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# Information Economy and Data Protection Laws: A Global Perspective

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## ABSTRACT

The research paper under review examines the information economies of various countries and studies their related data protection laws associated with those countries. The trade aspects of information economies including the ICT tools and the ICT enabled services have also been dealt with to assess the role and the impact of ICT tools in implementation of international trade among various countries to enable to achieve sustainable development goals targeted by the United Nations by the turn of 2030. The paper also highlights the various aspects of information technology tools such as artificial intelligence, cloud computing, robotics, framework of digital economy, e-commerce and e-Trade readiness etc., among others. The role of UNCTAD as an international organization with regards to promoting ICT tools and IT-enabled services to achieve international trade and in particular e-Trade and e-commerce leading to a seamless digital economy among various countries have also been focused in the research study. The data protection laws of various economies both developed and developing, have also been assessed to study specifically the role and impact of these cyber laws/data protection laws on the international economy including their related implications/ramifications on the regional, national and local economies, which would have a significant and sizeable impact on international trade including e-Trade among various economies. Though the developing economies including undeveloped, small island and landlocked economies have more or less good IT penetration, but their data protection laws seems to be still in prototype stage and need to be synchronized and integrated with the global data protection laws to achieve global e-commerce and e-Trade and a robust global digital economy. This would go a long way in achieving the SDGs slated by UN by the turn of 2030.

**Keywords:** Information economies; e-Trade; Local economies; Laws; Digital economy

## 1. INTRODUCTION

This research paper focuses on the new digital economy (NDE) which could be addressed at the international level and most prominently include viz; i) advanced manufacturing, robotics and factory automation, ii) new sources of data from mobile and ubiquitous Internet connectivity, iii) cloud computing, iv) big data analytics, and v) artificial intelligence. The main driver of the new digital economy is the continued exponential improvement in the cost-performance of information and communications technology (ICT), mainly microelectronics. The process of innovation have been altered due to the rapid digitization of design, advanced manufacturing, robotics, communications and distributed computer networking (e.g. the Internet), the content of tasks, and the possibilities for the relocation of work for decades. The paper discusses the various features of the NDE that are relatively novel i.e. (i) new sources of data, from smart phones to factory sensors, are sending vast quantities of data into the "*cloud*," where they can be analyzed to generate new insights, products, and services, (ii) new business models based on technology and product platforms, platform innovation, platform ownership, and platform complimenting are significantly altering the organization of industries and the terms of competition in a range of leading-edge industries and product categories and (iii) the performance of ICT hardware and software has advanced to the point where artificial intelligence and machine learning applications are proliferating. These novel features of NDE share reliance on very advanced and nearly ubiquitous ICT, embedded in a growing platform ecosystem characterized by high levels of interoperability and modularity. The NDE appears poised to extend the organizational and geographical fragmentation of work into new realms, including formerly indivisible and geographically rooted activities that reside at the front end of global value chains, especially R&D, product design, and other knowledge-intensive and innovation-related business functions. The impact on jobs and international competition would crucially depend on the pace of change and the ability of organizations and societies to manage it. The paper discusses how the NDE can be defined, explores its likely implications for the location of innovation and manufacturing, notably involving developing countries. The likely implications for smaller and developing country firms are discussed, as are positive and negative scenarios for society in general.

Recent public debate has become focused, with increasing frequency and urgency, on the imminent arrival of a "*4th Industrial Revolution*" which is said to be creating a "*new*" digital economy (NDE) powered by advanced "*cyber-physical*" systems spanning "*advanced*" manufacturing, transportation, services, and even biological systems [1-3].

Technological change and globalization have driven fragmentation in the organization and location of many industries for some time. To understand its characteristics, geography and social impacts, the NDE needs to be measured. Because many of the transactions and interactions in the NDE would be electronic, and cross borders without easy detection or characterization, the ability of official statistics to measure basic economic indicators such as investment, trade, and profits could be further hampered. On the other hand, '*big*' economic data might help data agencies overcome some of these problems.

## 2. ORGANIZATION OF THE PAPER

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The paper has been organized into and focuses on the following sections at length viz

1. Advanced manufacturing, robotics and factory automation
2. New Sources of data and the Internet of Things (IoT)
3. Cloud Computing Big data analytics
4. Artificial intelligence
5. Business models and industry organization in the
6. NDE Importance of platforms
7. Open innovation standards
8. Globalization and modularity
9. Manufacturing in the new digital economy and their trade-offs
10. Geography of advanced computing & geography of innovation in the NDE
11. Manufacturing in the NDE and their trade-offs
12. Scenarios for developing countries in the NDE
13. Winners and losers, opportunities and risks
14. Data partitioning and the new digital divide
15. Internet and Digitalization including digitally ordered transactions and delivery
16. Dimensions of digital trade including digital ordering & transactions
17. Compilation of digitally delivered transactions and digitally ordered goods and services
18. Role of UNCTAD as an international organization in promoting digitalization, digital trade including
19. Trade in ICT goods & services, e-commerce & e-trade and
20. Functions of Inter-Agency Task Force on Digital Trade and E-Commerce of UN- ECOSOC.

## 3. Review of Literature: Aspect-Wise

The review of literature of the paper aspect-wise is as follows:

### 1.Industrial Robots

Industrial robots have been available for decades, but they have steadily become more intelligent, agile, and flexible. The mechanized mass production revolution of the early 20th Century brought in dedicated production equipment for repeated operations [4].

Industrial robots are also becoming more artificially intelligent. As robots become more agile and aware of their surroundings, they might work safely side by side with people to augment and assist workers, rather than replacing them. Such "*robots*" might eventually perceive human movements and automatically and intelligently adjust their movements and routines on the fly through machine learning [5].

### 2. Manufacturing, Technology & Innovation

Manufacturing technologies are also driven forward by innovation. In the most advanced and experimental manufacturing environments, such as the creation of new materials, complex pharmaceuticals and synthetic biologics, it can become difficult to separate new products from new processes [6].

### Internet and Network Service Providers

The largest user of Internet bandwidth in the United States, Netflix, now relies mainly on network service providers such as Comcast, Verizon, and AT&T to store and serve up streaming content to customers, and on the cloud resources of Amazon Web Services for search, personalization, and even the sensitive billing and payments portion of its system externalization and aggregation of computing resources and data in the cloud that justifies the modifier "*new*" in the term NDE [7].

### 3. Architecture of NDE, Technology and Digital Platforms

The architecture of the NDE is, and would likely continue to be, characterized by a set of more or less, interoperable technology and product platforms [8, 9].

According to McAfee et al. [10], "*it is estimated that Wal-Mart collects more than 2.5 petabytes of data every hour from its customer transactions. A petabyte is one quadrillion bytes, or the equivalent of about 20 million filing cabinets' worth of text*."

### Cloud Computing & Artificial Intelligence

If the cloud contains vast quantities of data, and analytics lead to a deeper understanding about the sources of data (human and machine) and social and business dynamics they represent including how the NDE is functioning then AI, or machine-learning algorithms, can begin to make "*predictions and decisions in an increasingly automated way, and at large scale*" [11]

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Artificial intelligence has a long history, in part tied up in two competing approaches, rule-based decision-making versus machine learning [12].

### 4. Technology, Domains and Open Innovation

The complexity and multiplication of technology domains in the NDE have led industry players to make heavy use of "*open innovation*" to create the resources needed to develop and ensure the interoperability of a range of sub-system elements, from network infrastructure, to operating systems, to AI test datasets and algorithms [13].

### 5. Key Issues in Digital Economies and Data Protection Laws

Government's specifically in those developing countries attempting to adopt data protection legislation are having problems modelling their data protection regimes, though most opt for an approach consistent with the EU Directive. Common challenges include (i) the length of time it takes to pass legislation, (ii) financial costs associated with implementing and enforcing a data protection regime, and (iii) a lack of public and private sector knowledge and cooperation among governmental entities regulating in parallel. In some countries, a lack of understanding and fear within society also exacerbates one or more of the aforementioned difficulties. On the consumer side, concerns related to payment system integrity, hidden costs, fear of fraud and product quality are often more pronounced in the context of international e-commerce. Building trust in the online environment is key, and there has been a decline in trust

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with regards to transactions with both government and private actors. Studies show that consumers are concerned about how their personal data are collected and used, and that these concerns are increasing. A lack of clarity with regard to protection and avenues for redress tends to further aggravate these concerns. Businesses are concerned that (i) too stringent protection regimes would unduly restrict activities, increase administrative burdens and stifle innovation; (ii) a lack of clarity and compatibility between regimes add uncertainty, with negative effects on investments; and (iii) given the nexus between cross-border e-commerce and data protection, divergent regimes would inhibit the adoption and proliferation of emerging technological developments, reducing potential accompanying societal benefits.

## 6. Approach to the Problem and Hypothesis

The research paper broadly focuses on the growth and development of the digital economy in enhancing international trade. The basic problem of the '*new digital economy*' could be related very much to the least developed, small island and undeveloped economies which are lagging behind even though there is a certain degree and level of internet penetration in these countries to achieve digital trade. The proposed hypothesis that though there is a good level of awareness regarding growth and development of the digital economies which have been undertaken by UNCTAD, an international multilateral trade and development organization, on a continuous basis and from time to time, particularly in the small island, undeveloped and landlocked economies, but international trade can only be enhanced if there are proper and adequate ICT facilities and tools and adoption of seamless digital connectivity in these countries. In fact, from the data/information available from various international, national, regional and local organizations, it can be inferred that these economies are yet to be equipped with the required infrastructure, such as, adequate and proper ICT tools and trade logistics to undertake seamless digital trade at the global level which in the process could enhance e-commerce and e-trade thereby leading to promoting international trade.

## 7. Advanced manufacturing, robotics and factory automation

It was time-consuming and expensive to change what machines did, and the range of possible operations was severely limited. In the 1980s and 1990s, certain computer numerically controlled (CNC) production equipment earned the label of "*robot*" because they could be programmed and re-programmed to increase product variety and perform a range of operations in three-dimensional space. Over time the flexibility and speed of industrial robots and other CNC machinery have increased while costs have come down. Currently, relatively simple statistical process control algorithms could be relied on to shut down or adjust production processes automatically when they move out of tolerance. However, with the rise in computing power and advent of low-cost sensor technology, the collection and sharing of operational data across like machinery, within and even across factories, has made "predictive maintenance" possible, preventing processing errors or machine breakdowns before wear and tear of mechanical components or other predictable problems cross critical thresholds.

The International Standard Organization (ISO) defines a robot as an "*automatically controlled, reprogrammable, multipurpose manipulator, programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications*."

## 8. New Sources of data and the Internet of Things

Productivity improvements have long been based on data, from *(Frederick Winslow Taylor's)* time and motion studies of workers in the early 20th Century, to Japan's "*lean production*" principles of continuous improvement and total quality management in the 1970s and 1980s, to the "*Six Sigma*" movement toward "*zero defects*" in the US in the 1990s. Improvements come from measuring things, from the time it takes a worker to take a part from a bin, to the dimensions of a given part, to the number of defects coming from a specific supplier, to the relationship between air filtration levels or humidity and yields in a semiconductor plant. Needless to say, the art of measurement has become more sophisticated, from Taylor's famous stopwatch, to cards on a kanban board signalling a need for more parts, to barcode readers that follow parts through a factory to allow traceability across the supply chain, to laser scanners and test equipment that check the tolerance of parts to the nanometre. Today, low-cost sensor technologies widen the scope for measurement in factories. Sensors are embedded, not only in robots and production equipment, but in operator wearable devices, industrial vehicles, buildings, and pipelines. This is enabled by the falling cost of sensors that can continuously, periodically and automatically transmit data with very low power and bandwidth requirements. Wireless transmission introduces new levels of flexibility in regard to where sensors are practical, allowing remote devices to be linked with centralized systems. Since data can be collected on an on-going basis from multiple sources and in multiple points in the system, vast amounts of data can be accumulated over time.

