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Aligning digital and industrial policy to foster future industrialization

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Abstract

Digital technologies are driving industrial transformation, with impacts across a range of sectors of production. This includes potential shifts in the geography of global production with implications for industrial development. Novel approaches to industrial policy are necessary to embrace and take advantage of these changes. We explore the emergence of national digital policies and their compatibility with our previous understanding of industrial policy. While some alignment between national digital policies and industrial policy in terms of rationale and instruments is evident, the growing importance of data calls for the development of a new set of approaches. We use the concept of the "data value chain" to analyse potential approaches in terms of the distinct capabilities needed and the opportunities that arise within a chain of data capture, storage, processing and analytics. Building on this framework, we discuss emerging data pathways that link data policies to broader industrial development goals.

Key Messages

1.
In a world of digital divides, governments can systematically support latecomer firms through industrial strategies and policies

2.
The integration of digital technologies in industrial production calls for a close alignment of industrial policy with digital national strategies

3.
Building a data economy and creating capabilities along the "data value chain" will be a key success factor for future industrialization

The digital revolution and its implications for global production

Impacts of the digital revolution

Digital technologies are driving major technological shifts in today's economy. While the impacts of these shifts were initially confined to areas such as e-commerce, media and entertainment, they are having cross-sectoral economic impacts through the digitalisation of productive sectors such as manufacturing and agriculture.

These technological shifts are not only disrupting traditional production processes. In services, the rapid growth of digitally delivered services has led to the emergence of new service sectors. In manufacturing, new "Industry 4.0" innovations associated with robotics, artificial intelligence (AI) and machine connectivity are reshaping models of industrial organization.[1]

The implications of these technological shifts for technological upgrading and industrialization are not limited to advanced economies only.[2] While the number of digital users in developing countries is on the rise, a similar expansion of digital lead firms—which continue to be concentrated in a handful of advanced economies—is not evident. The digital economy has the potential to open up new avenues for technological and industrial development. Yet current technological shifts actually threaten to widen the global technological divide, thereby exacerbating structural inequalities.

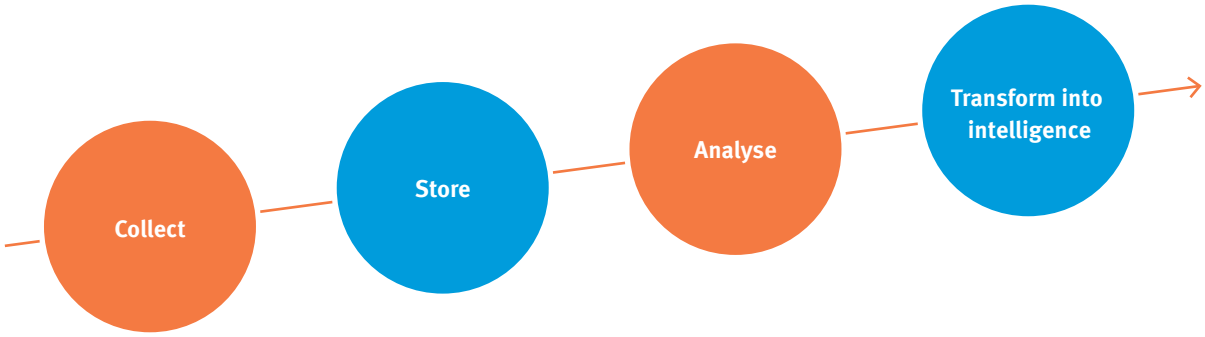
Data and the data value chain

Data have emerged as a key component of the digital economy. Data are a cornerstone of business models, be it in the form of data-driven scheduling of transportation, the monitoring of production or the monetization of consumer data. Consequently, data policies are key for creating and capturing value in the digital economy.[3]

While data might be seen as a resource just waiting to be tapped into, targeted actions, infrastructure and capabilities are needed if data are to generate value. In light of the growing complexity of data, it is useful to break down the related processes into an illustrative "data value chain" (Figure 1). Based on the data value chain, we can investigate the distinct stages through which data are produced/collected, stored, analysed and used to feed into decision-making processes (Box 1).[4]

The daily data generation of an autonomous vehicle is estimated at 4,000 gigabytes.

