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**Economic Commission for Europe****Conference of European Statisticians****Sixty-eighth plenary session**

Geneva, 22-24 June 2020

Items 3 and 9 of the provisional agenda

**Better measurement of the digital transformation****Coordination of international statistical work in the United Nations Economic Commission for Europe region: outcomes of the recent in-depth reviews carried out by the Bureau of the Conference of European Statisticians****In-depth review of measuring well-being in the era of the “digital society”: implications for official statistics<sup>1</sup>****Note by Statistics Canada***Summary*

This document is an in-depth review paper on measuring well-being in the era of the “digital society” that the Bureau of the Conference of European Statisticians discussed in October 2019 and February 2020.

The in-depth review identifies key issues that need to be considered when defining and measuring well-being in the digital age, focusing on emerging challenges and opportunities for adapting statistical infrastructures in the face of the digital transformation. The document presents the results of the survey on country practices and reviews the key international initiatives. It also presents the conclusions and recommendations for further work. The last section summarises the discussions by the Bureau and its decision in February 2020.

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<sup>1</sup> This document was scheduled for publication after the standard publication date owing to circumstances beyond the submitter's control.



## I. Background

1. It is now widely recognized that the digital transformation – the social and economic changes associated with Information and Communication Technologies (ICTs), automation, artificial intelligence, and other digital technologies – continues to reshape the lives of individuals, communities, and societies. The breadth of the digital transformation is immense, affecting virtually all aspects of peoples’ lives. The impacts of the digital transformation are also varied, ranging from minor adaptations in daily life to potentially transformative changes in fundamental values and processes. And many individuals, while already living ‘tech-saturated’ lives, continue to face rapid and ongoing technological change.

2. There are divergent views regarding the opportunities and risks that the digital transformation poses to well-being. For example, of the approximately 1,150 technology experts, health specialists, and other key informants who participated in the Pew Research Center’s 2018 assessment of “The Future of Well-being in a Tech-Saturated World,” 47% expected well-being “...to be more helped than harmed by digital life in the next decade”, while 32% expected well-being to be more harmed than helped (Pew Research Center, 2018).<sup>2</sup> More broadly, questions regarding the impacts of technological change are being raised across many quarters, highlighting how much is still unknown and how wide ranging the data needs are. One important question is whether these data gaps can be filled with traditional surveys or whether new instruments for data collection need to be considered.

3. The digital transformation is a source of both risks and opportunities for well-being, but how these risks and opportunities are distributed within populations and across countries is not well-established. As digital technologies continue to advance and spread, new classes of have and have-nots could emerge in both national and international contexts. At least, the distributions of risks and opportunities can be expected to depend on factors such as levels of connectivity, digital skills, and technological development. There is a ‘digital divide’ in horizontal (between socio-demographic groups) and vertical inequalities (between individuals) that stem from differences in the availability of digital infrastructure, access to digital technologies, the skills needed to use these technologies, and the human capital needed to capitalize on the opportunities these technologies present, while mitigating the risks (OECD, 2019a).

4. In parallel with the many challenges and questions posed by the digital transformation, national statistical offices (NSOs) and other stakeholders are working to broaden our understanding and measurement of ‘well-being’. The limitations of traditional economic measures, such as GDP, have long been recognized, and various alternative approaches to measuring well-being have been launched over the decades. Overlaying and integrating the many challenges and questions associated with well-being and with the digital transformation puts us, in the words of Gluckman and Allen (2018), in “...new and uncharted terrain.”

5. This review identifies key issues that need to be considered when defining and measuring well-being in the digital age. Given that work in this area is still at early stages, much of the focus is on emerging challenges and opportunities for adapting statistical infrastructures in the face of the digital transformation. As part of the review, a stocktaking exercise gathered information on NSOs’ activities to collect and/or aggregate information to produce indicators of well-being (see questionnaire in appendix I). The questionnaire was fielded among delegates to the OECD Working Party on Measurement and Analysis of the Digital Economy (WPMADe) in October 2019 and to other UNECE countries in November 2019.