The examples provided so far come from the industrial sector, and manufacturing has indeed been a main source of innovation for data-driven productivity improvement. But today, on-going digitization and the advent of the 'Internet' mean that data are gushing from every corner of industry and society, not only from sensors built into production lines, but also from electric meters, security cameras, customer service call logs, mouse "click streams" from online activity, point-of-sale registers, Facebook "likes" and status updates, and voice commands given to Amazon Echo or Google Home.

## 9. Cloud Computing

Cloud computing does not signal a shift back to centralization in computing architecture. UNCTAD describes cloud computing as a system that "*enables users, through the Internet or another digital network, to access a scalable and elastic pool of data storage and computing resources, as and when they are required*" [14]. The most significant difference from the 1970s mainframe era is that remote computing and storage

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are no longer centralized within enterprises, but distributed across the Internet, accessible to anyone with authorization and the means to pay for access.

The largest vendor of PC software, Microsoft, now earns more than half its revenue from cloud-based software [15]. Instead of downloading programs and installing them on PCs, web browsers have become the means of manipulating software and data that reside online. Storage space, applications, and platforms can be rented (usually according to a monthly subscription), and kept updated by the vendor. The shift of software as a product purchased in physical form on a disk or as a download, to software-as-a-service (SaaS) and platform-as-a-services (PaaS), means that software is always available, from anywhere with a suitable Internet connection, and is always up-to-date. The same goes for storage, which is shifting from the PCs and private networks to the cloud.

While data integrity and security are obvious risks, the cloud offers even greater promise as a place where data can be analyzed in vast quantities. This promise is heightened by the ever-increasing flows of new data entering the cloud each day. The question of how to make use of cloud-based data is answered, in part, by the field of data science, or big data analytics.

## 10. Big data analytics

The cloud is more than a place to store data and run programs. It is a receptacle for the huge volumes of data flowing in autonomously from the IoT. If the sensors and devices that make up the IoT automatically feed data into the cloud, duly tagged with fine-grained meta-data (about its source, location, etc.), they can be "*mined*" for insights that enable "*data-driven decision making*" by businesses, government agencies, and any person or organization with access to the data and the means to carry out further analysis. This is not simple or easy, since large sample sizes increase the robustness of analysis, but also introduce risks. One of the central challenges of analyzing big data is to develop methods for screening out the "*noise*" from poor data quality (including incorrect metadata tags) and weighting and interpreting data from different sources and of different kinds.

On the industrial side, companies such as General Electric offer a host of generic, industry-specific, and customized data analytics services for manufacturers on its Predix platform. In the realms of public health, social science, marketing, and innovation, new possibilities are seen emerging for "*crowd-sourced*" insights, such as tracking the timing and location of disease outbreaks through real time analysis of Google search terms [12,16]. Reliance on user reviews is a central feature of a range of online retail businesses, from e-commerce sites such as Amazon and Alibaba, to travel services such as Trip Advisor, Hotels.com, AirBnB, HomaAway, and C-Trip. While use of data for targeted marketing or improving operational performance is not new, McAfee et al. [16] identify three new aspects of "*big*" data: volume, velocity, and variety. Because it is scalable and always available and accessible, the cloud is allowing businesses to accumulate unprecedented volumes of data, available in near real time, in a wide variety of forms (written, numerical, audio-visual). Volume and variety increase accuracy of analysis (e.g. The "*wisdom of the crowd*,") and high velocity improves responsiveness and relevance. The volumes of data are staggering. One of the biggest challenges to using big data for making decisions is data integrity. How can decision makers know data have not been altered from their original? "*Blockchain*" is a powerful encoding and data sharing method that encrypts data, for example, with time and location stamps, so values cannot be altered after the fact. Asking about data integrity is different than asking about data accuracy or what a piece of data means. A defective sensor might provide faulty data, for example, and a value of 10 degrees Celsius from a temperature sensor may or may not mean a machine or process is operating out of range. Data accuracy and meaning have always been determined through analysis, but the importance of data integrity raises when data pools become very large, and especially when data are pooled and made available publically or across organizations. This is exactly what blocks chain systems are intended to facilitate.

## 11. Artificial intelligence

AI technologies have been publically available, often open sourced and for free, since 2008. However, to date they have been too slow and unstable to come into mainstream use. Advances in microelectronics, especially very powerful graphic processing chips (GPUs), mean that large pools of data can be analyzed and mathematically represented in graphic matrices, allowing machine learning to be carried out without deep domain knowledge of how objects are being incorporated in the model. The current excitement and worry about AI is coming from its gradual move beyond "*supervised machine learning*," where humans tag images and other data and define the "*right*" solution in advance (which mainly creates an appearance of machine intelligence) with the addition of "*unsupervised learning*," where the no solution is defined a priori and machines are able to classify unlabeled data on the fly, allowing system performance to improve without human intervention (March, 2017). Computers are good at making decisions based on logical rules, while replicating the "*neural networks*" of the brain to allow machines to "*learn*" and create new programming in response to stimuli, has proved to be extremely challenging from a mathematical and computer hardware perspective.

## 12. Business models and industry organization in the NDE

The technological advances of the NDE have come with a set of business models and industry organization characteristics that are all, in one way or another, meant to dynamically cope with growing system complexity. There is no way any one individual or organization can fully understand or control the underlying technology of the NDE or the specific domains where it operates. Collaboration across fields such as computer and data science with biology, political campaigning or banking is necessary, but not sufficient. Systems must be designed to dynamically cope with immense and growing complexity without breaking. The systems of the NDE must: i) rely on 3rd parties for complementary products and services, ii) draw on outside and even communally held sources of knowledge and technology, and iii) be partitioned into self-contained,

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manageable, affordable, yet interoperable segments. In other words, the NDE must be based on platforms, open innovation and modularity.

### 13. Importance of platforms

The complexity of the technologies and embedded products and services underlying the NDE means that no single company (or country, region, or technology cluster, for that matter) can master, control, or own all system elements. Over time, information technologies, including the electronic control of mechanical systems, have developed as a set of nested modules and platforms based on both de jure and de facto standards, stretching from discrete functional elements (technology platforms) to higher level tools, hardware systems, and software environments (core platforms) upon which developers can create a variety of goods and services for end users (higher-level platforms) and because modular system elements can be altered and upgraded without redesigning the entire system, there is no obvious limit to the depth and complexity of the NDE. The platform structure of the NDE allows final systems with extreme levels of embedded complexity and a broad range of capabilities. It also lowers the barriers to entry for both 3rd party technology vendors, which can sell discrete modules, products and services into the system; as well as opens up vast opportunities for companies, such as Facebook, to build higher-level platforms on top of lower-level platforms (e.g., PCs and mobile phones). To put it simply, because of the rich eco system of technology and product platforms, web services companies such as PayPal, Airbnb, or Alibaba, did not have to create the PC, the smartphone, the Internet, or any of the software programming languages they use to build or maintain their websites nor did they have to create the cloud storage services that they can use to collect and analyze their vast stores of data.

To sum up, the NDE can be described as a platform-based eco system of ICT-based products and services. It is rapidly evolving through a combination of ubiquitous and continuous measurement and data collection. IoT data is flowing from sensor-laden factory automation and business process systems as well as Internet-connected user devices, most obviously smart phones but including a growing list of Internet-connected products, from home appliances to automobiles. The IoT is generating "*big data*" pools that, because they reside in the "*cloud*", can be mined and analysed for patterns and correlations that would otherwise remain hidden, with these results fed into AI systems where machine learning and automated decision-making can be used to suggest upgrades to system elements and, speculatively, to the entire system.

Platform owners, such as Facebook, Google, Amazon, Microsoft, Alibaba, General Electric, SAP, and many others, already have big data and AI at the centre of their business models, and the capability for analysis would be much broader and deeper once larger swaths of society are connected via the IoT and improved AI technologies are developed and deployed.

### Open innovation, open standards

Open innovation refers to the strategy of relying on external, often shared and sometimes crowd sourced resources as an integral part of a company's innovation process.

### 14. Globalization and Modularity

Computerization of work, from product design and engineering, over manufacturing and logistics, to services, has enabled the geographic fragmentation of industries. Because computerization typically comes with rationalization of work processes and explicit rules, it facilitates standardization, and therefore the transfer of tasks from one stage to the next, either across organizations (outsourcing) across borders (offshoring), or both (offshore outsourcing). In the past 25 years, advancements in the ability to codify and transfer highly complex information from one stage of the value chain to the next, combined with plummeting costs for both the movement of goods and making voice and data connections, has enabled the shift of manufacturing to countries such as China and Vietnam and the sourcing of a variety of services from countries such as India and the Philippines.

### 15. Manufacturing in the NDE, what are the trade-offs

Industrialization has long been viewed as the path to development and traditionally, industrialization has meant manufacturing. While productivity increases and globalization have rendered this path less certain [17], manufacturing still plays an important role in all developed countries, even though its share of employment in advanced economies falls below 10 percent. What would the role of manufacturing be in the NDE, and the discussions of the topic, generally referred to as "*industry 4.0*" in Germany and "*advanced manufacturing*" in the US [6,18], tend to highlight specific features, including additive manufacturing (or 3D printing), intelligent and adaptive robots that can safely work alongside humans, ubiquitous measurement with sensor-laden equipment, very high levels of traceability in the supply chain, and the development of new material and processes. Advances in process and quality control in manufacturing have been on-going since the industrial revolution, with the biggest changes coming in the 1830s with interchangeable parts and in the early 1900s with mass production, when large-scale dedicated production machinery dramatically lowered cost and labour hours per unit, at the cost of product variety. With high-mix production, switching from one product to another raises challenges on the shop floor (often met with increased use of labour), and also in engineering, quality control, and materials management departments, where constantly-shifting set of specifications, requirements, and material flows must be accommodated. Smaller scale production has persisted in high-cost locations in the form of truly customized manufacturing, including prototyping, which is often labour intensive and part of local innovation eco systems, and also in the form of high-mix production for reasons of market responsiveness, low price sensitivity and requirements for co-location with innovation.

### 16. Geography of advanced manufacturing

Because mass markets do not exist for all products, rapid replenishment is sometimes required, and cost sensitivity is not always high, smaller manufacturing units have proven to be a

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durable and perhaps growing part of the manufacturing landscape, despite higher unit costs [19]. For example, even in Silicon Valley, where large companies such as Apple have famously turned to low-cost locations such as China for mass production and Mexico for some high mix, medium volume production, there are still dozens of low and medium volume contract manufacturers. They include both local firms (e.g. Amtech, Bentech, AlphaEMS) and branch plants of globally operating contract manufacturers (e.g. Sparqtron, Jabil, Flex, Benchmark, AQS). Boston and other technology clusters around the world have similar agglomerations of small and medium-sized contract manufacturers and firms engaged in manufacturing their own products on a small scale.

## 17. Innovation in the NDE

The richness of digital tools supporting innovation in the NDE, include new ways to access finance, labour, inputs and production services, customer service, sales channels, and marketing. Given this toolkit, the potential of the NDE for innovation and entrepreneurship could be profound. Even when using today's digital tools, product design requires many engineering hours and multiple rounds of validation and testing. Failed tests lead to engineering changes and many additional hours of redesign and retest. At a certain point, designs that work "*well enough*" are accepted because sunken time and expense threaten to become excessive. The results are high costs, long cycle times, and sub-optimal products. The new tools of the NDE, especially big data and AI, are set to change this. Digital design simulation has been around a long time, moving from simpler applications, like automated circuit and software testing, into more challenging applications, such as simulation of mechanical systems (e.g. fluid dynamics, automotive drive trains and avionics). However, the world appears to be on the cusp of new leaps in capabilities based on cloud-based crowd sourcing, big data analytics, and AI.

