



Original Research Article

Industrial Value-Chain Analytics for Localization and Economic Diversification in Saudi Arabia under Vision 2030

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Abstract: Saudi Arabia's Vision 2030 places industrial development, localization, non-oil growth and stronger participation in regional and global supply chains at the center of economic transformation. However, localization policies can produce limited domestic value when they focus only on final assembly, first-tier procurement or aggregate import substitution. Sustainable industrial diversification requires a deeper understanding of how value is distributed across upstream inputs, intermediate processing, core manufacturing, industrial services and downstream activities. This paper develops an industrial value-chain analytics framework for identifying and prioritizing localization opportunities in Saudi Arabia. Using a structured review and conceptual-framework methodology, the study integrates recent literature on global value chains, industrial upgrading, supply-chain resilience, Industry 4.0 and economic diversification with official Saudi Vision 2030, National Industrial Strategy and GASTAT evidence. The framework combines five analytical stages: market and trade screening, value-chain decomposition, domestic capability mapping, gap and linkage analytics, and opportunity prioritization. It proposes a Value-Chain Localization Potential Index that assesses domestic value capture, market attractiveness, capability readiness, linkage intensity, strategic importance and export potential. The analysis demonstrates that localization should be evaluated according to depth and connectivity rather than the location of final production alone. Upstream materials, components, tooling, engineering, maintenance, testing, logistics and downstream services can generate substantial economic spillovers even when complete product localization is not feasible. The proposed approach supports Saudi Vision 2030 by helping policymakers, industrial organizations and investors identify value-chain nodes that can strengthen supplier ecosystems, increase domestic value added, attract technology-intensive investment, improve resilience and support non-oil exports. The paper concludes that data-driven value-chain analytics can help Saudi Arabia shift from isolated localization projects toward connected industrial ecosystems capable of sustained upgrading and economic diversification.

Keywords: Industrial Value Chain, Localization, Saudi Vision 2030, Economic Diversification, Local Content, Supplier Ecosystem, Industrial Upgrading, Manufacturing, Supply-Chain Resilience, Value-Chain Analytics.

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1. INTRODUCTION

Saudi Arabia is implementing one of the world's most ambitious programs of economic transformation through Vision 2030. The Kingdom's industrial agenda seeks to expand domestic manufacturing, increase local value creation, strengthen private-sector participation, attract investment and develop more competitive non-oil exports. These objectives require more than the creation of individual factories. They require industrial ecosystems in which raw materials, intermediate inputs, manufacturing processes, engineering services, logistics, technology, skills and downstream markets reinforce one another.

The concept of the value chain provides a useful analytical lens for this transformation. A finished product is the outcome of a sequence of activities, often extending across multiple firms and countries. Economic value may be created through raw-material extraction, refining, component production, assembly, testing, software, design, logistics, maintenance, distribution and after-sales services. A localization strategy that concentrates only on final assembly can therefore overstate the depth of domestic industrial capability. Conversely, a country may capture substantial value through specialized upstream or downstream activities even when final production remains internationally distributed.

This distinction is particularly important for Saudi Arabia because the Kingdom combines large domestic demand, competitive energy and raw-material advantages, expanding industrial infrastructure and growing non-oil exports with continued dependence on imported machinery, electrical equipment, components and specialized technologies. GASTAT reported that machinery, electrical equipment and parts represented 28.9% of Saudi merchandise imports in Q2 2025. At the same time, the same category represented 21.7% of non-oil exports, while chemical products accounted for 23.0% of non-oil exports. Non-oil exports including re-exports grew by 17.8% year on year in Q2 2025 (GASTAT, 2025a). These patterns demonstrate that industrial categories can simultaneously contain import dependencies and export capabilities.

Economic data also show that diversification is not an abstract future objective. GASTAT reported real GDP growth of 3.9% in Q2 2025, with non-oil activities expanding by 4.6% and contributing 2.6 percentage points to overall growth (GASTAT, 2025b). The analytical challenge is therefore increasingly about the composition, depth and productivity of non-oil activity: which industrial value-chain nodes should be built locally, which

should be connected to international partners, and which can develop into export-oriented capabilities.

Saudi Arabia's National Industrial Strategy explicitly links industrial development with local production, supply-chain strength, high-value sectors and export competitiveness. The Global Supply Chain Resilience Initiative similarly seeks to attract strategic supply chains to the Kingdom and expand Saudi market share in sectors where the country has competitive and strategic advantages (Ministry of Investment, 2022). These initiatives reinforce the need for systematic value-chain intelligence capable of identifying where domestic investment can generate the strongest linkages.

Traditional localization studies frequently begin with import values. Import data are essential, but they do not show where value is created within a product, what domestic capabilities already exist, which inputs are critical or whether upstream and downstream linkages can develop. This paper therefore advances a broader research question: How can industrial value-chain analytics be used to identify localization opportunities that maximize domestic value creation and support economic diversification in Saudi Arabia under Vision 2030?

1.1 Research Aim

The aim of this study is to develop a data-driven industrial value-chain analytics framework for identifying and prioritizing localization opportunities that can strengthen domestic value creation and economic diversification in Saudi Arabia.

