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THE OECD GOING DIGITAL MEASUREMENT ROADMAP

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Foreword

The OECD Going Digital Measurement Roadmap is an important tool to align countries' priority areas for measuring digital transformation using common methodologies and approaches. It was developed in partnership with all relevant OECD statistical bodies in 2019 and amended in 2022. The Roadmap identifies ten actions to enhance the capacity of countries to monitor digital transformation and its impacts. The Roadmap reflects a recognition that national statistical systems need to adapt and expand to adequately reflect the digitalisation of our economies and societies, including from a gender perspective. It also highlights the need for new, complementary data infrastructures capable of monitoring digital activities and data flows on a timely basis wherever they happen.

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The OECD Going Digital Measurement Roadmap

Measuring digital transformation is a key component of designing and implementing evidence-based policies today. Yet measuring the digital economy is complex, in part because digital technologies and data are everywhere to a greater or lesser extent, rendering the notion of a siloed "digital economy" somewhat obsolete. In the short-term, the challenge is to improve the international comparability of current indicators and make statistical systems more flexible and responsive to the introduction of new and rapidly evolving concepts driven by digital technologies and data. In the longer term, the challenge for the statistical community is to design new and interdisciplinary approaches to data collection and to leverage the information captured by digital technologies (e.g. sensors). Moreover, the next generation of data infrastructure requires partnerships with the private sector and engagement with stakeholders to bring reliable and representative data that is gathered with trust into the policymaking process.

To address these challenges, the OECD Going Digital Measurement Roadmap (the Roadmap) was developed in partnership with all relevant OECD statistical bodies in 2019 (OECD, 2019[1]) and amended in 2022. The Roadmap includes ten actions that if prioritised and implemented would substantially advance the capacity of countries to monitor digital transformation and its impacts. The Roadmap reflects a recognition that national statistical systems need to adapt and expand to adequately reflect the digitalisation of our economies and societies, including from a gender perspective. It also highlights the need for new, complementary data infrastructures capable of monitoring digital activities and data flows on a timely basis wherever they happen. The ten actions are outlined below.

Action 1: Make the digital economy visible in economic statistics

Measuring the digital transformation and its impacts requires the development of indicators that complement the views provided by traditional measurement frameworks, such as those used to measure GDP and trade flows. But even within these current frameworks the way that firms, products and indeed transactions are classified and identified requires adaptation. In addition, it is essential to accelerate efforts to capture relevant phenomena outside the current production boundary of national accounts, for example, those concerning the consumption (and value) of online services provided to consumers free of charge, such as online search, social networking sites and so on. At the same time, work on tackling the challenges of globalisation and the measurement of services not physically fixed to a single location (e.g. cloud services and services provided by online platforms) should be further encouraged. Platforms in particular raise new policy challenges, but little is yet known about the actors operating on them, their characteristics, the types of activities in which they engage, the services they provide, the value they create and the locations from which they operate. In addition, by providing easy access to customers for transport services, accommodation, food delivery and many others, online platforms are increasing the importance

of household production, blurring the lines between different institutional sectors within the economy and changing the nature of work.

National statistical offices (NSOs), research communities and international organisations are encouraged to continue to work together to:

- Populate the OECD digital supply-use tables (Mitchell, 2020[2]) and measure transactions in line with the Handbook on Measuring Digital Trade (OECD, WTO and IMF, 2020[3]), in particular for those areas that supplement national accounts and trade statistics, in order to obtain new details and perspectives.

- Within the framework of the digital supply-use tables and the Handbook on Measuring Digital Trade:

    - Identify transactions based on their "digital nature" (i.e. digitally ordered, digitally delivered and/or digital intermediary platform enabled) and new actors relevant for the digital economy (e.g. digital intermediary platforms, e-sellers and firms dependent on intermediary platforms).

    - Develop new aggregations of firms, products and transactions that provide more granular insights into the actors, including households and the products involved.