## 18. Geography of innovation in the NDE

Just as with earlier rounds of globalization, there would be counter-trends to the fragmentation and spatial dispersion of GVCs, driving continued growth in technology clusters such as Silicon Valley, where the systems that underpin the NDE are developed, and standard battles are fought and won [20]. A look at the headquarters locations of the most important players in the NDE, reveals an extreme level of concentration in North America, which has headquarters of 63 of 135 NDE companies with a market capitalization of more than $1 billion in 2015. A closer examination of the North American companies suggests an even greater level of sub-national concentration. Their headquarters are, almost without exception, located in a handful of postal codes in and around Silicon Valley, California and Seattle, Washington. Given this situation, and the advent of new AI-assisted design processes just mentioned, the impact of the NDE on the location of innovation is likely to be two-fold. On the one hand, the need for iterative engineering work could fall along with the expertise required to design new products, and while this might generate additional demand for skilled labour for core platform owners, many fewer highly skilled engineers and workers could be needed in firms that use the systems to produce either higher level platforms or final products and services. This is because much of the expertise required designing, testing and validating new product designs will be embedded in software platforms, especially in the AI portion. While making successful use of such systems certainly requires expertise, job counts and spill-overs to local innovation clusters could be reduced. On the other hand, downstream innovation (not innovation in core platforms, but in new platforms and products created by and around them) could lead to an uptick of innovation outside the heartland of core NDE innovation, as products tailored to local markets are developed and produced more easily, quickly and inexpensively.

## 19. Scenarios for developing countries in the NDE

Given the scenarios just outlined, what impacts is the NDE likely to have on developing countries. While the features of the NDE might add up to radical change, it is in line with earlier advances in computerization, beginning in the 1980s, accelerating in the 1990s, and becoming mainstream in the 2000s, that allowed the organizational and geographic separation of R&D and design from manufacturing, leading to the creation of GVCs. Higher value business functions, such as branding and product design have tended to stay in established technology clusters, but vast new investments in manufacturing have been made in lower cost and market-proximate locations such as China, Viet Nam, South Africa, and Brazil and Mexico, creating large numbers of production jobs but also jobs in adjacent categories such as materials and supply chain management, manufacturing engineering, logistics and distribution [21-23].

However, even countries and regions that are deeply connected to GVCs, such as China and other export-oriented economies in East Asia, India, Eastern Europe, North Africa, and Latin America (e.g. Mexico) can fall into "*low value added traps*." This is because a greater share of value (and profits) tend to accrue to the "*lead*" firms in GVCs that control branding, product conception, and retail distribution, as well as to the suppliers of advanced production equipment and technology platforms and intellectual property owners that provide the key inputs and even de facto standards for others in the chain (e.g. Intel or Qualcomm CPUs).

## 20. Winners and losers, opportunities and risks

Being transformational, the NDE would likely create both winners and losers, both opportunities and risks. A positive, if somewhat utopian vision of the NDE might centre on the ubiquity and democratization of information not hard to envision nearly twenty years after the introduction of Google search and ten years into the smart phone era and the decoupling of economic growth from natural resource constraints enabled in part by the shortening of supply chains with the advent of on demand manufacturing (e.g. 3D printing) and super-efficient containerized urban agriculture [24]. The NDE, therefore, could usher in a newly equitable and environmentally sustainable growth model based on the maximization of human empowerment and well-being rather than maximization of profits and resource extraction and utilization [25]. Personal robots may certainty be helpful to the

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infirm and disabled, and be flexible enough to become well integrated into everyday life [26].

For smaller companies, the cost and expertise required to purchase, operate, and continually upgrade advanced manufacturing and IT systems may drive a larger wedge between the large and mainly multinational firms with the scale to justify the needed investments, and smaller, locally-oriented and developing country firms. The winner-take-all dynamics seen in platform-based industries (e.g. Google, Uber, Facebook, and WeChat), where network effect advantages accrue to first-movers and standard setters, could lead to accentuated polarization in the industrial base as the standard-bearers for the NDE consolidate their gains [8].

### 21. Data Partitioning: A New Digital Divide

Despite its promise, access to data is likely to remain partitioned in the NDE. Entrepreneurs with small companies would have access to their own data, and be able to analyze it by making use of AI tools and platforms, but access to larger insights from larger pools of data would either come with a cost or be entirely the purview of platform owners. So, the "*digital divide*" could increasingly describe not only the difference between those that are connected to the digital world and those that remain disconnected, or those with "*digital skills*" and those without them, but also widening inequality within groups and places that are connected. More people and places will be connected to the NDE, and benefit from it, but it is entirely possible that the levers of control and the extraction of profits will lie in the hands of only a few. Whatever the advantages of the NDE for average users, greater advantages would probably accrue to those with the capability and authority to accumulate access and analyze big data.

### 22. Inter-Agency Task Force on International Trade Statistics, UN-ECOSOC on Digital Trade and E-Commerce Statistics

In accordance with *(Economic and Social Council decision 2017/228)* [27] and past practices, the report of Inter-Agency Task Force on International Trade Statistics on the topic of measuring '*digital trade*' highlights that in recent meetings of the Committee on Statistics and Statistical Policy of the Organization for Economic Cooperation and Development, the Balance of Payments Committee of the International Monetary Fund and the Working Group on E-Commerce of the World Customs Organization, the topic of measuring digital trade was high on the agenda. Digital trade can be defined as all cross-border transactions that are either digitally ordered (i.e., cross-border e-commerce), digitally facilitated (by platforms) or digitally delivered. It has been growing in importance, together with demand for detailed statistics in a number of policy areas, including market access, trade facilitation, and opportunities for small and medium-sized enterprises, regulation, competition, cross-border data flows and privacy. In response to that demand, and as explicitly requested by the Group of 20 in its ministerial declaration entitled "*Shaping digitalization for an inter-connected world*", adopted in April 2017, the Task Force has prioritized and strengthened efforts to confront potential data gaps, biases and conceptual challenges with respect to measuring digital trade, by developing a conceptual framework and an inventory of current measurement practices and pilot studies in more than 70 countries. Building on those inputs, the Task Force is developing, together with experts from developed and developing countries, a handbook on measuring digital trade. Given the significance of and rapid developments relating to digital trade, and its potential implications for and applications in both developed and developing economies, the Task Force would develop the handbook expediently and plans to report on it to the Commission at its next session, in 2019.

### 23. Internet and Digitalization

The Internet and digitalization are fundamentally changing the way in which people, businesses and Governments interact. This has led to a new phase of globalization underpinned by the movement of data across national borders, and the actors in the international trade in goods and services. While digitally related transactions in either goods or services have existed for many years, the current scale of transactions and the emergence of new and disruptive players (online platforms) are transforming production processes and industries, including many that were previously little affected by globalization. To address these policy questions, several initiatives and inter-agency collaborative efforts have been carried out in recent years by international organizations, including Eurostat, the International Monetary Fund (IMF), Organization for Economic Cooperation and Development (OECD), United Nations Conference on Trade and Development (UNCTAD), World Trade Organization (WTO), the World Customs Organization (WCO) and others.

The conceptual framework identifies those three key characteristics, or dimensions, as the nature of the transaction ("*how*"), the product ("*what*") and the partners involved ("*who*"). Central to the framework is the nature of the transaction, which builds on the common understanding that digital trade should encompass cross-border trade transactions that are either digitally ordered, digitally facilitated (referred to as "*platform-enabled*") or digitally delivered (these are not necessarily mutually exclusive categories):

### 24. Digitally ordered transactions

These are seen as synonymous with e-commerce transactions (i.e., the sale or purchase of a good or service, conducted over computer networks by methods specifically designed for the purpose of receiving or placing orders).

### 25. Digitally delivered transactions

These involve services and data flows that are delivered digitally as downloadable products. Examples include software, e-books and data and database services. Goods, as physical and identical items, cannot be e-dimensional(3-D) printing may result in a future category of transactions that could possibly be classified as trade in goods, and therefore as digitally delivered goods, if those transactions are deemed fundamentally different from trade-in-services transactions (e.g., 3-D blueprints). The concept of digital delivery is consistent with what is described by the Task Group on Measuring Trade in ICT Services and ICT-enabled Services as ICT-enabled services, namely, service

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products delivered remotely over information and communications technology (ICT) networks. The second dimension identified in the framework ties into the first by identifying whether the products being traded relate to goods or to services, and also introduces a separate category referred to as information, or data. Although monetary transactions related to data would arise under service categories, many data-related transactions do not have a monetary flow, including not only intra-firm transactions, but also transactions related to data collected by firms such as digital intermediaries, which are then able to generate revenue streams through their use. The explicit reference here to data and information is designed to ensure that this category of products is also captured within the measurement framework. It is important to note that this broadens the scope of measurement beyond the traditional statistical notion of cross-border trade in goods and services, in order to recognize the significant economic benefits that accrue from international flows of data, which often fall under the radar on conventional trade statistics but are increasingly important conduits and determinants of related trade flows. While not all services can be delivered remotely over ICT networks (because many services require physical proximity for delivery and consumption), ideally, from a data collection point of view, all international trade-in-services transactions should be divided into those that are "*digitally delivered*" and those that are "*not digitally delivered*". Several countries have begun to collect data to better identify these breakdowns, often in line with statistical work on measuring trade by mode of supply, taking advantage of the fact that, by definition, all digitally delivered cross border services transactions involve the delivery of services through mode 1. Alternatively, linking trade-in-services surveys with data from ICT enterprise surveys at the micro (enterprise) level, can also, in combination with certain assumptions, provide insights into the share of international services transactions that are delivered and/or ordered digitally. Services digitally delivered to consumers, whether by enterprises or through the "*sharing economy*", can be measured using household surveys in combination with credit card data.

### 26. Dimensions of digital trade

The last dimension concerns the actors involved. Building on the work in the area of e-commerce, where businesses, consumers and Governments are distinguished as key actors in, for example, business-to-business or business-to-consumer transactions, the framework aligns the terminology with that used in the SNA. Additional breakdowns that are possible and that are being considered by the national accounts community under the broader work programme could include, within satellite accounts, the size and sector of corporations (for example, by providing information on the role and utilization of digitalized tools, utilization of small and medium-sized enterprises between financial and non-financial corporations).

### 27. Digital ordering

Statistics on the digital nature of the ordering process (e-commerce) have been developed for a number of years in many countries, mostly through ICT and e-commerce enterprise surveys (covering business-to-business and business-to-consumer transactions), as well as through household surveys on Internet use (covering business-to-consumer and, partly, consumer-to-consumer transactions). It is important to note, however, that such surveys do not yet provide a detailed breakdown of the value of cross-border transactions. Another possibility is to explore micro-data linking, for example, by integrating merchandise trade statistics with e-commerce enterprise surveys, albeit coupled with assumptions relating to foreign/domestic e-commerce breakdowns. Further refinements could also be made in combination with Broad Economic Categories (BEC) classifications to provide estimates of the share of cross-border sales that can be classified as business-to-business and business-to-consumer. The possibility of identifying trade flows that are the result of a digital ordering process, as opposed to a non-digital process, can also be explored from the perspective of merchandise trade statistics. In that respect, initiatives developed by WCO to begin exploring the possibility of identifying and monitoring e-commerce transactions in customs records, for example, through improved, electronic identification of origin/destination and content of packages (e.g., through the S10 bar code or special, simplified declaration forms for e-commerce) can provide an important future data source. In addition, postal data, such as those collected by the Universal Postal Union (UPU), can provide insights into the increase in small value transactions that are facilitated by digitalization and help to improve estimates for trade below the minimum threshold.