1.2 Research Objectives

- Examine the role of industrial value-chain development within Saudi Vision 2030 and the National Industrial Strategy.
- Explain why localization depth and industrial linkages are more informative than final-assembly localization alone.
- Identify the trade, supplier, production, technology and economic datasets required for value-chain analysis.
- Develop a structured framework for decomposing industries into upstream, core and downstream value-chain nodes.
- Propose a Value-Chain Localization Potential Index for prioritizing individual value-chain activities.
- Assess how supplier ecosystems, technology transfer and industrial clustering contribute to economic diversification.
- Provide implementation and policy recommendations for data-driven value-chain localization.

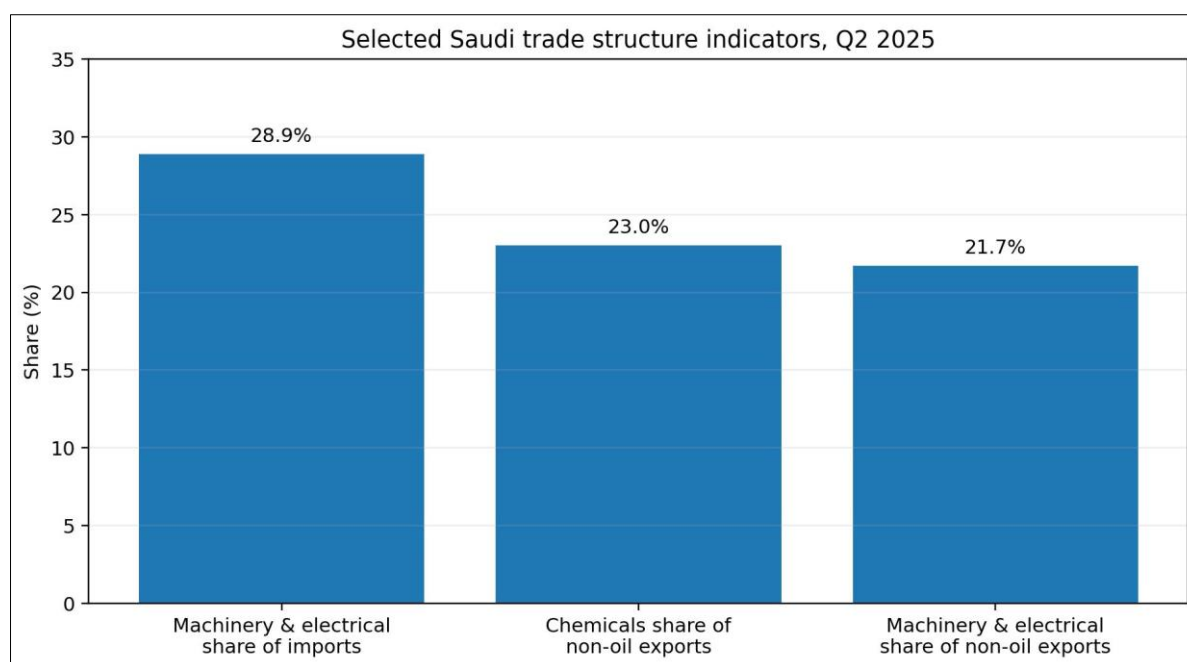


Figure 1: Selected Saudi trade structure indicators, Q2 2025. Source: GASTAT (2025a)

2. Conceptual Foundations of Industrial Value Chains

2.1 Value Chains, Global Value Chains and Industrial Upgrading

Porter's value-chain concept describes the activities through which firms create value, while global value-chain research extends the analysis across networks of firms and countries. Modern manufacturing rarely occurs within a single vertically integrated organization. Production is fragmented across specialized suppliers, technology owners, logistics providers and service companies. The policy question is therefore not only whether a product is manufactured locally but which activities within its chain are performed locally and how those activities evolve over time.

Global value-chain literature commonly distinguishes several forms of upgrading. Process upgrading increases efficiency within an existing activity. Product upgrading shifts production toward more sophisticated or higher-quality outputs. Functional upgrading moves firms into higher-value activities such as design, engineering or technology ownership. Inter-sectoral upgrading applies acquired capabilities to new industries. For Saudi industrial policy, localization can be understood as a pathway through these forms of upgrading rather than as a binary domestic-versus-imported decision.

A value-chain perspective also emphasizes linkages. Backward linkages arise when a manufacturing operation purchases inputs from domestic suppliers. Forward linkages arise when outputs become inputs for other domestic industries. Horizontal linkages occur when firms share skills,

infrastructure, technology or service providers. Localization has greater diversification impact when it creates multiple such linkages rather than operating as an isolated plant.

2.2 Economic Diversification and the Saudi Context

Economic diversification reduces dependence on a narrow group of activities or revenue sources by expanding the range, complexity and productivity of economic output. For resource-rich economies, diversification can involve downstream processing of natural resources, development of unrelated manufacturing and services, and the creation of knowledge-intensive sectors. Saudi Arabia's strategy combines all three approaches.

The Kingdom possesses substantial comparative advantages in energy, petrochemicals, minerals, geographic connectivity and capital. Value-chain development can convert these advantages into broader industrial capabilities. Petrochemical feedstocks can support plastics conversion, specialty chemicals and advanced materials; mineral resources can support metals processing and fabricated products; large energy and infrastructure markets can support machinery, electrical equipment, maintenance and engineering services.