6. This review is organized into the following sections. Sections II and III introduce the purpose and scope of the review. Section IV outlines the conceptual issues that NSOs and other stakeholders need to consider in defining well-being and evaluating whether traditional approaches to data collection are adequate for measuring well-being in the digital era. Section V presents the results from the survey fielded on country practices. Section VI reviews the

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<sup>2</sup> The remaining 21% did not expect much change in well-being compared to now.

key initiatives that international organizations have undertaken to re-define and measure well-being. Section VII presents the conclusions and recommendations.

## II. Introduction

7. The Bureau of the Conference of European Statisticians (CES) regularly reviews selected statistical areas in depth. The aim of the reviews is to improve coordination of statistical activities in the UNECE region, identify gaps or duplication of work, and address emerging issues. The review focuses on strategic issues and highlights concerns of statistical offices of both a conceptual and a coordinating nature. The current paper provides the basis for the review by summarizing the international statistical activities in the selected area, identifying issues and problems, and making recommendations on possible follow-up actions.

8. The CES Bureau selected “Measuring well-being in the era of the ‘digital society’: Implications for official statistics” for an in-depth review for its February 2020 meeting. Statistics Canada, with the assistance of the U.S. Bureau of Economic Analysis (BEA), was requested to prepare the paper providing the main basis for the review. The topic is an amalgam of two topics previously suggested to the CES: (i) digital society and (ii) measuring well-being.

## III. Scope/definition of the statistical area covered

9. Differentiating the impacts of the digital transformation on economic activities (i.e. the digital economy) and all other domains of life, broadly labelled as ‘social’, helps to map out the terrain.

10. In terms of economic activities, digitalization has fundamentally disrupted society by transforming business models and how households consume and interact. The digital economy has introduced a shift in the way households consume goods and services: items are now obtainable at a lower-cost, such as through online shopping and peer-to-peer services, or for free, such as online journals. Other transactions are more subtle, as consumers exchange personal information for access to digital goods or services. This new form of transaction has fundamentally changed consumer surplus for households, in some cases, that is not sufficiently captured in our current economic estimates. This shift will impact the well-being of individuals and society.

11. Sufficiently capturing the digital economy has important implications for the indicators employed to measure the status of an economy. Statistics Canada has focused this effort on four main themes which help frame the estimates of the impact on GDP, its potential under-coverage, and the impact on well-being: global consumption such as international trade, as consumers can purchase directly from anywhere in the world, or through the platform economy where an exchange of goods or services is facilitated outside of the country; household production and income which examines the changing role of the household sector from consumer to producer, impacting well-being; the new DIY household and how it affects the way goods and services are consumed; and the shift in the type of capital investments including valuation of data and estimation of stock of data. Recently released experimental estimates of the value of data and related activities estimated an upper bound of \$40 billion in 2018 (Statistics Canada, 2019). The stock of these activities is estimated to be larger than the stock of other intangible assets, such as software and research and development.

12. The economic and social implications of the digital transformation cannot always be clearly demarcated as these implications can be cross-cutting. For example, automation and gig employment have implications for job security, job quality, and personal finances, but are also relevant to the social aspects of well-being, such as job satisfaction, life satisfaction, and work-life balance. Nonetheless, the focus below is on issues beyond the economic impacts of digitalization.

## IV. Concepts and issues

13. Conceptual frameworks relevant to digital transformation and well-being are varied in their scope and level of abstraction. The level of abstraction is an essential point as it defines: (i) the mechanisms through which digital technologies affect well-being; (ii) the aspects of well-being that warrant concern in the short to medium run; and (iii) how digital technologies and the digital divide (i.e. group-level differences in access to ICT and ICT skills) may deepen or reduce pre-existing inequalities in well-being and/or generate new sources of well-being in the longer term.

14. In their paper prepared for the OECD, Gluckman and Allen (2018) present three fundamental considerations for framing discussions about well-being in the digital age. First, well-being should not be viewed through a narrow lens, such as a focus on a single factor, a composite indicator, or even a suite of indicators. Well-being is a diffuse concept that spans multiple domains and potentially includes a constellation of variables. Second, digitalization is itself a multifaceted phenomenon that consists of different types of technologies, which have distinct as well as cumulative implications. Third, it cannot be expected that the risks and opportunities of digitalization are or will be evenly distributed within and across populations. The digital divide in ICT access, skills, and security will also define what constitutes a risk or an opportunity and which sociodemographic groups are most vulnerable to risks or best positioned to seize upon opportunities.