### 28. Inter-Agency Task Force on International Trade on measuring digital trade

Currently, the Inter-Agency Task Force on International Trade on measuring digital trade comprises both conceptual challenges and compilation practices. It provides an overview of the current policy questions on digital trade, related to, for example, market access (including the new opportunities that digital trade may present for small and medium-sized enterprises and developing countries), trade facilitation, regulation, competition, cross-border data flows and privacy, as well as the potential blurring of various modes of the supply of services. Potential trade covers all cross-border trade transactions that are digitally ordered, digitally facilitated or digitally delivered.

### 29. Compiling digitally delivered transactions

Digitally delivered transactions typically cover services, although the rise of 3-D printing may also lead to goods being considered to be digitally delivered. This aspect reviews ongoing work by countries to better identify services that are actually digitally delivered (as opposed to a wider selection of potentially digitally delivered services), emphasizing the relationship with the provision of services through mode 1.

### 30. Compiling digitally ordered goods and services

It reviews existing and proposed classifications of goods and services aimed at identifying "*digital*" products (e.g., ICT goods and services, ICT-enabled services and trade in ideas), highlighting the importance of properly distinguishing between the digital nature of the transactions and the digital nature of the product; for example, while the nature of a transaction may be

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digital, the product may not be (as in the case of clothes ordered online). It also provides an overview of national efforts aimed at measuring cross-border data flows.

### 31. Information Economy 2017 : Digitalization, Trade and Development

Within **(***UNCTAD Division on Technology and Logistics, the ICT Analysis Section)* carries out policy-oriented analytical work on the development implications of information and communications technologies (ICTs) and e-commerce. The ICT Analysis Section promotes international dialogue on issues related to ICTs for development, and contributes to building developing countries' capacities to measure the information economy and to design and implement relevant policies and legal frameworks. The Section is also managing the '*e-Trade for all initiative*'.

The international community has a huge responsibility to ensure that no one is left behind in this transformation process. Given the very rapid evolution of the digital economy, many developing countries would need to develop or strengthen their capabilities in a wide range of policy areas, including in all kinds and in every aspect of e-trade readiness: connectivity, payment solutions, trade logistics, Internet security and legal frameworks.

### 32. Role of UNCTAD in promoting International Trade through ICT

UNCTAD has undertaken the following measures to promote international trade i.e. e-commerce and (e-Trade) through ICT viz;

Organizing awareness programmes on E-Commerce and ICT tools to create awareness in the various countries including undeveloped and small island economies and the concerned stakeholders including regional, national & global organizations, private sectors and civil societies and other related organizations for promoting e-Trade through ICT for the benefit of global community to achieve sustainable development.

1. Regulation of ICT policies to steer innovation through ICT to promote e-commerce and e-Trade through digitalization.
2. Digital Skills to drive in promoting women entrepreneurship through women empowerment.
3. Trust in internet connection and availability of uninterrupted internet facilities is vital for promoting e-Commerce and e-Trade.
4. Signing of treaties amongst various countries to harness technologies for promoting e-Trade.
5. Global Action to align digitalization and development which can promote e-Trade and achieve sustainable development.
6. Organization of E-Commerce week by UNCTAD focuses on risks and benefits of data driven economies to harness the growing role of digital platforms and evolving technologies for achieving sustainable development.
7. Information Society Forum focuses on using technology to solve development problems.
8. Developing national strategies with the expertise of UNCTAD and private sector support to harness online opportunities to promote e-Trade.
9. Creation of single digital market to meet the challenges posed by the digital transformation society.
10. UNCTAD E-Commerce Week helps in promoting e-Commerce and e-Trade which is held annually at UNCTAD and for enhancement of its capacity-building activities related to E-Commerce and Law Reform.

### 33. Digital technologies are changing the economy, with implications for development

The world is on the cusp of a new digital era. With dramatically reduced costs of collecting, storing and processing data, and greatly enhanced computing power, digitalization is transforming economic activities around the world. It is expected to affect value chains, skill requirements, production and trade, and will require adaptations of existing legal and regulatory frameworks in various areas. This has major implications for the implementation of the 2030 Agenda for Sustainable Development, presenting significant opportunities, but also challenges for developing countries**.** *(Information Economy Report 2017, UNCTAD)* examines the evolution of the digital economy and its potential consequences for trade and development [28].

Although the speed of digital transformation differs among countries, all of them would need to adapt policies in several areas. The research study shows that the digital economy is creating new opportunities for trade and development. It is helping smaller businesses and entrepreneurs in developing countries to connect with global markets more easily, and is opening up new ways of generating income. Information and communication technologies (ICTs), e-commerce and other digital applications are being leveraged to promote entrepreneurship, including the empowerment of women as entrepreneurs and traders, and to support productive activities, decent job creation, creativity and innovation. Furthermore, mobile and digital solutions are contributing to facilitating greater financial inclusion. Small firms in developing countries with sufficient connectivity may be able to access various cloud services and obtain crowd finance in online platforms.

However, such development gains are far from automatic, and there are certain development challenges associated with the evolution of digitalization. Many developing countries, especially the least developed countries (LDCs) and the small island economies, are inadequately prepared to capture the many opportunities emerging as a result of digitalization. Moreover, there is a risk that digitalization would lead to increased polarization and widening income inequalities, as productivity gains may accrue market capitalization are all closely linked to the digital economy ; Apple, Alphabet (Google), Microsoft and Amazon.com. There are also concerns over how data flows can be harnessed while at the same time addressing concerns related to privacy and security. The rapid pace at which the digital economy is evolving is a result of the technologies and innovations that were developed over several decades and that are becoming more pervasive. High-speed broadband access to increasingly powerful computing and storage capacity, and drastically reduced costs of ICT equipment and data management, have facilitated the process of

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digitalization. Key technologies underpinning the evolving digital economy include advanced robotics, artificial intelligence, the Internet of Things (IoT), cloud computing, big data analytics and three-dimensional (3D) printing.

### 34. Digital economy is evolving fast but at very different speeds

The digital economy is expanding in several ways. Global production of ICT goods and services now amounts to an estimated 6.5 per cent of global gross domestic product (GDP), and some 100 million people are employed in the ICT services sector alone globally. Exports of ICT services grew by 40 per cent between 2010 and 2015. Worldwide e-commerce sales in 2015 reached $25.3 trillion, 90 per cent of which were in the form of business-to-business (B2B) e-commerce and 10 per cent in the form of business-to-consumer (B2C) sales. *UNCTAD* estimates that cross-border B2C e-commerce was worth about $189 billion in 2015, which corresponds to 7 per cent of total B2C e-commerce. Sales of robots are at the highest level ever, worldwide shipments of three-dimensional printers more than doubled in 2016, to over 4,50 000 and are expected to reach 6.7 million in 2020. By the turn of 2019, the volume of global Internet traffic is expected to increase 66 times from what it was in 2005. At the same time, monitoring the digital divide remains important. Although the number of Internet users grew by 60 per cent between 2010 and 2015, more than half of the world's population remains offline. Broadband connectivity in developing countries, when available, tends to be relatively slow and expensive, limiting the ability of businesses and people to use it productively. Only 16 per cent of the world's adult population uses the Internet to pay bills or purchase items. While more than 70 per cent of the population in several developed countries already buys goods and services online, the equivalent share in most LDCs is less than 2 per cent. Meanwhile, most micro, small and medium-sized enterprises (MSMEs) in developing countries are ill-prepared to take advantage of the digital economy, and may thereby miss opportunities to boost their productivity and competitiveness. Small firms generally use the Internet much less than large ones for selling online. Only 4 per cent of all 3D printers are used in Africa and Latin America, and the use of robots is also very limited in most developing countries, with the exception of some countries in Asia where they are used quite extensively. As the digital economy evolves further, there is a greater need to ensure that as many people and businesses in developing countries as possible are able to engage in and benefit from it.

### 35. Digital economy is transforming

Digital technologies have a bearing on the prospects for MSMEs, especially those in developing countries, to participate in global trade. They allow enterprises to cut costs, streamline supply chains and more easily market products and services worldwide. Increased trade at reduced costs can have positive spillovers effects on the economy as a whole, for example through enhanced competition, productivity and innovation, as well as improved access to talents and skills. But to derive such benefits from digitalization, MSMEs would need to overcome various barriers. Many small firms in developing countries remain limited in their digital involvement in relevant value chains, reflecting inadequate connectivity, limited awareness of the benefits of digitalization, skills gaps and other barriers. It will be important for digital systems to be designed in ways that facilitate the effective integration of smaller firms in value chains. The use of online platforms is growing, especially in sectors facing strong global competition and involving many buyers and sellers. Smaller producers are more likely to benefit from participating in global platforms if they serve a well-defined niche market rather than competing in mass markets.

### 36. Rapid technological change presents a multifaceted policy challenge covering many areas

Policy makers are facing a bold task in keeping up with the rapid pace of technological change amidst a high degree of uncertainty about the shape of the future. The policy challenge is also contextual, varying greatly in terms of countries' readiness to engage in and benefit from the digital economy, with LDCs being the least prepared. For these countries, formulating relevant policies and implementing adequate measures will be particularly important, not least to avoid falling behind even further as the digital economy evolves, as well as to seize new opportunities. Countries also vary in their capacity to formulate, implement and monitor policies related to the digital economy.

The research study touches upon a number of policy areas, one of which relates to connectivity. In many developing countries, adequate and affordable ICT connectivity is still insufficient for MSMEs to compete effectively online. Policy measures needed to address this situation, both at the national and international level, include efforts to ensure that policy frameworks and regulations secure an open, transparent and fair communication market to attract additional investment. Measures to make broadband use more affordable include infrastructure sharing, effective spectrum management and the avoidance of high taxes and import duties on telecom/ICT equipment and services. Another critical area concerns education and training. All countries will need to adjust their education and training systems to deliver the skills required in the digital economy. This is vital not only for young people entering the labour market, but also for existing workers who need to be retrained and prepared for a future of lifelong learning that equips them for jobs and provides skills flexibility and adaptability. Priorities may vary by country. For instance, LDCs may need to focus on promoting digital literacy among a growing number of students and workers, as well as on building a base of ICT specialists. Policies should also expand the opportunities for workers and teachers to upgrade their skills, promote alternative means of developing non-cognitive skills, adapt teaching methodologies and capabilities, and seek to make future skills more attractive to students and workers. In addition, attention should be given to the social and political dimension of technological change, innovation and job creation. Proactive redistribution policies could help mitigate the risk of increased polarization and income inequality. Social protection systems that support workers when they are between jobs or not working regularly are currently available only to about a quarter of the worlds population.

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Countries should also explore ways to integrate digital solutions in export promotion. In most countries, current export and trade promotion and capacity-building efforts are insufficiently adapted to help MSMEs engage in the digital economy Trade promotion organizations (TPOs) should embed digital tools in their services offered to small businesses. For instance, online platforms could be better leveraged to present businesses internationally and reach desired communities, as well as to facilitate data collection and analysis, and assess customer needs. With the growing importance of online marketing channels, there should be a greater use of e-market solutions and social media platforms in events or trade shows, and in other efforts to facilitate e-commerce. Public-private partnerships (PPPs) can be useful in such a context. Policymakers need to deepen their understanding of the issues at the interface of trade logistics, digitalization and e-commerce. An increasing number of products are delivered digitally, rather than physically, and the expansion of e-commerce in physical products implies rapid growth in shipments of small parcels and low-value goods, sometimes referred to as a "*tsunami of parcels*". Policymakers should explore and harness relevant opportunities to embrace cross-border e-commerce, and create conditions (e.g. alignment of standards), procedures and resources that would enable e-commerce to thrive, keeping in mind the best interests of MSMEs. New technologies may help overcome some logistical bottlenecks. For example, they can help navigate traffic by calculating the fastest routes or identifying the most fuel/time-efficient pick-ups. Trade facilitation experts and city planners may leverage 3D printing in order to reduce the need for long-distance transportation of final products.