FIGURE 1: SIMPLIFIED DATA VALUE CHAIN



BOX 1.
Data use in self-driven vehicles

Advanced sensing and self-driving vehicles are examples of how the data value chain operates in practice. Huge volumes of data "teach" the car how to behave in real-life road conditions. Such vehicles are equipped with a sensor system that enables them to gather information from their surroundings. These systems consist of sensors, radars, GPS systems and computer vision systems that together collect an enormous amount of data. The daily data generation of an autonomous vehicle is estimated at 4,000 gigabytes.

The collected data are fed into the vehicle's machine learning algorithm which interprets the information and decides on the best course of action. Moreover, these data are transferred to cloud infrastructure and fed into a chain of analytics to improve machine learning performance. This training process is continuous, and any new data that are fed into the system serve to further improve it.

Sensor data can initially be stored in a domestic cloud infrastructure, but can also be transferred internationally for analytics purposes and for training of machine learning models.

Aligning industrial and digital policies in developing countries

Digital latecomers

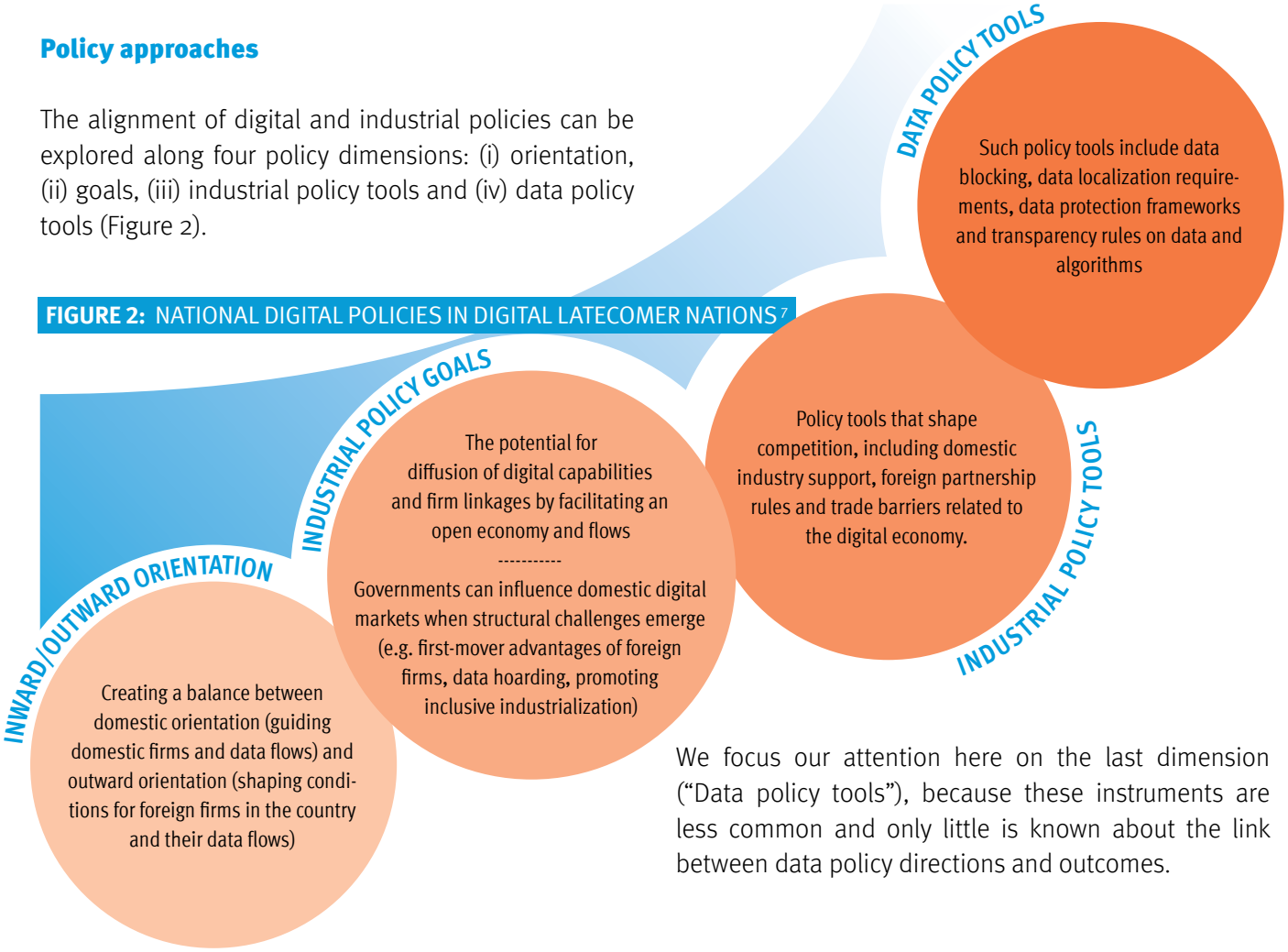
Late adopters of technology are at risk of losing competitiveness, but given appropriate strategies for technology transfer, linkages and leveraging technologies can rapidly upgrade. Government can systematically support latecomer firms through industrial strategies and policies.[5]