15. Coordinating measures of well-being requires a common understanding of ‘well-being’ and an operational definition that is comparable across countries. An operational definition of well-being is challenging in the case of digitalization because digitalization affects virtually all aspects of life, and also because national circumstances influence the relationship between digitalization and well-being outcomes. There is a need to be more specific about which aspects of well-being ought to be priorities when considering the implications of digitalization in both national and comparative contexts. This work involves deciding on the level of abstraction, the unit of analysis, and a ‘minimum set’ of domains or dimensions of well-being on which to focus.

16. The OECD’s recent publication *How’s Life in the Digital Age* (OECD, 2019a) is instructive for distilling a common definition of well-being in context of digitalization, although expert consultation is needed to decide on a ‘minimum set’ of comparable measures. The OECD provides a practical approach for organizing the concrete aspects of well-being at a lower-level of abstraction, dividing well-being into the following components: doing well (material conditions), being well (individual-level states), relating well (the relational aspects of well-being), and the forms of capital that are needed to sustain well-being. This approach helps bridge the gap between higher-level concepts and the practical need to focus on a selection of variables as opposed to a constellation of variables.

17. Within the research literature, digitalization and well-being is approached using narrower disciplinary frameworks, with analytical emphasis on specific outcomes. For example, a growing body of research on the effects of technology on physical and mental health is emerging, with recent studies examining outcomes such as cortisol levels (Affi et al., 2018), quality and quantity of sleep (Carter et al., 2016), eye strain (Rosenfield, 2016), musculoskeletal problems (Al Abdulwahab, 2017) cardiorespiratory fitness (Lepp et al., 2013), depression and anxiety (Shensa et al., 2017; Maras et al., 2015), perceived social isolation (Primack et al., 2017), and attention-deficit/hyperactivity disorder (Ra et al., 2018). Such focused, robust research provides the necessary empirical foundation upon which the selection of well-being indicators and higher-level reporting can be based.

## V. Country practices

18. From October to November 2019, a short questionnaire regarding data collection on technology-use and well-being was sent to national statistical offices (NSOs) in countries participating in CES (see questionnaire in appendix 1). Responses were received from 40 countries. Information was collected regarding technology and well-being questions included on dedicated internet adoption and use surveys and on other household surveys. Results are

presented in turn below, followed by a review of countries' use of alternative modes of data collection.

## A. Household surveys – dedicated internet adoption and use surveys

19. As part of the CES review, NSOs were first asked if they field “...a dedicated household survey of Internet Adoption and Use,” and if so, whether that survey includes measures of well-being in each of 13 listed domains. Twenty-nine organizations report that they field such a survey and 11 organizations report that they do not. Among those fielding surveys, three report that they do not include any well-being measures, eight report that they include well-being measures in 1 to 4 domains, and 18 report that they include well-being measures in 5 or more domains (Table 1).

