Development of Singapore’s Digital Economy Satellite Accounts (DESA)

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Content

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Digitalisation is an important driver of economic growth

- National Research Foundation’s Research, Innovation and Enterprise (RIE) 2025 Plan – Smart Nation and Digital Economy
- Digital Economy Agreements (DEAs) with key partners such as Singapore-Australia DEA (SADEA), United Kingdom-Singapore DEA (UKSDEA) and Korea-Singapore Digital Partnership Agreement (KSDPA)

Growing presence of e-commerce and digital intermediation platforms (DIPs)

Creation of business models and gig economy jobs

COVID-19 pandemic further accelerated the pace of digitalisation globally
Monthly online retail sales and food & beverages (F&B) sales proportions have been increasing in Singapore.

Source: Singapore Department of Statistics (DOS)
No economy-wide measure of DE estimates in Singapore that is internationally comparable

Studies have been undertaken by Singapore government agencies e.g. Infocomm Media Development Authority (IMDA), Ministry of Trade and Industry (MTI) and Singapore Department of Statistics (DOS), to size the DE

- Definition and scope of measurement differ across these studies
- Usually based on a basket of indicators such as Gross Value Added (GVA) and e-commerce revenue

To develop DESA and produce internationally comparable estimates that can provide meaningful insights to policymakers and users
DESA covers OECD’s HPIs...

Digital Supply and Use Tables (DSUTs)

<table>
<thead>
<tr>
<th>Digital industries</th>
<th>Digital products</th>
<th>Nature of transactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Digitally enabling industries</td>
<td>Digital products within the SNA production boundary</td>
<td>i. Digitally ordered</td>
</tr>
<tr>
<td>ii. Digital intermediation platforms (DIPs) charging a fee</td>
<td>a) ICT goods</td>
<td>a) Direct from a counterparty</td>
</tr>
<tr>
<td>iii. Data and advertising driven digital platforms</td>
<td>b) Priced digital services – except cloud computing services and digital intermediation services</td>
<td>b) Via a resident DIPs</td>
</tr>
<tr>
<td>iv. Firms dependent on DIPs</td>
<td>c) Priced cloud computing services</td>
<td>c) Via a non-resident DIPs</td>
</tr>
<tr>
<td>v. E-Tailers</td>
<td>d) Priced digital intermediation services</td>
<td>ii. Not digitally ordered</td>
</tr>
<tr>
<td>vi. Financial service providers predominantly operating digitally</td>
<td>OECD’s HPI: Output and/or intermediate consumption of digital products</td>
<td>iii. Digitally delivered</td>
</tr>
<tr>
<td>vii. Other producers operating only digitally</td>
<td>OECD’s HPI: Output, GVA and its components, of digital industries</td>
<td>iv. Not digitally delivered</td>
</tr>
</tbody>
</table>

OECD’s HPI: Expenditures split by nature of transactions
... along with the international dimension of the digital economy, i.e. digital trade

<table>
<thead>
<tr>
<th>Nature of transactions</th>
<th>Products</th>
<th>Economic actors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digitally ordered</td>
<td>Goods <em>(Digitally ordered only)</em></td>
<td>Corporations</td>
</tr>
<tr>
<td>Digitally delivered</td>
<td>Services</td>
<td>Households</td>
</tr>
<tr>
<td>Transactions enabled via digital</td>
<td></td>
<td>Government</td>
</tr>
<tr>
<td>intermediation platforms</td>
<td></td>
<td>Non-profit institutions serving households</td>
</tr>
</tbody>
</table>

Key indicators:
- Exports and imports of digitally ordered goods
- Exports and imports of digitally ordered and/or digitally delivered services

DESA is based on the conceptual and compilation frameworks set out in the *Handbook on Compiling Digital Supply and Use Tables (OECD)* & *Handbook on Measuring Digital Trade, Second Edition (IMF, OECD, UNCTAD and WTO)*
Development of our digital economy measurement

**Mid 2020-2021**

- Conducted environmental scanning on other national statistical offices (NSOs) as well as international organizations
- Reviewed studies done by government agencies to size Singapore’s DE and indicators compiled related to DE
- Assessed the data available to compile DESA, and observed many data gaps

**2022**

- Engaged stakeholders, primarily government agencies, to introduce the DESA framework
- Collaborated with IMDA to improve on the data collection of DE indicators by adding relevant questions to Infocomm Usage by Enterprises (IU) Annual Survey
- Piloted collection of digital services trade information in DOS’ International Trade in Services (TIS) Survey
Development of our digital economy measurement

- **Obtained resources** to compile DESA
- **Engaged other NSOs** to learn and adopt their methods of compilation
- **Utilised web scraping techniques** to identify firms with both physical and online presence
- **Assessed and cultivated data sources** e.g. business, trade, tourist and household surveys, tax data, credit card transaction data

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**2023**

- **In Progress-2024**
  - **Complete scoping and compile** preliminary estimates for digital industries and digital trade
  - **Complete mappings** for digital products
Data collection – IMDA’s Infocomm Usage by Enterprises (IU) Survey

• Tapped on IMDA’s IU Survey to include relevant questions on DE, mostly related to the nature of transactions on digitally ordered and/or digitally delivered transactions

  ✓ **Economy-wide survey** that provides a consistent point for data collection on the level of infocomm usage by enterprises

  ✓ **Minimised respondents’ burden** by ensuring that the additional questions do not overlap with those in existing surveys

  ✓ **Learnt from other NSOs’ practices** (e.g. UK Office for National Statistics and US Bureau of Economic Analysis) in terms of data collection methods and survey questionnaire design
Data collection – IMDA’s Infocomm Usage by Enterprises (IU) Survey

• Some challenges faced during data collection:
  ✗ Sensitivity concerns of respondents in providing the required data (e.g. e-commerce revenue)
  ✗ Complexity of the data requirements which pose challenges to respondents

• To address respondents’ concerns, we plan to
  • Simplify and improve on the clarity of the survey questionnaire
  • Provide further statistical guidance on the complex scenarios e.g. ordering of goods and services through digital intermediation platforms
Data collection – DOS’ International Trade in Services (TIS) Survey

• TIS survey is the main data source for Singapore’s international trade in services statistics. Data is collected on types of services and trading partners.