Many countries in the technology race are "digital latecomers" and lag behind the digital cutting edge. This group does not only include emerging and developing countries, but parts of Europe as well.[6] While policies to support the technological capability development of latecomer firms are well known, less is known about how industrial policies can be aligned with strategies for the digital economy.

Policy approaches

The alignment of digital and industrial policies can be explored along four policy dimensions: (i) orientation, (ii) goals, (iii) industrial policy tools and (iv) data policy tools (Figure 2).

FIGURE 2: NATIONAL DIGITAL POLICIES IN DIGITAL LATECOMER NATIONS[7]



We focus our attention here on the last dimension ("Data policy tools"), because these instruments are less common and only little is known about the link between data policy directions and outcomes.

Data policies for catching up

Policies along the data value chain

The underlying reasons for developing a data policy include, among others, cybersecurity, consumer protection and privacy. Yet data policies are increasingly incorporating economic objectives as well and are moving beyond a simple binary of "data blocking" vs "free flow of data" to include a broader range of policy tools along data value chains.[8]

Each stage within the data value chain entails different costs, activities and skills. Extending the previous discussion on policy orientation, we identify several policy components:

- The nature of technology and skills determine the type of capabilities required and the feasibility of policy to drive catch-up in the data value chain.
- Domestic-oriented policies and strategies support and encourage domestic firms to adopt a data-driven culture so data can be more easily shared and reused.
- Outward-oriented policy shapes the conditions for foreign firms and data flows. National data regulations, standards and sectoral requirements define the types and use of data in latecomer economies.
- Demand-side data policies can play an important role in building domestic demand for data (and in sophistication of demand). Government strategies, procurement and other initiatives can drive demand.

The distinct skills, technological requirements and data policies implemented in latecomer economies depend on their stage in the data value chain (Table 1).[9]

TABLE 1: DISTINCT DATA POLICY INSTRUMENTS CLASSIFIED BY POLICY ORIENTATION AND STAGE IN THE DATA VALUE CHAIN

Data value chain	Skills & technology requirements	Supporting local content & production	Shaping external actors	Facilitating data demand
Collection	*Skills:* IoT, integration of data and machines *Tech:* data standards, dataset availability, government data	Clear regulation on data sharing Strategies for sectoral data sharing from private or public sector	Non-personal data regulations Personal data protection	Opening up government, sharing of national data (e.g. health, government data)
Storage/ Infrastructure	*Skills:* distributed systems, databases *Tech:* core infrastructure, databases	Supporting integration of local firms with infrastructure	Data localization rules	Encouraging businesses to localize (given the growing commercial advantages of local data)
Analytics	*Skills:* data processing, data science, AI/ ML *Tech:* data science libraries, vision, voice	Supporting local labs, demonstrator firms or key projects with spillovers or links	Standards, norms for data processing	Public procurement and integration of local analytics firms
Applications	*Skills:* apps, business integration, services *Tech:* client-server platforms, open source, sectoral-specific tools	Subsidies or support for local firms (local development)	Control of apps (licencing, filtering) Local content/ partnership requirements	Procurement of local firms Infrastructure drives demand and sophistication