### 37. International support and collaboration on a massive scale is needed

To prevent the evolving digital economy from leading to widening digital divides and greater income inequalities, and to ensure that more people and enterprises in developing countries have the capacity to participate effectively in it, the international community would need to expand its support on a massive scale. Indeed, the share of ICT in total aid for trade declined from 3 per cent in 2002−2005 to only 1.2 per cent in 2015. Proactive efforts are therefore warranted. One way to capitalize on existing knowledge and maximize synergies with partners is to tap into UNCTAD's '*e-Trade for All initiative*'. UNCTAD has also launched a project to help LDCs assess their readiness to engage in and benefit from e-commerce and other activities in the digital economy. This would also help them identify areas in which targeted support is needed the most. Given the transformative impact of the digital economy, both developed and developing countries would be looking for ways to adapt their policies and strategies. In this context, it is important to avoid reinventing the wheel, where possible. Instead, countries should seek to collaborate and exchange experiences about both the benefits they have reaped from digitalization and the costs and problems encountered. It is expected that the new (*UNCTAD Inter-Governmental Group of Experts on E-Commerce and the Digital Economy)* would provide a valuable forum for member States to engage in such multilateral policy discussions and to explore good practices in relevant policy domain.

### 38. An Evolving Digital Economy

The role of Information and Communication Technologies (ICTs) in the implementation of the 2030 Agenda for Sustainable Development is gaining importance. With reduced costs of collecting, storing and processing data, and greatly enhanced computing power, digitalization is transforming more and more economic activities around the world. However, the pace at which the digital economy is evolving varies considerably. Some countries have quickly embraced digital technologies, but most of them lag far behind in their readiness to engage in the digital economy. Although the speed of digital transformations differs, they present both opportunities and risks for countries at all levels of development. The impacts depend on the readiness of countries, enterprises and people to take advantage of digitalization. The world economy is increasingly affected by digital technologies, with potentially profound disruptions to industrial organization, skills development, production and trade, and would thus require appropriate regulatory frameworks. In its (*'Overall Review of the implementation of the Outcomes of the World Summit on the Information Society', the General Assembly of the United Nations)* committed to harnessing the potential of ICTs to achieve the 2030 Agenda for Sustainable Development, noting that ICTs could accelerate progress across all 17 Sustainable Development Goals (SDGs). Different ICTs and the digitalization of economic activities are of direct relevance to several of these goals, as highlighted in various reports. Digitalization of economic activities and transactions can help to overcome certain barriers to more inclusive development. For example, ICTs, e-commerce and other digital applications can be leveraged to promote entrepreneurship including the empowerment of women as entrepreneurs and traders (SDG 5, target) productive activities, creativity and innovation, as well as the creation of decent jobs. They can also encourage the formalization and growth of micro, small and medium-sized enterprises (MSMEs), including through access to ICT-enabled financial services (SDG 8, target 3). Digital solutions can be leveraged to increase access by MSMEs in developing countries to financial services (online and mobile payments) and markets (e.g. leveraging virtual market places), and enable their integration into value chains (SDG 9, target 3). Moreover, e-commerce would become increasingly important for achieving (SDG 17, target 11) to significant increase of the exports of developing countries, and to double the share of global exports of the least developed countries LDCs by 2020. Unsurprisingly, the impact of digitalization on economies and societies is the focus of several international policy dialogues and processes. UNCTAD Member States, at the Ministerial Conference in July 2016, decided to set up an Intergovernmental Group of Experts on E-Commerce and the Digital Economy, and the Group of 20 (G-20) issued a Digital Economy Ministerial Declaration in April 2017. E-commerce and digital trade also featured in discussions related to the Ministerial Conference of the World Trade Organization (WTO) held in December 2017. More broadly, e-commerce and e-business remain central aspects of the follow-up to the World Summit on the Information Society.

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A major concern is the prevalence of various "*digital divides*" in both access and use of ICTs, notably between the rich and poor (across and within countries), between urban and rural areas, as well as by gender. Significant variations in the readiness of countries to take part in and benefit from the digital economy enhance the risk of these gaps widening, and of greater income inequality. Among the LDCs, only one in six people currently use the Internet, and digital exclusion remains a reality. Nonetheless, high-speed broadband access to increasingly powerful computing and storage capacity, as well as drastically reduced costs of ICT equipment and data management, are fostering the growth of the digital economy. This has direct and indirect positive and negative consequences for countries at all levels of development.

## 39. Key Technologies Underpinning the Digital Economy

There is no widely accepted definition of the "*digital economy*", but have developed a useful approach. This distinguishes between core, narrow and broad scopes. The core and narrow scopes relate to the ICT producing sector, and encompass various digital services (e.g. outsourced call centre services) and platform economy services (e.g. Facebook and Google). The broad scope includes the use of various digital technologies for performing activities such as e-business, e-commerce, automation and artificial intelligence (AI) (referred to collectively as the "*algorithmic economy*"), the "*sharing economy*" (e.g. Uber and Airbnb) and online labour platforms. This evolving digital economy is the result of the development and adoption of new technologies and innovations over several decades. The major landmarks include the arrival of mass market personal computers (PCs) in the mid-1980s, the maturing of digital design tools and robotized manufacturing equipment in the 1990s, the boom in outsourcing and off-shoring in the 2000s, and the growing ability of multinational enterprises (MNEs) to better use what were once disparate corporate information technology (IT) systems, and improve interoperability and coordination. Today, supply-chain integration is taking place as part of the development of digital business systems, though at a relatively slow pace in many developing countries. The "*third industrial revolution*," based on ICTs, set the stage for the fourth revolution. This latest revolution is emerging from a combination of technologies, which are becoming more pervasive across mechanical systems, communications and infrastructure. An expanding variety of ICT devices, and especially software, have become increasingly important in manufacturing, agriculture(e.g. precision farming), services, transportation The underlying technologies and processes have far reaching implications for the organization of work, production and trade, extending existing organizational and geographic fragmentation into knowledge-intensive business functions and job categories. For global manufacturing firms, digitalization is influencing all segments of the supply chain, from inbound logistics and supplier management to internal processes and customer management (*UNCTAD, 2017 Report on Information Economy)*. The full impact of the digital economy will only be apparent if and when all these features mature, and become integrated and widely used. However, various factors, such as data security risks, data localization pressures, as well as data collection and privacy concerns, may significantly slow down its development.

The key technologies that are underpinning the evolving digital economy include advanced robotics, artificial intelligence (AI), the Internet of Things (IoT), cloud computing, big data analytics, three-dimensional (3D) printing and electronic payments. While most developing countries are at a very early stage in their use of these technologies, it is important for them to gain a better understanding of their possible implications. Furthermore, several of these technologies are being tapped to support efforts to achieve the SDGs.

## 40. Digital payment systems in various Countries

Digital payment systems refer to the use of debit and credit cards, online and mobile payments, and of systems based on distributed ledger technologies, such as block chain. In general, digital payments make transactions faster, reduce frictions and lower transaction costs, offering productivity gains and enabling firms to engage in trade. They free banks and merchants from the financial and non-financial costs of manual acceptance of payments, record keeping, counting, storage, security, delays, transparency of payment tracking, the risk of non-payment at cash-on-delivery, recipient security and transportation of physical currency. They can also help developing country governments address critical challenges, including tackling black markets and tax avoidance as well as supporting the financial inclusion of under-banked populations. The uptake of debit and credit cards as well as innovative online and mobile payment methods has grown over time. In 2014, credit and debit cards accounted for more than half of all e-commerce payments in value terms. However, their share is expected to drop to 46 per cent by 2019, as e-wallets and other alternative payment methods (such as mobile money) gain in importance. In developed regions, digital payments are dominated by credit and debit cards, followed by e-wallets. In developing countries, by contrast, credit cards are rarely the most important payment method for e-commerce, and the uptake of digital payments is often low. For example, in Egypt, around 90 per cent of e-commerce transactions are paid by cash-on- delivery, and in LDCs the reliance on cash is even more pronounced [28]. In China, the preferred payment method for business to consumer (B2C) e-commerce is Alipay, an escrow-based system used by 68 per cent of all online shoppers in that country. In Kenya, mobile money, or accessing services via a mobile telephone, is more commonly used than credit cards for e-commerce, although cash on delivery remains the main method. In a (*CIGI-IPSOS-UNCTAD)* global survey of Internet users, 79 per cent of the Kenyan respondents expressed mobile payment as their preferred method of paying for goods and services purchased online. For cross-border purchases, e-wallets appear to be particularly popular as a method of payment. A 2016 survey of cross-border e-commerce shoppers across 26 countries found that e-wallets (such as PayPal) were the preferred choice for 41 per cent of the respondents, followed by credit cards (33 per cent) and debit card/bank transfer (18 per cent) (International Post Corporation, 2017). A major obstacle to cross-border transactions is the lack of interoperability of payments systems. In the future, distributed ledger technologies such as block chain may increasingly be used for cross-border payments. This

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technology can make online payments safe, and being peer-to-peer, it is less expensive than intermediated payment platforms. While few Internet users currently prefer this method of payment, it is gradually being adopted as it improves security, accelerates settlement, reduces the size of the minimum viable transaction and executes digitized versions of traditional contracts (so-called "*smart contracts*"). Its properties enable cross-border micro-transactions, including remittances, which would otherwise not be made due to high fixed costs or lack of trust among parties.

### 41. Business use of ICTs: Small enterprises are lagging behind

There is a growing body of literature on how ICTs can help firms become more efficient and better connected. One important potential impact is increased productivity [29]. The operation of markets, including product development, production, and business administration and marketing functions can also be impacted. As more and more buyers search the Internet for items they wish to purchase, enterprises increasingly need an online presence to be visible in the market. In Europe, online sales were found to boost enterprises' productivity [30], and a study for Vietnam concluded that total factor productivity growth of enterprises that sold online was 1.7 percentage points higher than those that used the Internet but did not sell online.

Technology use can be measured by indicators such as the availability of computers, Internet and other ICTs in enterprises, as well as by indicators related to the kinds of activities that are performed online. Official data are available for European Union (EU) and OECD countries, and for a small number of developing countries. By contrast, very few low-income countries measure enterprises' use of ICT. To what extent and for what purpose enterprises are using ICTs vary greatly. In most countries for which data are available, a lower proportion of small enterprises make use of the Internet than large companies. In general, fewer enterprises engage in complex tasks online. For example, enterprises are more likely to use the Internet to obtain information about goods and services, than to deliver products online, which requires adapting their business model to the online world. In countries where ICTs are widely available, more enterprises are likely to perform more complex online tasks. Enterprise size adds to the complexity. A number of countries collect data on enterprises that buy or sell goods and services online. Thus, data showing an increase in the overall proportion of businesses that receive orders online does not guarantee that small and medium-sized enterprises are benefited as much as larger figures.