However, diversification also requires capabilities that may not arise automatically from resource endowments. Technology, technical standards, supplier quality, specialized skills, research and development, tooling and market access often determine whether domestic firms can move

into more complex activities. Value-chain analytics can identify these missing capabilities and help policymakers design targeted interventions.

3. Saudi Vision 2030, Industrial Strategy and Value-Chain Localization

The National Industrial Strategy positions industry as a major engine of diversification and seeks to expand local production while improving the Kingdom's integration into global supply chains. The strategy emphasizes sectors in which Saudi Arabia can build on existing strengths as well as advanced industries that require capability development. Importantly, the strategic logic extends beyond import substitution: the objective is to create competitive industrial activities capable of supplying domestic and international markets.

The Global Supply Chain Resilience Initiative complements this agenda by seeking to attract strategic supply chains to Saudi Arabia and build on the Kingdom's competitive advantages, infrastructure and location connecting Asia, Africa and Europe. This initiative highlights a central feature of modern localization policy: the goal is not autarky. Saudi Arabia can deepen domestic value creation while remaining integrated with international capital, technology and markets.

Industrial value-chain analytics is therefore relevant to at least four Vision 2030 priorities. First, it can identify areas where local production can increase domestic value added. Second, it can reveal supplier-development opportunities for Saudi SMEs. Third, it can support investment attraction by translating market gaps into specific value-chain projects. Fourth, it can identify nodes with export potential, allowing localization to evolve into internationally competitive production.

The Saudi trade structure reinforces these opportunities. The continuing importance of machinery and electrical equipment in both imports and non-oil exports suggests that the category should not be treated as a single localization target. It should be decomposed into equipment types, components, subassemblies, repair services, engineering, control systems and testing activities. Similarly, strong chemical exports can be analyzed to identify opportunities for further downstream conversion into higher-value specialty products.

4. LITERATURE REVIEW

4.1 Industrial Localization and Value-Chain Development

Industrial localization literature generally recognizes that successful domestic production requires more than market protection or procurement preference. Firms must achieve

appropriate scale, productivity, technology and quality while becoming embedded in supplier and customer relationships. Global value-chain research adds that the position occupied within a chain influences the amount and type of value captured.

The distinction between shallow and deep localization is important. Shallow localization may involve local registration, distribution or final assembly with high imported content. Deep localization involves increasing domestic participation in materials, components, engineering, technology, maintenance and services. The latter typically produces greater spillovers and stronger resilience, although it may require longer capability-development periods.

Recent Saudi-focused studies of Industry 4.0 and localized manufacturing further suggest that digital technologies can alter localization feasibility. Flexible automation, data analytics, additive manufacturing and digital production systems can reduce scale constraints and improve quality, making some value-chain nodes more feasible for domestic firms (Aljuaid, 2024).

4.2 Data Analytics and Industrial Intelligence

Value-chain mapping has traditionally relied heavily on expert interviews, company surveys and qualitative sector studies. These methods remain essential because industrial processes contain tacit knowledge. However, big-data approaches can substantially increase the scale and frequency of analysis. Customs transactions, company registries, supplier databases, procurement records, industrial licenses and project pipelines can be integrated to map economic relationships at product and company level.

Network analytics is particularly relevant because value chains are relational systems. Firms can be represented as nodes and supply relationships as edges. Measures of centrality can identify companies or inputs whose disruption would affect many downstream activities. Community detection can identify industrial clusters, while input-output data can reveal sectors with strong domestic multiplier effects.

Natural-language processing can supplement structured data by extracting product, process and technology information from company websites, technical catalogues, industrial licenses and investment announcements. These methods allow analysts to create dynamic capability maps that are updated more frequently than traditional sector studies.

4.3 Supply-Chain Resilience and Strategic Value

Recent global disruptions have increased attention to resilience and supply-chain concentration. Value-chain localization can improve resilience when it creates alternative sources for critical inputs or shortens lead times. Yet complete localization is neither necessary nor efficient for all products. A value-chain framework allows policymakers to identify critical nodes where redundancy or domestic capability generates disproportionate strategic value.

Saudi Arabia's Global Supply Chain Resilience Initiative explicitly reflects this logic by seeking to attract strategic supply chains rather than merely individual factories. This reinforces the importance of identifying upstream and downstream linkages around investment projects so that localized production can become part of a broader ecosystem.

4.4 Research Gap

Although Saudi industrial policy places strong emphasis on localization, supply chains and diversification, a recurring analytical gap remains between high-level sector strategy and project-level localization decisions. Import statistics identify market size, and industrial databases identify firms, but neither alone reveals which stages of a value

chain offer the highest domestic value capture, strongest linkages or best export potential. This paper addresses that gap through a multidimensional value-chain analytics framework.

5. RESEARCH METHODOLOGY

5.1 Research Design

The study adopts a structured review and conceptual-framework methodology. It synthesizes recent Saudi policy documents and official economic indicators with literature on industrial value chains, economic diversification, Industry 4.0, supply-chain resilience and data analytics. The study does not claim to have executed a confidential national industrial database; instead, it develops a replicable architecture for future empirical implementation.

