledge-based Theory of Spatial Clustering. Annual Conference. New York: AAG.

Marshall, A. (1890). Principles of Economics. London: Macmillan.

Marshall, A. (1920). Principles of Economics. London: Macmillan.

Memon, N. (2010). Challenges faced by knitwear industry in the international export market. Pakistan Textile Journal .

Miller, G. (2001). The Development of indicators for sustainable tourism: Results of a Delphi survey of Tourism researchers. Tourism Management Volume **22** (4).

Mo, C; He, C; & Yang, L. (2020). Structural characteristics of industrial clusters and regional innovation. Economics Letters Vol 88, 109003.

Nadvi, K; Barrientos, S. (2004). Industrial Clusters and Poverty Reduction. Vienna: United Nations Industrial Development Corporation.

Patlitzianas, K,D; Doukas, H; Kagiannas, A.G; Psarras, J. (2008). Sustainable energy policy indicators: Review and recommendations. Renewable Energy **33** (5).

Piori, M.J; Sabel, C.F. (1984) *The Second Industrial Divide: Possibilities for Prosperity*, *Reviews in American History*, 13(4).

Porter, M.E. (2003). The economic performance of regions, *Regional Studies* **37** (6–7): 549–78.

Ruiga, I., Kovzunova, E., Stupina, A., Kashina, E., & Burmenko, T. (2020). Improvement of the methodological approaches to the evaluation of the agro-industrial clusters development potential in the regional economy. IOP Conference Series: Earth and Environmental Science Volume 421 (3) (pp. 1-6). IOP Publishing Ltd.

Porter, M. (1998). Clusters and the new economics of competition. Harvard Business Review .

Porter, M. (1990, March). The Competitive Advantage of Nations. Harvard Business Review .

Rao, P. (2016). The rise of IT services clusters in India: A case of growth by replication. Telecommunications Policy .

Ridley, D. (2008). The Literature Review: A Step-By-Step Guide for Students. London: Sage Publication.

Salmond, S. (1994). Orthopaedic nursing research priorities: a Delphi study. Orthopaedic Nursing **13** (2).

Santos, J.B., & Brito, L.A.L. (2012). Toward a subjective measurement model for firm performance. *BAR-Brazilian Administration Review*, *9*(SPE), 95-117.

Scarparo, F; Laus, M; Azevedo, S; Freitas, D; Gabriel, S; Chaves, P. (2012). Reflections on the use of the Delphi technique in nursing. *Rev Rene*, *13*(1), 242-51.

Schot, J; Steinmueller, W.E. (2018). Three Frames of Innovation Policy: R&D, System of Innovation and Transformative Change. *Research policy* **47**: 1545-1557.

Scott, J. (1991). Social Network Analysis: A Handbook. London: Sage.

Shakib, M. (2020). Using system dynamics to evaluate policies for industrial clusters development. Computers & Industrial Engineering vol 147, 106637.

Sonobe, T; Otsuka, K. (2014). Cluster-Based Industrial Development: KAIZEN Management for MSE Growth in Developing Countries. Basingstoke and New York: Palgrave Macmillan.

Sonobe, T; Otsuka, K. (2006). Cluster-Based Industrial Development: An East Asian Model. Basingstoke, UK: Palgrave Macmillan.

Subohi, A. (2018, December 3). *As industry falters, Pakistan's lack of policy comes to light*. Retrieved from Dawn, The Business and Finance Weekly: https://www.dawn.com/news/1448973

Tichy, N; Tushman, M; Fombrun, C. (1979). Social Network Analysis for Organisations. *Academy of Management Review* **4** (4): 507-519.

Veleva, V; Ellenbecker, M. (2001). Indicators of sustainable production: A new tool for promoting business sustainability. New Solutions. 11 (1).

Wizarat, S. (2002). The Rise and Fall of Industrial Productivity in Pakistan. Karachi: Oxford University Press.

Wright, J.T.C., & Giovinazzo, R.A. (2000). Delphi–a support tool for prospective planning. Cad Pesqui Adm, 1(12), 54-65.