• With reference to international guidance in the *Handbook on Measuring Digital Trade*, DOS piloted new questions on digitally delivered services to collect information on digital services trade information.

Section B4: Revenue/Receipts from Non-Residents (Percentage of Services Digitally Delivered)

Please select the percentage of each service that was digitally delivered by your firm to overseas customers. Digitally delivered services are transactions delivered remotely over computer networks.

<table>
<thead>
<tr>
<th>Include:</th>
<th>Exclude:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Any service delivered over the web / Internet (including via mobile devices), extranet, video conferencing, websites, applications, platforms, phone, fax or email.</td>
<td>• Services provided by your firm’s personnel travelling abroad to your customers.</td>
</tr>
<tr>
<td>• Services provided to your customer’s personnel travelling abroad to Singapore.</td>
<td></td>
</tr>
</tbody>
</table>
Data collection – DOS’ International Trade in Services (TIS) Survey

• To facilitate firms’ reporting, **only a percentage range is requested** for relevant services items that are prepopulated from data reported in earlier sections of the survey.

• In our experience, respondents generally understood the need for DOS to collect such data. However, some found it **challenging to provide accurate estimates** as such details are not tracked in their accounting records.
Data collection – DOS’ International Trade in Services (TIS) Survey

• To assist with the identification of digital intermediation platforms (DIPs) within Singapore, DOS also experimented with directly asking respondents to indicate whether their companies operate a DIP

• Based on preliminary survey results, we gather that it is important to provide further clarifications (e.g. use of examples) beyond the conceptual definition, as respondents may not understand the statistical scope of DIPs
• NSOs such as the Statistics Netherlands have been using **web scraping techniques** to detect and classify digital firms based on the content of the websites.

• Utilisation of similar web scraping techniques on our end to **identify firms with both physical and online presence**, and classify them to the different digital industry categories.
Web scraping – Identification of digital firms

**Step 1. Obtain URLs of enterprises**
- Gather from various sources e.g. surveys, administrative data, online directory, Singapore Network Information Centre (SGNIC)

**Step 2. Categorise based on the usage of their corporate websites using a supervised machine learning classifier**
A. Enterprises without websites
B. Enterprises with websites but do not generate revenue directly from their websites
C. Enterprises with websites and generate revenue directly from their websites

**Step 3. Merge information on predicted categories with other data on firm characteristics for further analysis**
- Use economic activity codes (ISIC equivalent) and other category-specific keywords to assign the firms into the correct digital industry
Web scraping – Using E-tailers as an example

Internet Economy C – Enterprises with websites and generate revenue directly from their websites

SSIC 46 – Wholesale Trade
SSIC 47 – Retail Trade
SSIC 56 – F&B
...

Keywords – Cart, order, ...

Scoping

Web scrape output

E-tailers

Similar scoping is done for digital firms under
- Data and advertising driven digital platforms
- Financial service providers predominantly operating digitally
Integrate various datasets to scope the remaining digital industries

Digital industries

- i. Digitally enabling industries
- ii. Digital intermediation platforms (DIPs) charging a fee
- iii. Data and advertising driven digital platforms
- iv. Firms dependent on DIPs
- v. E-Tailers
- vi. Financial service providers predominantly operating digitally
- vii. Other producers operating only digitally

Legend
- UEN = Unique Entity Number. UEN is Singapore’s identifier for firms.
- SSIC = Singapore Standard Industrial Classification. SSIC is Singapore’s International Standard Industrial Classification of All Economic Activities (ISIC) equivalent.
- VA = Value-added
- IC = Intermediate consumption
Development and compilation of DESA is dependent on resources available

- Multi-agency collaboration, with involvement from several government agencies
- Need to strike a balance between meeting users’ needs and aligning the compilation with international statistical standards

Wide range of data sources will be required to develop and compile DESA

- Survey data collection tends to be resource-intensive and subject to data quality assessments
- Use of alternative administrative data sources and estimation methods (e.g. card transactions data, tax data) would likely require more assumptions to be made, given that they are not collected primarily for statistical purpose and do not contain information at the required level of details
No internationally prescribed percentage cut-off to determine the firms to be classified in the digital industries

• Binary approach with predominance rule was the recommendation provided by OECD in the *Handbook on Compiling Digital Supply and Use Tables* for the scoping of firms to be included into the digital economy

• We need to consider compiling based on (i) internationally comparable estimates, (ii) source data availability, and (iii) resource requirements

• Testing of different parameters on datasets to determine the feasibility of the approach we will eventually use
Key milestones of Singapore's DESA

- **Digital industries** - Output, GVA and its components, of digital industries

- **Nature of transactions** - Expenditures split by nature of transactions

- **Digital products** - Intermediate consumption of digital products

- **Digital trade estimates**

By End-2024

By End-2025
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Thank you  谢谢
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