The framework was constructed through five stages: defining the analytical unit at value-chain-node level; identifying relevant datasets; establishing metrics for localization potential; linking individual nodes into upstream, core and downstream structures; and connecting prioritization results with policy and investment actions.

5.2 Data Requirements for Value-Chain Analytics

Table 1: Data architecture for industrial value-chain analytics

Data category	Illustrative variables	Value-chain purpose
Trade data	HS code, import/export value, quantity, origin, destination	Measure market size, dependency and export performance
Industrial production	Output, capacity, factory status, licenses	Determine existing domestic supply
Procurement and buyer data	Material/category, specification, volume, contract frequency	Validate real demand and buyer concentration
Supplier capability	Processes, machinery, certifications, capacity, products	Map domestic production readiness
Technology data	Patents, process requirements, equipment, IP ownership	Assess complexity and technology gaps
Input-output data	Inter-industry purchases and sales	Estimate backward and forward linkages
Investment/project pipeline	Planned plants, infrastructure, capex	Forecast future value-chain demand
Skills and workforce	Occupations, qualifications, technical workforce	Evaluate human-capital readiness
Logistics/geospatial data	Ports, industrial cities, transport, customers	Assess cluster and location economics
Market and export data	Regional demand, tariffs, competitors, standards	Estimate export-oriented scale potential

5.3 Value-Chain Decomposition

The analytical unit should be a value-chain node rather than a broad sector. A node is a distinct activity or input that can potentially be supplied by a specialized firm. For an industrial pump, nodes may include metal casting, machining, seals, electric motors, control systems, assembly, testing, coating, installation and maintenance. Each node has different

technological requirements and localization potential.

A standardized hierarchy can classify nodes into upstream, core and downstream activities. Upstream nodes include raw materials, intermediate inputs and specialized components. Core nodes include manufacturing, assembly, testing and

production engineering. Downstream nodes include distribution, maintenance, refurbishment, recycling, digital services and export logistics. This structure

facilitates comparison across sectors while preserving product-specific detail.

5.4 Value-Chain Localization Potential Index

Table 2: Illustrative Value-Chain Localization Potential Index (VCLPI)

Dimension	Meaning	Illustrative weight (%)
Domestic value-capture potential (DV)	Share of product/service value that could be retained locally	20
Market attractiveness (MA)	Current demand, growth, stability and scale	20
Capability readiness (CR)	Existing firms, skills, infrastructure and technology	20
Linkage intensity (LI)	Potential backward/forward supplier connections	15
Strategic importance (SI)	Resilience, critical infrastructure and national priority	15
Export potential (EP)	Regional/global competitiveness and scalable demand	10

An illustrative Value-Chain Localization Potential Index can be expressed as $VCLPI = 0.20(DV) + 0.20(MA) + 0.20(CR) + 0.15(LI) + 0.15(SI) + 0.10(EP)$. These weights are conceptual and should be calibrated by sector. A healthcare or

infrastructure-critical input may require greater strategic weighting, while an export-oriented commodity may require greater emphasis on cost and market scale.