Table 1.  
**Dedicated household surveys of internet adoption and use**

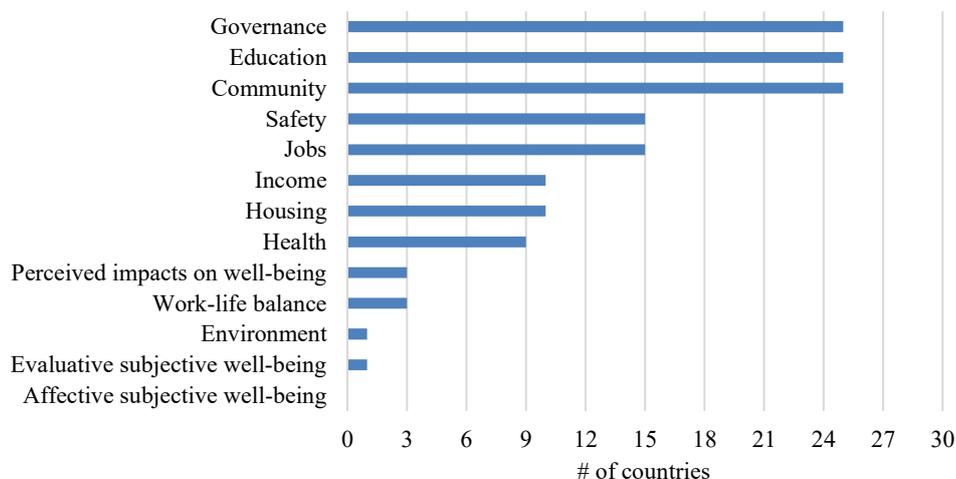
	N
Does organization field a dedicated household survey of internet adoption and use?	
No	11
Yes	<u>29</u>
Total	40
Of organizations fielding a dedicated survey, number indicating that the survey includes ...	
No well-being measures	3
Well-being measures in 1 to 4 domains	8
Well-being measures in 5 to 8 domains	17
Well-being measures in 9 to 13 domains	<u>1</u>
Total	26

20. Of the 29 countries fielding an internet adoption or use survey, 25 include measures of well-being in the domains of governance, education, and community (Figure 1). Under ‘governance’, questions primarily pertain to individuals’ use of government websites to obtain information and services; under ‘education’, questions primarily pertain to individuals’ on-line learning activities; and under ‘community’, questions primarily pertain to individuals’ use of social networking and related sites. Overall, it appears that survey questions in these domains largely focus on what people *do*. This is also the case in the ‘jobs’ and ‘income’ domains, with questions mainly about telework, on-line job searches, and use of the internet to earn money. Nine countries include health questions on their dedicated internet survey. Again, these tend to ask about activities, such as using the internet to book medical appointments and obtain health information, although some countries ask respondents to assess the impacts of technology on their health.

21. Fifteen countries include questions about internet safety and security on their dedicated internet adoption or use surveys. Most often these questions are about on-line victimization, such as experiences of on-line fraud, misuse of personal information, on-line harassment or bullying, and identity theft. Ten countries include questions about housing, with access to internet in the home being the most prevalent question.

22. Finally, very few countries include questions about perceived impacts of technology on well-being, work-life balance, positive or negative affect, or life satisfaction on their dedicated ICT survey, and very few include questions about environmental behaviours or outlooks (e.g. disposing of e-waste).

Figure 1  
**Measures of well-being included on dedicated household surveys of internet use or adoption**



23. Overall, the absence of subjective measures of well-being on dedicated internet adoption and use surveys is one observation from the results above. People’s own assessments of the impacts of technology in their lives is an important line of evidence for understanding digitalization and well-being. Nonetheless, it appears that relatively little information of this type is being collected on dedicated ICT surveys. Adding well-documented measures of subjective well-being to these surveys would yield valuable analytical returns. Well-documented single-item measures (e.g. self-assessed mental health, life satisfaction) may be the most feasible given space limitations on most surveys. Multi-item measures (e.g. psychological functioning, positive and negative affect) are another option.

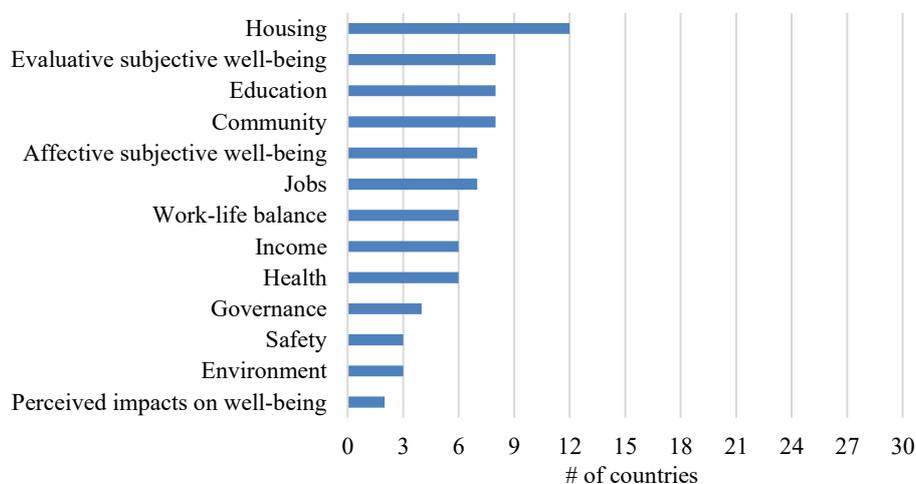
## B. Household surveys – other household surveys