### 42. Growing Role of E-Commerce

E-commerce is a prominent feature of the evolving digital economy, although it remains hard to measure. This paper looks at trends in business-to-business (B2B) and business-to-consumer (B2C) e-commerce. Despite the lack of detailed official data, it is possible to estimate the total value of global e-commerce sales. *UNCTAD* estimates that global e-commerce sales amounted to $25.3 trillion in 2015 ($22.4 trillion for B2B plus $2.9 trillion for B2C). Global B2B sales were estimated based on official data for China, Japan, the United States and the EU, which accounted for 67 per cent of world GDP in 2015. Their annual share in total world GDP is used as the basis for deriving a global estimate. The United States was by far the largest e-commerce market in 2015, with combined sales of over $7 trillion, followed by Japan and China. While the United States was ahead by some margin in B2B e-commerce sales, it was just behind China in the B2C segment. Overall, B2B dominated, accounting for about 90 per cent of the total among this group of economies. The total value of e-commerce was equivalent to 34 per cent of the total GDP of these economies; in Japan and the Republic of Korea it exceeded 60 per cent. Based on non-official data for the B2C market only, the Russian Federation would rank 12th and India 13th. Given the highly uncertain figures for B2B, it is not possible to estimate where other countries fit in. The absence of e-commerce data and statistics for most developing countries remains a concern. Without it, their governments are handicapped when formulating and implementing relevant policies. E-commerce statistics are also needed for private enterprises to make informed investments and strategic decisions. A much more concerted effort is needed to strengthen the capacity of developing countries to carry out enterprise and household surveys with a view to generating the statistics needed for analyses of e-commerce trends and development impacts. Particular attention should be given to collecting statistics related to both B2B and B2C e-commerce.

### 43. Trade Aspects of the Digital Economy

The external sector of the economy is greatly affected by digitalization. Products and services are increasingly purchased and delivered across borders using electronic networks. This paper examines the trade dimension from four perspectives: trade in ICT services; trade in electronically delivered services (ICT-enabled services); trade in ICT goods; and cross-border e-commerce resulting from orders received electronically from abroad.

### 44. Trade in ICT Services

The expansion of ICT services in world trade reflect how much the digital economy has grown. World exports of telecommunications and computer services stood at $467 billion in 2016. Exports of ICT services rose at an average annual rate of 8 per cent between 2005 and 2016, increasing their share in all commercial services from 7.8 per cent to 10.3 per cent. Exports of information services, including online content provision, thrived thanks to improved connectivity, reaching $26 billion in 2016 nearly three times their 2005 value. Estimates for the top 10 exporters and importers of ICT services from 2014 to 2016 at $353 billion, world exports of computer services were more than three times higher than world telecommunications services exports in 2016. The EU and the United States topped the list of major exporters of telecommunications services in 2015, with $44 billion and $13 billion worth of exports, respectively, together accounting for over 80 per cent of the top 10 economies. This partly reflect their roles as hubs for much of the world's Internet traffic other regional hubs that feature prominently include Hong Kong (China), India, Kuwait and the Russian Federation. In many

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developing countries, especially those with low incomes, telecommunications were the only or main component of ICT services exports. For example, telecommunications accounted for more than 85 per cent of ICT services exports from Cambodia, Guatemala, Honduras, Myanmar, Senegal, Thailand, Turkey and the United Republic of Tanzania. The value of computer services exports of the top ten exporters of such services amounted to $315 billion in 2016. The EU and India together accounted for 86 percent of the total computer services exports of the ten major exporters. If reported separately, Ireland would rank as the largest exporter of computer services which amounted to $64 billion in 2015. In relative terms, computer services accounted for more than 80 percent of exports of ICT services of developing and transition economies such Argentina, Costa Rice, Republic of Korea, Philippines, Sri Lanka and Uruguay.

### 45. Trade in ICT-enabled services

The evolving digital economy is not only creating more trade in ICT services; many other services that feature within the "*narrow scope*" of the digital economy have also become tradable due to improved Internet connectivity. Trade in these ICT-enabled services is believed to have grown very rapidly over the past decade, now constituting a significant proportion of all services exports. Such trade includes various business and knowledge processes. For example, India earned $23 billion from ICT-enabled exports in accounting, customer care, medical transcription, engineering and other services in 2014−2015. As a strategic component of the digital economy, such services are of interest to both developing and developed countries. However, there is a lack of official statistics on the amount and composition of the services trade that is delivered digitally, which is a disadvantage for policymaking in this area, at both national and international levels. With a view to remedying this situation, UNCTAD has developed a definition of ICT-enabled services as "*services products delivered remotely over ICT networks*" [31]. It identifies services that are potentially ICT-enabled, and groups them into nine categories. The United States has used these groupings to estimate the volume of such trade in that country. In 2014, 54 per cent ($385 billion) of all services exported from the United States were found to be potentially ICT-enabled (or "*digitally deliverable*"). The next step is to conduct enterprise surveys to find out how much is actually delivered remotely using ICT networks. To this end, in 2016 UNCTAD developed a survey questionnaire in collaboration with the Inter-Agency Task Force on International Trade Statistics, along with experts from Costa Rica, Egypt, India and Thailand. The survey was pilot tested in these four countries during the course of 2017.

### 46. Trade in ICT goods

Trade in ICT goods has grown dramatically over the past decade, driven by a number of factors, such as the WTO Information Technology Agreement (ITA), various regional and bilateral trade arrangements, rapid technological change and the emergence of new business models. For the first time since 2009, global imports of ICT goods declined in 2015 by 3.6 per cent in current prices, to just over $2 trillion. Most of this decline was due to lower imports from developed economies in Asia and Europe, which fell by 11 per cent and 7 per cent, respectively, and also to the decline in imports of computers and peripherals as well as consumer electronic equipment. Global exports of ICT services also declined over the period 2014−2015 by 4 per cent, to $ 472 billion. Imports of ICT goods accounted for 13 per cent of global merchandise imports in 2015. There were considerable variations by region, from 27 per cent in East Asia, to only 5 per cent in Africa, and an estimated 4 per cent in both Oceania and the LDCs. Most of the trade in ICT goods, which includes both finished and intermediate goods, was between Asia, Europe and the United States. Developing economies in Asia, many of which host large manufacturing facilities, accounted for nearly half (49 per cent) of global ICT goods imports in 2015 as per the latest year for which data are available. China alone accounted for one fifth of those imports.

### 47. Cross-border e-commerce

Individuals and enterprises ordering or selling goods and services online across borders contribute to international trade and cross-border e-commerce. However, despite growing interest in this mode of trade, there are virtually no official statistics on its value, as few countries publish official estimates of such transactions. Based on the limited information that does exist from official statistics and market research, *UNCTAD* estimates that cross-border B2C e-commerce in 2015 amounted to $189 billion, with some 380 million consumers making purchases on overseas websites. Such purchases accounted for 1.4 per cent of total merchandise imports, and were equivalent to around 7 per cent of domestic B2C e-commerce. Some regions and countries collect data on at least some aspects of cross-border e-commerce. Eurostat reports data for every other year since 2011 on the proportion of businesses based in the EU that purchased or sold abroad. However the data are not disaggregated by type (e.g. electronic data interchange (EDI) or web sale), counterpart (e.g. business or consumer) or value. The proportion of enterprises purchasing from suppliers in their own country has been declining while that of enterprises purchasing from other EU countries has been increasing. Moreover, some 83 million EU residents made cross-border B2C purchases in 2015, corresponding to almost a quarter of all Internet users. A few European countries provide some details. The United Kingdom breaks down the proportion of electronic sales by EDI and web sales. The proportion of firms making overseas EDI sales is small and on the decline, whereas for overseas web sales it is increasing. Spain reports the distribution of web sales (by value), which shows that almost one fifth were made to clients outside Spain. Since data on the type of client (i.e. consumer or business) are not available, it is not possible to distinguish between B2B and B2C sales. A few non-European countries publish statistics on cross-border online purchases. Japan reported the value of its cross-border B2C transactions in 2015 with China and the United States. They show that Chinese consumers spent more than 30 times more on purchases from Japan than Japanese consumer spent on purchases from China. Meanwhile, United States consumers bought less than half as much from China than what Chinese

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consumers bought from the United States.

### 48. Data Protection Regulations and International Data Flows : Implications for Trade and Development

Within the (*UNCTAD Division on Technology and Logistics, the ICT Analysis Section)* carries out policy-oriented analytical work on the development implications of information and communication technologies (ICTs). It is responsible for the preparation of the Information Economy Report as well thematic reports on ICT for development. The ICT Analysis Section promotes international dialogue on issues related to ICTs for development and contributes to building developing countries' capacities to measure the information economy and to design and implement relevant policies and legal frameworks. The E-Commerce and Law Reform Programme has supported developing countries in Africa, Asia and Latin America since 2000 in their efforts to establish legal regimes that address the issues raised by the electronic nature of ICTs to ensure trust in online transactions, ease the conduct of domestic and international trade online, and offer legal protection for users and providers of e-commerce and e-government services. UNCTAD helps to build the capacity of policy makers and law makers at national and regional levels in understanding the underlying issues underpinning e-commerce. The assistance targets, in particular, ministry officials in charge of law reform who need to learn more about the legal implications of ICTs; parliamentarians who have to examine new cyber laws; and legal professionals who enforce new legislation. Increasingly, an ever-wider range of economic, political and social activities are moving online, encompassing various ICTs that are having a transformational impact on the way business is conducted, and the way people interact among themselves, as well as with government, enterprises and other stakeholders. This new landscape gives rise to new business models and a wider scope for innovation. At the same time, it facilitates undesirable activities online, including cybercrime. Against this background, world leaders in 2015 underscored the importance of adopting relevant policy responses to harness the potential of ICTs for all seventeen Sustainable Development Goals (SDGs). Creating trust online is a fundamental challenge to ensuring that the opportunities emerging in the information economy can be fully leveraged. The handling of data is a central component in this context. In today's digital world, personal data are the fuel that drives much commercial activity online. However, how this data is used has raised concerns regarding privacy and the security of information. The present regulatory environment on protection of data is far from ideal. In fact, some countries do not have rules at all. In other cases, the various pieces of legislation introduced are incompatible with each other. Increased reliance on cloud-computing solutions also raise questions about what jurisdictions apply in specific cases. Such lack of clarity creates uncertainty for consumers and businesses, limits the scope for cross-border exchange and stifles growth. As the global economy shifts further into a connected information space, the relevance of data protection and the need for controlling privacy will further increase. Understanding different approaches to and potential avenues for establishing more compatible legal frameworks at national, regional and multilateral levels is important for facilitating international trade and online commerce. The rules surrounding data protection and cross-border flows of data affect individuals, businesses and governments alike, making it essential to find approaches that address the concerns of all stakeholders in a balanced manner.

This research study is a contribution to our understanding of how data protection regulations and international data flows affect international trade. It reviews the experience in different parts of the world and of different stakeholders. The study identifies key concerns that data protection and privacy legislation need to address. It also examines the present patchwork of global, regional and national frameworks to seek common ground and identify areas where different approaches tend to diverge. The research study also considers possible future policy options, taking the concerns of all stakeholders into account.

### 49. International and Regional Organizations Working on Data Protection Regulations and International Data Flows

1. The following international and regional organizations are working on data protection regulations and international data flows and the themes as mentioned against their names viz;

2. African Union Convention on Cyber-security and Personal Data Protection (AU CCPDP). Moctar Yedaly, Head, Information Society Division, Infrastructure and Energy Department, AU Commission.

3. Privacy Policy Developments in the Asia Pacific Economic Cooperation (APEC) Forum. Danièle Chatelois, Former Chair of the APEC Data Privacy Subgroup (2012-February 2016).

4. Data Protection in the Commonwealth. Elizabeth Bakibinga-Gaswaga, Legal Advisor, International Development Law, Commonwealth Secretariat.

5. The Council of Europe Convention 108. Maria Michaelidou, Programme Advisor, Data Protection Unit, Council of Europe.

6. Data Protection in the East African Community. Robert Achieng, Senior Communications Engineer, EAC Secretariat.

7. ECOWAS Supplementary Act A/SA.1/01/10 on Personal Data Protection. Dr. Isias Barreto Da Rosa, Commissioner for Telecommunication and Information Technologies, ECOWAS Commission.