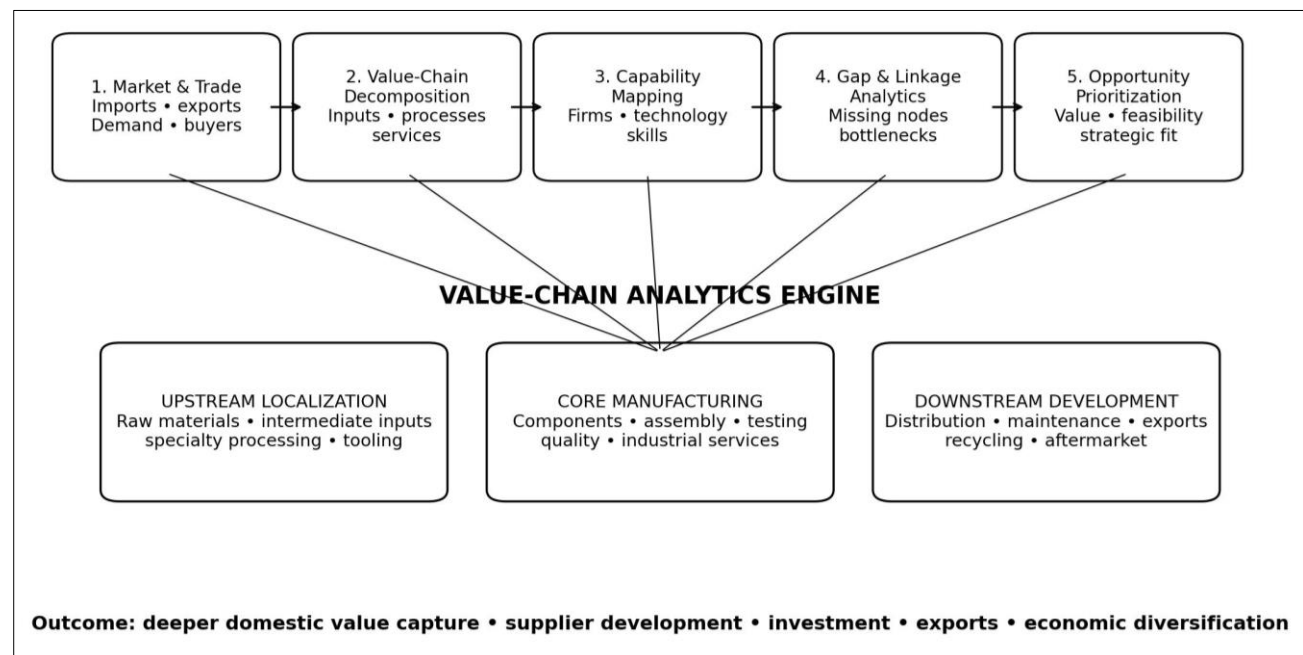


Figure 2: Industrial value-chain analytics framework for localization

Source: Author-developed framework

6. Analytical Framework for Identifying Localization Opportunities

6.1 Stage 1: Market and Trade Screening

The first stage identifies products and activities with sufficient economic relevance for deeper analysis. Import value, import growth, source concentration, domestic production and export performance provide an initial market signal. Products with high imports and growing demand may represent localization opportunities, but products with strong existing exports can also reveal adjacent opportunities for deeper domestic value capture.

Analysts should avoid using high imports as an automatic localization criterion. Large imports can reflect competitive global sourcing, lack of raw materials or extremely specialized technology. The purpose of trade screening is therefore to narrow the opportunity universe rather than make final decisions.

6.2 Stage 2: Value-Chain Mapping

The shortlisted product is decomposed into its major inputs, processes, services and downstream activities. Bill-of-material information, engineering expertise, supplier interviews and industry

databases can support this decomposition. The resulting map shows where value is generated and which activities are technically dependent on one another.

Cost decomposition is useful because physical component count can be misleading. A product may contain many simple localizable items but derive most of its value from one imported high-technology component. Localization depth should therefore be measured through value as well as activity count.

6.3 Stage 3: Domestic Capability Mapping

Each value-chain node is matched against Saudi firms, industrial facilities, technology providers, research institutions and service companies. Capability matching should consider production processes rather than product names alone. A firm that has never produced the target item may nevertheless possess the same machining, molding, chemical formulation or testing capabilities required.

This approach expands supplier-development possibilities. It allows industrial programs to distinguish among immediately localizable nodes, nodes requiring moderate supplier development, and nodes requiring international technology partnerships or greenfield investment.

6.4 Stage 4: Gap and Linkage Analytics

Gap analysis identifies missing nodes that prevent an otherwise attractive value chain from operating competitively. A domestic assembly industry may depend on imported tooling, specialized coatings or certification laboratories. In such cases, the missing supporting activity can be a higher-leverage localization target than another assembly facility.

Linkage analytics evaluates how strongly a node connects with the wider Saudi economy. Activities purchasing domestic raw materials, supplying multiple industries or creating shared technical services generate larger spillovers. Input-output coefficients, supplier-network centrality and cross-sector use can be used as quantitative proxies for linkage intensity.

6.5 Stage 5: Opportunity Prioritization

Each node is scored using the VCLPI and classified according to recommended action. High-readiness, high-value nodes may proceed directly to investor or supplier development. High-value but low-readiness nodes may require technology transfer, training or joint ventures. Nodes with low domestic demand but strong export economics may require regional-market strategies. Low-value and low-feasibility nodes can remain internationally sourced and periodically monitored.

Table 3: Value-chain localization decision logic

Opportunity type	Interpretation	Recommended action
High value / High readiness	Existing capabilities + attractive demand	Accelerate supplier qualification and investment
High value / Low readiness	Attractive economics but technology/capability gap	JV, technology transfer, skills and financing
Moderate domestic demand / High export potential	Local scale alone insufficient	Develop export-oriented cluster strategy
Strategically critical / weak economics	Resilience value exceeds commercial return	Targeted strategic intervention or dual sourcing
Low value / Low readiness	Limited economic or strategic case	Continue global sourcing and monitor

7. Upstream, Core and Downstream Localization

7.1 Upstream Localization

Upstream localization includes raw materials, processed inputs, components and industrial consumables. It often produces strong backward linkages because downstream firms repeatedly purchase these inputs. Saudi Arabia's energy, petrochemical and mineral resource base can create advantages for selected upstream industries, particularly where locally available feedstocks can be transformed into higher-value intermediate products.

Upstream development can also improve resilience by reducing dependence on imported

components used across multiple industries. However, scale economics are important. Commodity-like intermediate products may require large regional or export markets, making demand aggregation and export competitiveness central to investment feasibility.

7.2 Core Manufacturing Localization

Core manufacturing includes fabrication, processing, component manufacturing, assembly and testing. These activities are highly visible in localization programs but should be evaluated together with supporting inputs and services. A plant that imports nearly all components may create less

domestic value than a smaller facility integrated with Saudi suppliers.

Advanced manufacturing technologies can improve feasibility by increasing flexibility and reducing production setup costs. Digital quality systems, robotics and additive manufacturing can also allow Saudi firms to enter specialized product niches that would be difficult to serve using conventional high-volume manufacturing models.

7.3 Downstream and Industrial-Service Localization

Downstream activities are sometimes underemphasized despite their potential for employment and knowledge creation. Maintenance, repair, overhaul, calibration, inspection, software, engineering, recycling and aftermarket services can capture substantial value over the lifetime of industrial equipment. They can also serve as entry points through which domestic firms learn product technologies before moving upstream into component production.