    - Better capture digitally enabled production by households and continue to develop estimates of unpaid household activities in economic statistics and tackle the challenge of understanding and estimating the value generated by services provided to users free of charge (though often involving an implicit transaction related to personal data).

    - Improve the quality and breadth of information on e-commerce transactions through enhancements to surveys on ICT use by businesses and individuals, the incorporation of e-commerce questions into other appropriate surveys (particularly e-commerce revenues in structural business surveys and online spending in household expenditure surveys), and the use of alternative data (e.g. anonymised information on transactions from banks and credit card companies).

    - Support the development of common definitions and taxonomies of different types of platforms, formulate standard questions on platform work for inclusion in relevant surveys (e.g. labour force, ICT usage and time-use surveys) in order to derive robust estimates of the numbers of platform workers, and explore the role of administrative data and alternative data sources (e.g. web-scraped data) to gain insights into platform-intermediated transactions.

Action 2: Understand the economic impacts of digital transformation

Digital technologies are implemented as a part of business processes, together with labour, capital and knowledge capital assets, in order to drive performance. The initial and strongest evidence of their economic impact will likely surface in micro-data (data about firms, workers or consumers) before showing up in macro-data. To this end, it is important to be able to link together existing datasets, exploit the potential of administrative records, and develop measures of digital maturity in business that can then be used to analyse the impacts of digital technologies on firm performance. Robust measures of changes in prices and quality are also crucial to analysing the contribution of digital technologies to economic performance. For example, measures of the actual performance of broadband connections (i.e. broadband quality) are critical for consumers to make informed choices, and for policy makers and regulators alike to ensure that the services provided are of optimal quality. However, they are also key to measuring productivity and assessing the contribution of ICTs to economic growth. Digitalisation may also further

complicate the measurement of prices and volumes more generally, as it increases the pace of quality change, leads to changes in the outlets through which products are sold and may involve new price differentiation practices, among others.

Quality of service provision should also be considered in the context of "divides", such as between businesses of different sizes, or households with different compositions, incomes or locations. To this end, business and household surveys on the adoption of digital technologies should continue to be reviewed regularly to fully account for emerging phenomena, such as high-speed broadband, cloud computing services, data assets and other technologies, both as enablers of innovation and as contributors to business performance and consumer welfare. At the same time, opportunities to further capitalise on administrative data through linking existing datasets should continue to be exploited. In addition, surveys of technology adoption and administrative data need to be aligned with aggregate economic measures.

The broader statistical community is encouraged to:

- Improve the measurement of ICT investment to arrive at internationally comparable deflators for hardware, software and communication infrastructure, including the pricing of broadband services bundles, and analyse the impacts and opportunities digitalisation creates in relation to the measurement of prices and volumes more generally.

- Improve the measurement of broadband quality (performance), including experienced speeds, latency, reliability and robustness of broadband services in both rural and urban areas.

- Regularly review the framework for measuring ICT usage to identify and prioritise areas in which surveys can improve and evolve in line with ongoing developments and policy priorities; this includes delivering sufficiently granular detail for the differentiated analysis of impacts of the digital transformation on individuals, firms and places.

- Exploit the statistical potential of administrative data sources and review existing data collections to maximise data-linking opportunities for research.

- Improve access to these datasets while ensuring data confidentiality.

Action 3: Encourage measurement of the digital transformation's impacts on social goals and people's well-being

The digital transformation impacts many aspects of people's lives. Accordingly, measurement frameworks are required to capture these aspects including emerging impacts. In this respect, frameworks play a key role in measuring the extent to which digital technologies and new business models can help address societal goals, including those associated with health, ageing populations and climate change. At present, evidence of the impacts of the digital transformation on well-being is scarce in many areas. For example, relevant data on how the use of digital technologies affects people's experiences of mental health or their social lives are not collected frequently or in a harmonised manner. Survey vehicles are an important source of self-reported objective and subjective data. They can be used to collect data on people's life experiences in the context of the digital transformation, as well as to attempt to establish causal relationships (e.g. between the diffusion of digital technologies and various well-being outcomes).