8. Data Protection in the European Union: Today and Tomorrow. Lukasz Rozanski, European Commission.

Private Sector and NGOs

9. The following private sectors and NGOs are working on data protection regulations and international data flows and the themes as mentioned against their names viz;

10. Personal Data Protection and International Data Flows: The Case of Brazil. Rafael Zanatta, Brazilian Institute of Consumer.

11. Cross-border e-commerce: building consumer trust in international data flows. Liz Coll, Consumers International.

12. Comments of the Computer & Communications Industry

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Association on Data Protection Regulations and International Data Flows: Impact on Enterprises and Consumers. Bijan Madhani, Public Policy & Regulatory Counsel; Jordan Harriman, Policy Fellow, CCIA.

13. Optimizing Societal Benefit of Emerging Technologies in Policy Development Related to Data Flows, Data Protection and Trade. Joseph Alhadeff, Chair, International Chamber of Commerce Commission on the Digital Economy; Chief Privacy Strategist and Vice President of Global Public Policy, Oracle Corporation.

14. Middle East and Africa (MEA) Privacy Principles Will Protect Privacy and Advance Trade, The Case for a New Legal Framework. Eduardo Ustaran, IAPP board member, Olanrewaju Fagbohun, Research Professor, Nigerian Institute of Advanced Legal Studies, Yasin Beceni, Managing Partner, BTS & Partners; and Lecturer; Istanbul Bilgi University, Ussal Sahbaz, Director, Think Tank – TEPAV, Geff Brown, Assistant General Counsel, Microsoft Corp., Marie Charlotte Roques Bonnet, Director Microsoft EMEA, Ed Britan, Attorney, Microsoft Corp., Heba Ramzy, Director Corporate Affairs, Microsoft Middle East and Africa.

### 50. Governments

The following Government organizations are working on data protection regulations and international data flows and the themes as mentioned against their names viz;

1. The Protection of Data in Benin. Adjaigbe S. Rodolphe, Director, Studies and Research, Ministry of Communication and ICTs, Benin.

2. Implementation of Data Protection Legislation - The Case of Ghana. Albert Antwi-Boasiako, Founder and Principal Consultant, e-Crime Bureau, Ghana.

3. The Status of Data Protection in Mauritius, Ammar Oozeer, Juristconsult Chambers, Mauritius.

### 51. Importance of Data Protection and Privacy Laws

Data protection is directly related to trade in goods and services in the digital economy. Insufficient protection can create negative market effects by reducing consumer confidence, and overly stringent protection can unduly restrict businesses, with adverse economic effects as a result. Ensuring that laws consider the global nature and scope of their application, and foster compatibility with other frameworks, is of utmost importance for global trade flows that increasingly rely on the Internet.

Many social and cultural norms around the world include a respect for privacy. While underlying privacy principles contain many commonalities across countries, interpretations and applications in specific jurisdictions differ significantly. Some protect privacy as a fundamental right, while others base the protection of individual privacy in other constitutional doctrines, or still others have yet to adopt privacy protections. Such differences would increasingly affect individuals, businesses and international trade.

The information economy is increasingly prominent and promises to provide many opportunities, but could also generate some potential drawbacks. Internationally compatible data protection regimes are desirable as a way to create an environment that is more predictable for all stakeholders involved in the information economy and to build trust online.

New technological developments are adding urgency to this need. Cloud computing has quickly risen to prominence, disturbing traditional models in various areas of law, business and society. Certain projections estimate that the cloud computing industry had a global market worth of $107 to $127 billion in 2017. The Internet of Things is also rapidly developing, and has a direct nexus to management of data. While forecast reports vary greatly, one report estimates that value-added services related to the '*Internet of Things*' will grow from around $50 billion in 2012 to approximately $120 billion in 2018, and that there will be between 20-50 billion connected devices by 2020. Another report forecasts a potential economic impact of between $3.9 and $11.1 trillion per year in 2025. Data protection regulation must carefully correspond to the evolving needs and possibilities associated with these changes in order to facilitate potential benefits. In 2014, approximately $30 trillion worth of goods, services and finance was transferred across borders. Around 12 percent of international trade in goods has been estimated to occur through global e-commerce platforms like Alibaba and Amazon. The international dimension of flows had increased global GDP by approximately 10 percent, equivalent to a value of $7.8 trillion in 2014. Data flows represent an estimated $2.8 trillion of this added value.

Although there is significant divergence in the detailed data protection laws of the world, there is more common ground around the core set of data protection principles that are said to be at the heart of most national laws and international regimes. This set of core principles can serve as a useful starting point for efforts towards achieving more compatibility and harmonization.

Data protection regulation is high on the political agenda as evidenced by a number of current developments.

1. The United Nations in 2015 appointed a Special Rapporteur on the right to privacy.
2. The European Union is finalizing a new General Data Protection Regulation to replace the European Directive on Data Protection, which has been a prominent source of regulation for twenty years.
3. Data protection has been included in several international trade agreements.
4. Data protection regulation has been considered in several high profile court cases in relation to national surveillance issues.
5. Numerous countries are drafting new data protection laws or are reviewing existing ones.
6. The European Union and the United States have re-negotiated a long standing cross-border data protection agreement (the former EU-US Safe Harbor Framework, now to be known as

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the EU- US Privacy Shield).
7. Several global and regional organizations have issued (or are developing) multiparty agreements and/or guidelines on data protection.

### 52. Trade Implications of Data Protection

Divergent regulatory approaches result in uneven levels of protection between jurisdictions. This, in turn, leads to the need for legal controls over cross-border flows of personal data between jurisdictions, in order to prevent the laws of the more protective regime from being circumvented and the privacy rights of the individuals being eroded.

Article XIV (c) (ii) of the WTO's General Agreement on Trade in Services (GATS) permits trade restrictions that are necessary for "*the protection of the privacy of individuals in relation to the processing and dissemination of personal data and the protection of confidentiality of individual records and accounts*", specifying that "*such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where like conditions prevail, or a disguised restriction on trade in services*".

This is a very high level provision that recognizes the positive aspects of data protection regulation. However, it is also well recognized that if data protection regulations go 'too far' they may have a negative impact on trade, innovation and competition.
While the potential need to control cross-border flows of data for privacy purposes is clear, the application of such controls in an increasingly inter-connected world is very challenging. ICT developments, such as cloud services, are making things even more complex, with processing entities not necessarily aware about where data are located. Although the answer may eventually be a technological one, increased harmonization of laws and regimes would greatly reduce the likelihood of friction over cross-border data flows.

Data protection is an increasingly important field, mostly due to the expansion of the digital/information economy. As more business models and practices move onto the digital platform and data becomes increasingly shared and exchanged on an international scale, its relationship to international trade intensifies. Since data are gathered, digitized, stored, and moved on a truly global basis by a multitude of parties, restrictions and regulations concerning data directly affect global trade.

Several studies have tried to estimate the potential impacts of data protection requirements that place unreasonable burdens on businesses or disrupt cross-border data transfers findings include:

1. proposed economy-wide data localization requirements would lead to a negative impact on GDP in several countries where such requirements have been considered (Brazil -0.8%, India -0.8% and Republic of Korea -1.1%) or implemented (Indonesia -0.7%);

2. for many countries that are considering forced data localization laws, local companies would be required to pay 30-60% more for their computing needs if they could go outside the country's borders and ;

3. if services trade and cross-border data flows are seriously disrupted (between the EU and US), the negative impact on EU GDP could reach 0.8 % to -1.3%.

Data protection is also important for facilitating the growth of the Business Process Outsourcing (BPO) and Information Technology Enabled Service (ITES) sectors. These are important industries, especially in developing nations, but they can only succeed if personal data can be transferred to the processing jurisdiction with trust and confidence that the data will be protected. Countries hoping to develop these industry sectors have a strong interest in data protection law. For example, Mauritius is seeking to have its data protection law recognized internationally by joining the Council of Europe Convention 108. Many other countries with growing BPO and ITES sectors have worked hard to establish strong data protection laws that meet international standards (for example, the Philippines and South Africa).

Data localization requirements are considered to have potentially significant trade implications. They are seen by some observers as going '*too far*,' posing risks to trade, innovation and competition. Others also consider that physical localization requirements ignore the reality that logical control over access to data (e.g. encryption keys) is a more important factor for determining the use and abuse of personal data. The issues arising from cross-border data transfers are to some extent being addressed through International Trade Agreements (ITAs). One recent example of a relevant agreement is the Trans-Pacific Partnership (TPP) agreement, covering 12 countries. The TPP addresses the issue of balancing data protection against trade considerations. Specifically, it imposes limits on the extent of data protection regulation that signatories can provide in their national laws and builds partly on Article XIV of the WTO General Agreement on trade in Services. Article 14.11 allows restrictions on cross-border transfers if they satisfy four requirements:

1. The law must be necessary "*to achieve a legitimate public policy objective*" this appears to be very straight forward requirement;
2. The law must not be "*applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination*";
3. The law must not be "*a disguised restriction on trade*";
and
4. The law must "*not impose restrictions on transfers of information greater than are required to achieve the objective*".

## 4. Data Protection Laws: Features of Few Countries

The following provide a few countries features on data protection legislation in select jurisdictions. These countries have been taken into account in order to display the diversity of legal approaches that have been undertaken. Some of the examples concern data protection laws in

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developed countries, but they still provide useful lessons for developing countries.

### Australia

Australia is a good example of a country that has amended and expanded its privacy legislation over many years, resulting in an up-to-date law with fairly comprehensive coverage. The law still exempts some small businesses and completely excludes employee records, but is otherwise closely aligned with international data protection models.

The Privacy Act 1988 requires private-sector organizations to comply with the Australian Privacy Principles in their collection, use, disclosure and handling of an individual's personal information. The legislation was significantly amended in 2012, resulting in increased penalties and a wider range of powers for the regulator (These amendments came into effect in 2014). In addition, some Australian states and territories have their own privacy legislation covering state government agencies and/or health providers. The Australian law is broadly compatible with the EU Directive (apart from the exemptions for small business and employee records), but Australia has never been granted '*adequacy*' status by the EU.

Australia is also a member of APEC and the current privacy legislation is compliant with the APEC Privacy Framework. However, Australia is not a participant in the APEC Cross-Border Privacy Rules scheme (APEC CBPRs) at this stage.

### Brazil

No general privacy or data protection law currently exists in Brazil, but it is a good example of a country that has been attempting to develop draft data protection legislation. A Draft Bill for the Protection of Personal Data was released in January 2015. It is broadly based on the European Data Protection Directive. In the meantime, privacy is a guaranteed right under Article 5 of the 1988 Constitution. The Constitution also provides for the innovative right of '*habeas data'*, which gives consumers the right to know what data are held about them and to correct it. In addition, some limited additional statutory protection for privacy can be found in the Consumer Protection Law 1990. Also, the Brazilian Internet Civil Rights Law, Federal Law No. 12965/2014, provides numerous legal rights for Brazilian citizens and Internet users, including protection about collecting and sharing personal data, its scope is limited to on-line activity. There are no cross-border data transfer restrictions in Brazil and it is unclear what exact form these might take in the draft Bill. The 2015 Draft Bill requires explicit consent to transfer personal data with limited exceptions and restricts the transfer of personal data only to countries that provide an equivalent level of data protection to Brazil.

Article 11 of the Internet Civil Rights Law, Federal Law No. 12965/2014, prescribes that, if any act that includes collection, storage, custody and treatment of data by a service provider occurs within the national territory of Brazil, it must respect Brazilian law and rights. This does not, however, place any specific restrictions on the transfer of data.