Export logistics, distribution and regional service hubs can further deepen value capture. Saudi Arabia's location and logistics investments can support value chains that serve domestic customers while also supplying neighboring markets.

8. Supplier Ecosystems, Industrial Clusters and SMEs

Industrial diversification becomes more sustainable when localized activities form clusters rather than isolated projects. Clusters allow firms to share specialized labor, logistics infrastructure, testing facilities, training institutions and knowledge. They also improve the economics of supporting suppliers because a single supplier can serve several customers within the cluster.

Value-chain analytics can identify potential clusters by mapping common inputs and processes across industries. For example, precision machining capabilities may be relevant to energy equipment, automotive components, aerospace and medical devices. Rather than developing separate supplier programs for each sector, Saudi industrial policy can

support cross-sector process capabilities with multiple demand sources.

SMEs can play an important role in such ecosystems because many components and services do not require the scale of large manufacturing plants. However, SME participation requires finance, certification, demand visibility and technical support. Analytics can identify where supplier-development resources will produce the greatest linkage effects.

Anchor firms are also important. Large domestic companies and multinational manufacturers can provide standards, contracts and technical knowledge that allow smaller suppliers to upgrade. Localization programs should therefore measure supplier development and knowledge transfer, not merely first-tier local spending.

9. Technology, Digitalization and Value-Chain Intelligence

Digital technologies support both industrial production and the analysis of value chains. Enterprise data, industrial Internet of Things systems, procurement platforms and supplier portals generate continuous information about demand, quality, capacity and performance. Integrating these sources can transform a periodic value-chain study into a dynamic intelligence system.

Machine learning can cluster products and suppliers, identify adjacent capabilities and forecast demand. Natural-language processing can extract process information from unstructured documents. Graph analytics can map relationships among firms, inputs and industries. Geospatial analytics can evaluate proximity to ports, industrial cities, customers and raw materials.

Digital twins and virtual process models can also assist feasibility assessment for complex value-chain nodes by simulating capacity, equipment and production flows before investment. However, digital sophistication does not substitute for industrial knowledge. Engineers and sector specialists must validate whether apparent data relationships correspond to real manufacturing capabilities.

10. Economic Diversification Effects

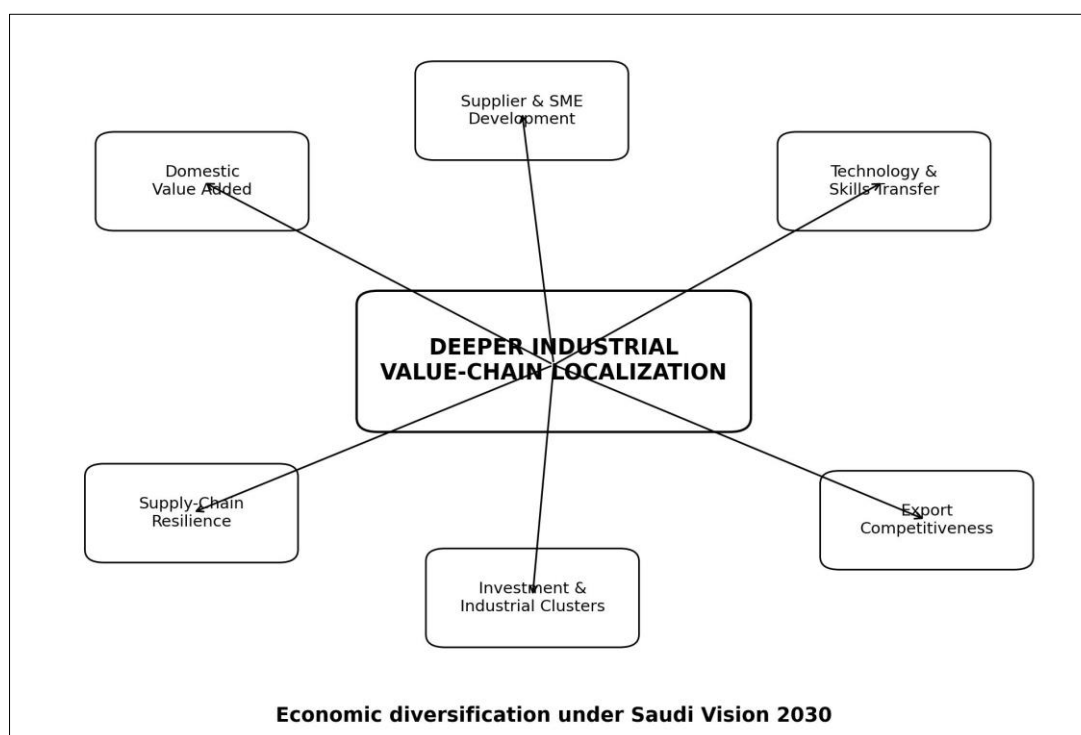


Figure 3: Pathways from deeper value-chain localization to economic diversification
Source: Author-developed framework

The diversification effect of localization extends beyond replacing imports. First, deeper value chains increase domestic value added because more production stages occur within the Kingdom. Second, supplier development creates opportunities for SMEs and specialized service providers. Third, international investment can transfer technology and management capability when local participation is embedded within project design.