The broader statistical community is encouraged to:

- Promote wider implementation of the OECD Model Survey on ICT Access and Usage by Households and Individuals (OECD, 2015[4]) to develop subjective well-being and mental health questions for inclusion.

- Include detailed ICT-use variables in household surveys (e.g. general social surveys and labour force surveys), and especially in longitudinal surveys, in order to better understand the causal relationships between Internet use and well-being outcomes over time.

- Develop new statistical tools including surveys to monitor the impact of ICT use on adults and children, such as exposure to disinformation or hate speech.

- Improve measurement of the impact of the digital transformation on the environment, by enhancing statistical linkages among ICT-use surveys, consumer expenditure surveys, supply-use tables and industry-level data.

Action 4: Design new and interdisciplinary approaches to data collection

Given the pace of technological change, it is understandable that current frameworks are not yet able to reveal the full magnitude and scope of the digital transformation. However, digital technologies can be part of the solution as they generate enormous flows of information. Numerous online actions leave digital "footprints" that can be observed using tools that scan, interpret, filter, gather and organise information from across the Internet. While they offer great opportunities for statistics, Internet-based data also raise a number of issues regarding statistical quality, security and privacy that must be addressed. The Internet also enables the creation of non-physical organisations and the flexible outsourcing of business activities, within sectors of activity and across locations, thus blurring the boundaries between firms and markets and between work and social life. This creates challenges for current methods of collecting statistics. New interdisciplinary methods of analysis are therefore necessary to understand innovative behaviour, its determinants and its impacts at the level of the individual and the organisation.

NSOs, regulators, Internet Service Providers (ISPs), the research community, the Internet community and international organisations are invited to work together to:

- Further develop international statistical standards for the collection of Internet-based data and their compilation into statistical indicators (e.g. treatment of web search results).

- Assess alternative models of co-operation among businesses, Internet intermediaries and NSOs for the collection and treatment of Internet-based data; and promote the development of an associated regulatory framework, including technical and regulatory solutions, to preserve user security and privacy.

- Develop interdisciplinary approaches to data collection and new units of data collection.

- Improve the measurement of digital activities in complex business structures, organisations and networks.

Action 5: Monitor technologies underpinning the digital transformation, notably the Internet of Things, AI and Blockchain

A range of rapidly developing technologies are set to drive the next phase of the digital transformation. The Internet of Things (IoT), an ecosystem in which applications and services are driven by data collected from devices that act as sensors and interface with the physical world, is expected to grow exponentially, connecting many billions of devices within a relatively short time. IoT applications span economic sectors including: health, education, agriculture, transportation, manufacturing, electric grids and many more. Meanwhile, artificial intelligence (AI) has the potential to revolutionise production as well as contribute to tackling global challenges related to health, transport and the environment. Blockchain likewise has the potential to transform the functioning of a wide range of industries and applications such as finance, health,

transportation, agriculture, environment and supply chain management. The general purpose and interdisciplinary nature of these digital technologies underscores the need for a consistent framework to define them, identify their emergence, monitor their development and diffusion, and quantify their economic and social impacts.

Policy makers, regulatory authorities, business, statistical and research communities are encouraged to:

- Develop internationally harmonised definitions and taxonomies for AI and Blockchain, fit for the purpose of monitoring the development of these technologies and their applications, including defining the key policy needs for measurement.

- Build on the OECD definition of IoT (OECD, 2018[5]) and related taxonomies for its application domains (e.g. massive machine communications such as sensors for smart cities, critical IoT requiring ultra-fast and highly reliable connections such as automated vehicles); and provide clear prioritisation for the measurement of those IoT elements and indicators of most relevance to policy makers, beyond simple counts of machine-to-machine connected devices, in order to measure the potential demands IoT might create for communication infrastructures due to the flow of large amounts of data generated.