### France

France is a good example of an established data protection regime under the EU Directive. It is also an interesting example of the use of complex '*registration requirements*'. The Data Processing Act 1978 (revised 2004) sets out the main data protection provisions in France. Several other laws contain minor data protection requirements. The National Commission on Computer Science and Freedoms (CNIL) is an independent administrative authority protecting privacy and personal data. CNIL is probably one of the most visible and active privacy regulators in the world. Like many European data protection laws, some registration requirements are in place. Data Processing Act sets out the required formalities for data processing. Depending on the type of data processing involved, the data controller must comply with one of four different sets of formalities, ranging from simple notification to authorization. These rules are complex. Authorization is generally restricted to activities that are "*deemed potentially harmful to privacy and liberties*".

Article 23 of the Data Processing Act 1978 sets out complex rules for the notification and authorization of cross-border transfers:

1. Transfers within the EU do not require notification or authorization;
2. Transfers to countries formally declared as 'adequate' by the EU requires notification only; and
3. Transfers to all other countries require authorization.

### India

India is an example of a country with a complex, sectoral approach to data protection. India does not have a stand-alone data protection law, those protections that are available are contained in a mix of statutes, rules and guidelines. The most prominent provisions are contained in the Information Technology Act, 2000, as amended by the Information Technology Amendment Act, 2008. In particular, Section 43A, which addresses '*reasonable security practices and procedures*' is complemented by the Information Technology (Reasonable Security Practices and Procedures and Sensitive Personal Data or Information) Rules, 2011.

However, the scope and coverage of these rules is limited:

1. The majority of the provisions only apply to '*sensitive personal information*';
2. The provisions are restricted to corporate entities undertaking the automated processing of data; and
3. Consumers are only able to take enforcement action in relation to a small subset of the provisions.

In order to address these limitations, India has been considering implementation of a comprehensive privacy law for some time. The draft Right to Privacy Law 2014 law is being considered by the Government, but its exact progress is uncertain. At this time, India does not have a central, national regulator or complaints body for data protection. The draft Right to Privacy Law being considered would establish a national Data Protection Authority of India (DPA). Some very limited rules are in place for the transfer of sensitive data offshore. Data can be transferred only to a country where it is clear that the sensitive

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data will be adequately protected (Information Technology [Reasonable Security Practices and Procedures and Sensitive Personal Data or Information] Rules, 2011). "*Sensitive data*" is defined under the 2011 rules as information relating to a data subject's password, financial information, health, sexual orientation, medical records, and biometric information.

### Indonesia

Indonesia is a good example of a jurisdiction that has introduced a data localization requirement. The Law on Information and Electronic Transactions of 2008 contains a very brief section on privacy (Article 26). A regulation under the Act (Regulation No. 82 of 2012 on the Operation of Electronic Systems and Transactions) provides more detail.

Electronic system providers must ensure the protection of any personal data that they process. Such protection broadly includes obtaining necessary consent and ensuring that personal data are used only in accordance with the purpose communicated to data subjects. The Indonesian approach is not based on any international model.

Indonesia has yet to establish a data protection regulator. While the legislation is silent on the establishment of a regulator, this may be covered in future regulations.

Indonesia is one of the few developing countries to have introduced general data localization requirements related to data processed for public services. Article 1 of the Draft Ministerial Regulation concerning Data Center Technical Guidelines states that "*Any Electronic System Administrator for public service shall place a data center and a disaster recovery centre in Indonesia*."

Also, Article 17 (2) of the Regulation on Electronic System and Transaction Operation states that "*Electronic System Operation for public services shall place a Data Center and disaster recovery center in the territory of Indonesia for law enforcement, protection and sovereignty of the state and its citizens*."

These provisions are very recent, and their impact has not yet been measured.

### Japan

Japan is a good example of a country that has recently amended its privacy laws to address specific problems with enforcement. The Act on Protection of Personal Information (APPI) 2003 has applied to the private sector since 2005. The law covers both the public and private sectors. A substantial amendment to the APPI was passed on 3 September 2015. (This did not come into full effect until 2017.) The current law (still in force today) contains a general exemption for organizations that hold fewer than 5,000 records. However, this exemption has been removed in the recent amendments. Although Japanese law contains some unique provisions, the core principles are based on a mix of the OECD Guidelines and the EU Directive. Japan is also a member of APEC, and the Japanese privacy law complies with the APEC Privacy Framework. Japan is a formal participant in the APEC Cross-Border Privacy Rules system (CBPRs). The 2015 amendments to the law are expected to be supported by implementation guidelines developed by the new Personal Information Protection Commission (PIPC). An early draft of the implementation guidelines includes a proposed provision recognizing the APEC Cross-Border Privacy Rules schemes(APEC CBPRs) as binding for the purposes of cross-border data transfers. Once in force, this provision could act as an exemption to cross-border rules in the Japanese legislation, where the receiving company is a certified APEC CBPRs participant. The original Act on Protection of Personal Information (APPI) 2003 did not establish a central privacy regulator in Japan. Instead, each sectoral regulator took on the role of privacy regulator for that sector. This was seen as a major deficiency of the existing regime. The amendments to the APPI establish a new Personal Information Protection Commission (PIPC). The PIPC will have significant powers, including audit and inspection powers, and the power to request that companies submit compliance reports. The amendments also allow companies to buy and sell personal data that has been anonymized or aggregated this provision has been included to enable (and encourage) the use of big data analytics in Japan. A range of EU-style rules apply to data transfers for both domestic and global third party service providers, including a requirement to supervise sub-contractors when data are transferred to a third party. The 2015 amendments to the Act on Protection of Personal Information (APPI) set out a more comprehensive set of rules for cross-border transfers, but also include certain exceptions. The new amendments in Japan are considered to be a significant improvement.

### Republic of Korea

South Korea's privacy law is contained in the Personal Information Protection Act (PIPA) 2011, a comprehensive data protection law. PIPA was amended in 2013, 2014 and 2015. The key principles are based upon an EU directive and the OECD guidelines with some variations. Korea is also a member of APEC, although Korea does not participate in the APEC Cross-Border Privacy Rules scheme (CBPRs) at this stage. Korea has a unique dispute resolution system for privacy. In the event that a user suffers damage from an organization violating the information protection provisions, the user may claim compensation from the provider. In this case, the provider would be held responsible if it fails to prove the non-existence of an intention to infringe, or the absence of negligence causing such violations. Claims for damages may be filed with the Personal Information Dispute Mediation Committee.

### Russia

Russian privacy law is complicated. The key legislation is Federal Law No. 15-FZ on Personal Data 2006 (the Personal Data Law), which is supplemented by numerous additional laws, regulations and guidelines, including:

1. Provisions on methods and means for protection of personal data information systems, enacted through Order by the Federal Service for Technical and Export Control No. 58 dated

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5 February 2010;
2. Government Resolution No. 781 dated 17 November 2007, on establishing the regulations for providing security of personal data while processing personal data information systems; and
3. Main procedures for organizing and technical support for the security of personal data processed in personal data information systems enacted on 15 February 2008."

The combination of a number of Russian laws provides comprehensive privacy protection across all sectors. The Russian law has many similarities with the EU Directive. However, enforcement of the law appears to be limited. Russia is a member of APEC but does not participate in the APEC Cross-Border Privacy Rules system (CBPRs).

An interesting aspect of Russian law is that Article 110 of Federal Law no. 149-FZ on Information, Information Technologies and Protection of Information provides citizens with a 'right to be forgotten' and can be used to remove some URLs from search results. The key regulator is the Federal Service for Supervision in the Sphere of Telecommunications, Informational Technologies and Mass Communications (Roskomnadzor)· In Russia, the collection and processing of data requires formal registration by the data operators with the Roskomnadzor. There are exceptions for simple, one-off collection of data and human resources data. Overseas transfers are subject to the same registration requirements as domestic collection and processing.

From September 2015, however, it is a legal requirement that data operators store the personal data of Russian citizens on servers based in Russia. The Roskomnadzor is tasked with implementing this law. Large foreign-based data operators have been given extra time to comply with the law (until early 2016). The law only applies to data collected or updated after September 2015.

### South Africa

South Africa's comprehensive privacy law, the Protection of Personal Information Act 2013, was enacted in August 2013. The legislation covers all sectors. It is one of the most recent examples of a new privacy law in a significant market. The Act was based on, and is compatible with, the EU Data Protection Directive. The Information Regulator is the national privacy regulator of South Africa, an independent body with a national jurisdiction. There are no registration or notification requirements in South Africa. Cross-border transfers are forbidden unless they satisfy certain requirements most notably that the recipient is subject to a law, code or contract that ensures a level of privacy protection equivalent to that of South Africa.

### United Kingdom

The Data Protection Act 1998 (DPA) is a comprehensive privacy law for the public and private sectors. It has been updated several times. The legislation is comprehensive and covers all sectors. The Data Protection Act 1998 implements the EU Data Protection Directive. Article 8 of the Human Rights Act 1998 is also important in the UK. It provides a right to respect for private and family life, home and correspondence. The provision is sometimes used in actions related to privacy breaches by the media. The Information Commissioner's Office (ICO) is the UK's independent data protection regulator. Data controllers must register with the Information Commissioner's Office to report their intention to process personal data before they begin. Fees and an annual renewal requirement apply. There are a small number of exemptions to the registration requirement. The Data Protection Act allows data to be transferred to non-EU countries, subject to a range of conditions (such as consent and contract).

### Lessons learned from National Data Protection Laws

A large number of national data protection laws are in place, and although each law is slightly different, some interesting lessons can be learned from the overall trends in their development.
For example, lessons can be learned from the most recent countries to introduce data protection legislation (such as Malaysia, Singapore and South Africa).
It is notable that in each of these jurisdictions, the laws included:

1. High level principles, with less detailed prescription;
2. The establishment of a single independent national data protection regulator;
3. The complete absence of 'registration' requirements;
4. High-level (non-prescriptive) provisions enabling cross-border data transfers, subject to some conditions; and
5. Lengthy transition periods for local business compliance.

Some of the key drivers for amending privacy legislation in these countries included:

1. A perceived need to strengthen the powers of data protection regulators, particularly in relation to increased sanctions;

2. The removal of exemptions and exclusions;

3. A desire to simplify (and centralize) data protection regulation in a single

national agency; and

4. The expansion of data protection

5. Requirements to include matters related to security, particularly data breach and

notification requirements.

## 5. Concluding Observations and Policy questions

There is a common global goal of ensuring compatibility in data protection regulation. Although numerous attempts have been made to promote global harmonization, there is no single agreed model for data protection law at this stage. However, compatibility is the stated objective of many initiatives (for example, those that have been led by the APEC, the Council of Europe, the EU and the OECD). Further, no single initiative has won comprehensive global support. Some individual countries

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have amended their laws to improve compatibility and have changed their laws to ensure that foreign citizens have data protection and dispute resolution rights. This demonstrates that these countries see compatibility as an important objective. Although there is a shared objective of compatibility, it has not yet been achieved in practice. There are significant challenges for compatibility to work in practice. The findings of the research study would help to inform the much needed multi-stakeholder dialogue on how to enhance international compatibility in the protection of data and privacy, especially in relation to international trade, e-commerce and e-trade readiness and to provide policy options for countries that wish to implement new laws or amend existing ones. The findings of the research study would serve as a basis for a much-needed global dialogue aimed at building consensus in a very important policy field.

In fact, the broad policy questions include:
1. Who would build the systems underpinning the NDE
2. Where in the world would the NDE emerge, and when
3. How would the NDE alter the demand for labour and skills
4. When and to what degree would the NDE alter the balance of power and incomes within and across industries and societies
5. Will the NDE introduce unacceptable privacy concerns and cyber-security risk, or will such risks and concerns be manageable and outweighed by benefits to users.

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