Fourth, value-chain development can create export platforms. Saudi demand can provide the initial scale required for a factory, but long-term competitiveness may depend on regional or global markets. Export-oriented localization is particularly important where domestic demand alone is below minimum efficient scale.

Fifth, industrial clusters can create cumulative capability. Skills developed in one sector may be applied in another, engineering services may serve multiple industries, and common suppliers can expand into adjacent products. This process supports diversification into more complex activities.

Finally, domestic value-chain depth can improve resilience. When essential inputs, maintenance capabilities and alternative suppliers are available locally, industrial operations become less vulnerable to external disruption. Resilience should therefore be treated as an economic value alongside cost and employment.

11. Illustrative Sector Applications

Table 4: Illustrative sector applications of value-chain analytics

Sector	Illustrative value-chain nodes	Localization rationale	Strategic direction
Machinery & electrical equipment	Components, motors, controls, machining, testing, repair	Large import share; cross-sector demand; maintenance opportunity	Component manufacturing + MRO + technology partnerships
Chemicals & advanced materials	Feedstocks, intermediates, specialty formulations, conversion	Strong Saudi feedstock base and non-oil export presence	Move downstream into higher-value specialties
Automotive	Metals, plastics, electronics, assembly, aftermarket	Cluster effects and large supplier network potential	Localize selected components around anchor OEM demand

Sector	Illustrative value-chain nodes	Localization rationale	Strategic direction
Healthcare manufacturing	Consumables, diagnostics, devices, maintenance	Strategic demand and healthcare resilience	Prioritize recurring, certifiable products and technical services
Food processing	Ingredients, packaging, processing equipment, logistics	Domestic demand and food-security relevance	Deepen processing and packaging linkages
Mining & metals	Ore processing, metals, fabrication, equipment, services	Resource advantage and industrial cross-linkages	Develop downstream metal products and mining services

Machinery and electrical equipment illustrate why value-chain decomposition matters. The category's large import share includes products ranging from consumer electronics to industrial machinery and electrical components. A useful localization strategy should identify recurring industrial components, repair-intensive equipment and cross-sector processes rather than treating the entire category uniformly.

Chemicals provide a different pathway. Saudi Arabia already possesses strong petrochemical capabilities and chemical export performance. Value-chain analytics can identify opportunities to move further downstream into formulations, specialty chemicals, advanced polymers, coatings and industrial consumables where domestic feedstock advantages can support higher value capture.

Automotive localization depends heavily on cluster economics. Assembly investment can create anchor demand, but the diversification effect increases when plastics, metals, wiring, electronics, seats, glass, logistics and aftermarket services develop around it. The policy question is therefore which supplier layers can achieve competitive scale and which should remain internationally integrated.

Healthcare and food value chains add strategic considerations because supply continuity can affect public welfare. In these sectors, localization scores may assign greater weight to resilience, regulatory capability and product criticality even where immediate commercial returns are lower.

12. FINDINGS AND DISCUSSION

The first major finding is that localization depth matters more than the simple presence of a domestic final producer. Measuring domestic value capture across multiple nodes provides a more accurate picture of industrial capability. This suggests that local-content metrics should distinguish distribution, assembly, component production, upstream inputs and higher-value technical activities.

Second, the most valuable localization opportunity is not always the final product. A missing intermediate input, testing facility, tooling supplier or maintenance capability can constrain several industries simultaneously. Value-chain analytics can reveal these leverage points.

Third, economic diversification depends on connectivity. Isolated projects may increase output but create limited spillovers. Projects embedded within supplier networks generate demand for local inputs, skills and services and therefore have stronger multiplier effects.

Fourth, export potential should be built into localization decisions from the beginning. Saudi domestic demand can support initial scale, but some value-chain nodes will only become globally competitive if they serve GCC, Middle Eastern, African or wider markets. Export economics should therefore influence plant scale, technology choice and quality standards.

Fifth, industrial capability is dynamic. Technology transfer, workforce development and supplier learning can change localization feasibility over time. A low-readiness value-chain node should not automatically be dismissed if it has high strategic and economic value; it may become the target of a structured capability-development program.

Sixth, data integration is essential. Trade, procurement, production and supplier databases each reveal only part of the value chain. The highest analytical value emerges when products, firms, processes and economic linkages are connected within a common data model.

13. Implementation Roadmap

Phase 1 - Build the Data Foundation: Standardize product classifications, supplier identifiers, industrial activity codes and key data-sharing rules.

Phase 2 - Select Priority Sectors: Use trade, demand, national strategy and strategic criticality to identify sectors for detailed mapping.

Phase 3 - Map Value-Chain Nodes: Decompose priority products into raw materials, components, processes, services and downstream activities.

Phase 4 - Match Domestic Capabilities: Link nodes to Saudi companies, industrial facilities, technologies, skills and research capabilities.

Phase 5 - Score and Prioritize: Apply VCLPI, sensitivity analysis and expert validation to rank opportunities.

Phase 6 - Design Interventions: Choose among supplier development, joint ventures, investment attraction, training, financing and infrastructure.

Phase 7 - Monitor Outcomes: Track local value added, supplier growth, exports, productivity and resilience.

Phase 8 - Refresh Continuously: Update value-chain maps as technologies, demand and firms change.