- Engage with stakeholders within the IoT ecosystem (e.g. different connectivity providers, IoT platform providers, etc.) for the benefit of data collection and policy and regulatory analysis.

- Develop tools to monitor the adoption of IoT, AI and Blockchain technologies by businesses and the impact of their diffusion on performance and productivity.

Action 6: Improve the measurement of data and data flows

In recent years, both the scale of data usage and its importance for many business models and processes has increased exponentially. However, there are significant challenges involved in evaluating data as an input to production and their "asset-like qualities". Data flows between organisations in particular can take place quickly and at low cost. Moreover, different organisations can derive value from the same data, at the same time, without diminishing what others can do with them. Finally, the value of data is heavily context-dependent (e.g. on the information contained and how it is used). The combination of these factors results in many conceptual and practical measurement challenges. These are further amplified by the fact – linked in part to the proliferation of cloud computing services – that these flows and interactions commonly occur across national boundaries.

The statistical, business and research communities, and international organisations are encouraged to work together to:

- Develop pertinent taxonomies and classifications of data for statistical measurement purposes.

- Further study the role and nature of data in business models and processes.

- Explore methods for measuring data flows and stocks.

- Improve the measurement of knowledge-based assets including data and their role for production, productivity and competitiveness.

Action 7: Define and measure skills needs for the digital transformation

The development of the digital economy and its applications, such as "Big data" analytics, cloud computing and mobile applications, increases the demand for certain skills that are often in short supply. At work, a shortage of ICT specialists may be compounded by managerial obstacles to the development of new

business models, new organisational structures and new working methods. At the same time, demand is rising for complementary skills, such as the capability to compile and analyse information, communicate on social networks, brand products on e-commerce platforms and so on. This trend also heightens the need for users to learn how to search and choose among a myriad of mobile applications and to know how to protect themselves against digital security risks ("digital hygiene").

Traditionally, official statistics have used educational attainment, vocational training with standardised content, or occupational categories with codified and predictable tasks as a proxy for skills. New insights could be gained by exploiting and harmonising detailed national surveys on tasks and skills and by working with the business community to define new metrics of skill shortages.

The statistical, business and research communities, and international organisations are encouraged to work together to:

- Exploit the potential of existing public and private statistics on skills, and occupation and industry classifications, and to promote the harmonisation of national job tasks surveys.

- Better exploit existing cross-country surveys (e.g. the European Survey of Working Conditions and the OECD Survey of Adult Skills - PIAAC), and promote the linking of employer-employee datasets containing information on skills, jobs and activities at the individual level.

- Improve access to and the use of online vacancy datasets to measure vacancies in digital-related jobs, their duration and rate of filling.

- Encourage the systematic use of expert assessment to identify emerging skills needs at a detailed level of tasks and occupations, and across different countries.

Action 8: Measure trust in online environments

Management of security, privacy and consumer protection risk online, as well as the general level of trust of the population in online environments, have become key policy issues as individuals, businesses and governments shift large parts of their daily activities to the Internet. While efforts have been made to improve the measurement of trust, such as the harmonisation of statistics from Computer Security Incidents Response Teams (CSIRTs) and a consumer survey of attitudes to trust in peer platform markets, other avenues should be explored further. For instance, the OECD has developed an analytical framework for measuring digital security risk management practices in businesses, based on the Principles contained in its 2015 Council Recommendation on Digital Security Risk Management for Economic and Social Prosperity. This framework has led to the identification of a set of potential core indicators. Work is also ongoing to improve the international comparability of personal data breach notification statistics, which are produced by Privacy Enforcement Authorities (PEAs). Despite the broadly acknowledged importance of trust between partners in online exchanges, measurement of these aspects of trust is not a longstanding practice, especially within official statistics. Alternative approaches currently underway utilise behavioural insights from experiments, for example, to ascertain how disclosures impact consumer trust in the context of personalised pricing in e-commerce. Internet-based data (e.g. malware activities recorded by a firewall, use of sentiment analysis on social media to measure people's trust, cookie statistics, browser settings or statistics on downloads of security/privacy-related software) could also be used to measure various aspects of trust.