Considering data pathways

National data policies continue to evolve, but we are beginning to see some coherence. This specifically refers to the data value chain, where governments are operationalizing a cluster of actions into more coherent "data pathways". We identify four major pathways:

i) Data sovereignty and localization rules as a foundation for data ecosystems: Several countries are nurturing local data economies by incorporating more targeted industrial policies around data localization and local control. Their efforts are often positioned as digital or data sovereignty. In Indonesia, for example, the push towards data localization is considered an important part of the national pathway to develop domestic data-driven firms. Policy in Indonesia is promoting data sovereignty by putting forward requirements for data localization to facilitate strategic data flows and public data.

ii) Strategic government initiatives to support data economies: Governments in several developing countries are implementing strategies to promote accessibility and use of strategic data as the foundation for building a data economy. Examples include the

IndiaStack initiative which has played an important role in supporting data-driven industries and firms in India[10]; public initiatives in Latin America (e.g. in Chile, Mexico and Colombia) to foster open data in the public sector and to support innovation[11]; and data integration in Thailand's financial sector, which opens up opportunities for the emergence of new data-driven firms. Governments can pave the way for a more dynamic data economy by implementing data infrastructure, setting standards for data and elaborating data rules.

iii) Opportunities in 'low value' data processes: Several countries that are in the information processing and data analytics stage stand out as hubs for low value data activities such as simple analytics, content curation, clickwork, etc. They include India, Pakistan and the Philippines (and to a lesser extent some better-connected cities in Africa). This pathway depends on existing digital capabilities as well as infrastructure strategies and data rule alignment. Stories of well-established firms in Asia upgrading their information technology (IT) and business process outsourcing (BPO) in service value chains have been documented (i.e. from simple IT tasks towards higher value software development and IT project leadership roles). Whether these low value data activities will serve as a similar stepping stone for catching up in the data value chain is not yet certain, however.

iv) Building sector-specific applications linked to data: A data economy can be built in the application stage of the data value chain; policies that drive the adoption of data-rich applications are implemented that ultimately lead to new opportunities and demands. Strategies linked to the Fourth Industrial Revolution have received significant policy attention in several countries, notably Mexico and South Africa. The focus here is on data used in key industrial sectors and applications, supported by data capacity building, industrial data infrastructure and national demonstrators. Whether these strategies will have positive economic outcomes remains to be seen.

Data policy and future industrialization

An increase in data policies and activities is evident in digital latecomer economies. With the growing significance of data in value creation, data will play a key role in future industrialization.

Data policies are being integrated into broader pathways and are being aligned with broader development goals. These pathways are still emerging and whether they will lead to technological catching up is uncertain. Yet they provide an important first step for exploring how data policy could be strategically aligned with broader industrial development.

Endnotes

1 UNIDO, 'Industrial Development Report 2020: Industrializing in the Digital Age'.
2 Rodrik, 'New Technologies, Global Value Chains, and the Developing Economies'.
3 UNCTAD, 'Digital Economy Report 2019: Value Creation and Capture: Implications for Developing Countries'.
4 Li, Nirei, and Yamana, 'Value of Data'.
5 Mathews, 'Competitive Advantages of the Latecomer Firm'.
6 Azmeh, Foster, and Echavarri, 'The International Trade Regime and the Quest for Free Digital Trade'.
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8 UNCTAD, 'Digital Economy Report 2021: Cross-Border Data Flows and Development'.
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10 Raghavan, Jain and Varma, 'India Stack—Digital Infrastructure as Public Good'.
11 Bonina and Eaton, 'Cultivating Open Government Data Platform Ecosystems through Governance'.

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