14. Governance and Institutional Requirements

A national or sector-level value-chain platform requires clear data governance. Product classifications, company identifiers and definitions of local production must be consistent across organizations. Data owners should be responsible for timeliness and quality, while sensitive commercial information should be protected through role-based access.

Institutional coordination is equally important because value chains cross the mandates of industry, investment, trade, procurement, logistics, education and finance. A localization opportunity identified through analysis may require coordinated action across several entities. Governance should therefore include mechanisms for converting analytical findings into accountable implementation plans.

Transparency is important when prioritization influences incentives or public support. The VCLPI should remain explainable: decision-makers should understand whether an opportunity ranks highly because of domestic value capture, supplier readiness, strategic importance, export potential or another factor. Black-box ranking systems are less appropriate for industrial policy.

Finally, outcome measurement should distinguish announced investment from realized capability. A project should be evaluated through production, domestic procurement, employment, supplier development, exports and technological upgrading rather than investment value alone.

15. Policy and Managerial Recommendations

1. Move from product-level localization targets toward value-chain-node analysis.

2. Measure depth of domestic value creation rather than counting final assembly as full localization.
3. Prioritize common industrial processes and supporting services that can serve multiple sectors.
4. Link large anchor investments with structured supplier-development and technology-transfer programs.
5. Use demand aggregation to make smaller value-chain nodes commercially investable.
6. Include export potential when evaluating industries with limited domestic scale.
7. Develop dynamic supplier capability maps using verified production-process information.
8. Integrate trade, procurement, production and investment data into a unified industrial intelligence platform.
9. Use scenario analysis to compare immediate localization, phased capability development, joint ventures and continued global sourcing.
10. Track industrial outcomes using value added, productivity, exports, local supplier growth and resilience indicators.

16. Research Implications

16.1 Theoretical Implications

The proposed framework connects global value-chain concepts with data-driven localization policy. It reframes localization from a binary location decision into a process of selecting and upgrading individual value-chain functions. This perspective provides a stronger link between localization, industrial linkages and economic diversification.

16.2 Managerial Implications

For companies, value-chain analytics can identify where supplier-development investment is most likely to reduce cost, lead time or risk while improving local content. Large buyers can map recurring imported components and services across business units and create aggregated demand signals for Saudi suppliers.

16.3 Investor Implications

For investors, value-chain maps can identify gaps supported by verified demand rather than broad sector narratives. They can also reveal adjacent opportunities around anchor investments, helping investors understand customers, inputs, suppliers and downstream markets before committing capital.

16.4 Policy Implications

For policymakers, the framework supports more targeted industrial development. Instead of offering similar incentives to all projects within a sector, support can be directed toward nodes with strong linkages, strategic value or export potential and toward enabling capabilities that unlock several downstream industries.

17. Limitations and Future Research

This study is conceptual and does not present results from a complete confidential Saudi supplier, procurement and input-output dataset. The VCLPI therefore requires empirical calibration before use in high-value investment or policy decisions.

Sector-specific technical criteria are also necessary. Semiconductor, pharmaceutical, chemical and food value chains have different regulatory, technology and capital structures. Future research should develop specialized scoring models for priority Saudi sectors.

Another limitation concerns measurement of domestic value added. Supplier nationality or purchase location is not an adequate proxy for economic value retained in Saudi Arabia. Future empirical work should estimate domestic content at multiple supplier tiers and distinguish imported inputs from locally generated labor, services and capital value.

Future studies can also use network science to identify high-centrality inputs and firms across Saudi industrial ecosystems. Longitudinal analysis can examine whether deeper domestic linkages are associated with greater productivity, export performance and resilience. Geospatial models can identify the industrial cities and regions where specific clusters have the strongest economic logic.

18. CONCLUSION

Saudi Arabia's Vision 2030 industrial transformation requires a shift from isolated localization projects toward deeper and more connected industrial ecosystems. Value-chain analytics provides a practical way to make this shift by revealing where economic value is created, which capabilities already exist in the Kingdom and which missing nodes constrain domestic industrial development.

This paper proposed a five-stage framework combining market and trade screening, value-chain decomposition, domestic capability mapping, gap and linkage analytics, and opportunity prioritization. It also introduced an illustrative Value-Chain Localization Potential Index incorporating domestic value capture, market attractiveness, capability readiness, linkage intensity, strategic importance and export potential.

The framework demonstrates that the highest-value localization target may be an upstream input, specialized component, testing facility, engineering service or downstream maintenance capability rather than final assembly. These nodes can create strong spillovers when they serve multiple

industries and become embedded within supplier networks.

For Saudi Arabia, deeper value-chain localization can support economic diversification through several channels: increased domestic value added, supplier and SME development, technology and skills transfer, stronger industrial clusters, export competitiveness and supply-chain resilience. These outcomes closely align with the broader objectives of Vision 2030 and the National Industrial Strategy.

The ultimate objective should not be maximum domestic production of every item. Competitive industrial systems remain integrated with global markets. The strategic objective is to identify where Saudi Arabia can capture more value, build durable capabilities and create internationally competitive industrial ecosystems. Data-driven value-chain analytics can provide the evidence required to make those choices systematically and to update them as technologies, markets and capabilities evolve.

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