The statistical community, regulators and other stakeholders, such as Internet intermediaries, business and consumer associations, and international organisations are invited to work together to:

- Develop guidance for PEAs to produce and report internationally comparable statistics on data breach notification.

- Develop a more reliable and comprehensive dataset on digital security incidents and digital risk management practice, key elements of which include reaching a consensus on typology and taxonomy, the creation of a trusted public-private digital security incident repository, and incentives to promote the reporting of incidents and data sharing by organisations.

- Test and improve the quality and rate of response of digital security-related surveys.

- Further study consumer attitudes and behaviour to highlight contexts where trust in online interactions increases or decreases, with a view to improving survey methodology in this area.

- Develop a framework for measuring individuals' trust in online environments, and explore survey-based and experimental approaches to test the feasibility of measuring this trust.

- Explore the use of Internet-based statistics to measure trust-related aspects and promote a statistical quality framework for Internet-based data.

Action 9: Establish an impact assessment framework for digital governments

Governments are progressively adopting digital technologies to encourage innovation in service design, operation and delivery. The move from using digital technologies to improve efficiency (e-government) to using them to influence and shape public governance outcomes (digital government) should enable governments to better respond to broader policy imperatives such as public trust, social well-being and civic engagement. To address the challenges and seize the opportunities of the digital age, governments should prioritise the establishment of an impact assessment framework to measure the concrete contribution of digital government to broader policy outcomes.

Policy makers, the statistical and research communities, and international organisations are encouraged to work together to:

- Develop new statistical tools to assess the effects of digital technologies on the relationship between governments and citizens and businesses, taking into special consideration the extent to which key groups are impacted (e.g. seniors, low-income households, single parents, those with disabilities or mental health issues and so on), and providing evidence on the overall level of public trust in government.

- Define metrics to assess the effect of digital technologies on driving more efficient, inclusive and tailored public service delivery.

- Develop metrics to measure the impacts of existing practices and policies to promote public sector data sharing, access and re-use, including with regard to citizens' trust in the ability of governments to handle personal data.

- Establish guidelines for public sector organisations to measure the scope and impact of data re-use in public administrations and on public policy-making processes.

- Measure the diffusion of emerging technologies such as AI and Blockchain within government processes and services.

- Evaluate potential barriers to the full integration of digital technologies within government.

Action 10: Expand the collection and accessibility of gender statistics

Expanding the collection and accessibility of gender statistics relevant to digital transformation is essential to understanding the existence and extent of digital divides across all dimensions of the OECD Going Digital Integrated Policy Framework (the Framework) (OECD, 2020[6]) and developing well-suited policies

in response. To develop new indicators and enhance existing gender statistics, it is necessary to use both traditional and non-traditional data collection techniques, foster trust by all actors, and ensure that data quality is maintained and biases, including those that might emerge with non-traditional data collection approaches, are addressed. It is also important to achieve consensus among Members on priority areas and methodologies.

National statistical offices, Ministries responsible for digital transformation policies, regulators, the research community, the Internet technical community and international organisations are invited to work together to:

- Align Members' priorities for gender statistics using common measurement methodologies and approaches.

- Encourage the collection of gender statistics in official surveys as well as other data collection approaches, and make that data easily accessible to support evidence-based policymaking.

- Develop a systematic understanding of gender biases in existing and future datasets, including those created using non-traditional data collection approaches.

- Engage with the private sector to make use of privately held data using confidentiality agreements and other trust-building mechanisms to allow for the development of new gender statistics and breakdowns.

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