24. NSOs were next asked if they “...collect information on ICT adoption and use through any other household surveys” and, if so, whether that survey includes measures of well-being in each of the 13 domains listed above. Half of the 40 organizations responding do include ICT adoption and use questions on other household surveys, while others do not.<sup>3</sup> Of the 20 organizations that include ICT questions on other household surveys, six said that these surveys do not include any measures of well-being.

25. Overall, household surveys (other than dedicated ICT surveys) are not used extensively to collect information on digitalization and well-being. About one-third of countries (14 of 40) report that ICT questions *and* well-being questions are included on other household surveys. Of these 14 countries, the largest number (12) include well-being questions in the ‘housing’ domain (Figure 2). Organizations were not asked to list their survey questions in this section of the CES review, so it is not possible to determine if the housing questions pertain to internet access in the home or to other issues. Seven or eight countries include well-being questions in the domains of evaluative subjective well-being (e.g. life satisfaction) and affective subjective well-being (e.g. feeling happy or anxious yesterday) on other household surveys that also include internet use questions. This is more than the number that include subjective well-being questions on dedicated ICT surveys. Nonetheless, fewer than 9 of the 40 countries include ICT questions and subjective well-being questions on household surveys, and similarly small numbers include ICT questions and questions about well-being in other domains on these surveys.

<sup>3</sup> Of the 20 national organizations that include ICT measures on other household surveys, 14 of them report that no well-being measures are included on the survey, while about 5 to 6 reporting that well-being measures are included in 1 to 4 domains, 5 to 8 domains, or 9 to 13 domains listed earlier above.

Figure 2

**Well-being measures on other household surveys that include information on ICT use**

26. Dedicated internet use and adoption surveys generally include very large numbers of questions regarding respondents' uses of technologies. Including all of these questions on other household surveys is likely unfeasible given survey space limitations. Using dedicated internet use and adoption surveys to develop and validate a short set of ICT-use questions for inclusion on other household surveys warrants consideration. This could facilitate the collection of information on ICT-use and well-being across a broader range of survey vehicles.

27. Of the countries that include ICT-use questions on other household surveys, the largest number (8 to 10) include these questions on General Social Surveys, including time-use surveys, surveys of leisure, and other social surveys. Another three countries report that ICT-questions are included on household budget and expenditure surveys, and two report that ICT-questions are included on employment or labour force surveys. The specific surveys that countries use to collect information on ICT-use and well-being is another issue warranting consideration given potential implications for international comparability.

### C. Household surveys - complementarities between dedicated ICT surveys and other household surveys

28. The high-level information collected for this review does not allow conclusions to be drawn about the degree to which NSOs coordinate or integrate ICT and well-being content across dedicated ICT surveys and other household surveys. A crude categorization of this intersection is presented in Table 2. Only five countries field neither a dedicated internet use survey nor include ICT questions on other household surveys; fourteen countries field both.

29. One consideration is the degree of coordination that occurs within NSOs between project teams responsible for dedicated ICT surveys and other household surveys. In situations where integration between project teams is weak, opportunities for replicating or leveraging survey content may be lost.

Table 2

**ICT content across survey vehicles, UNECE countries**

Include ICT questions on other household surveys	Field a dedicated Internet Use Survey	
	No	Yes
No	5	15
Yes	6	14

## D. New technologies and opportunities for data collection

30. NSOs continue to adapt and develop elements of their statistical infrastructures in order to keep pace with economic, social, and environmental change. The scope and rapidity of technological change poses new challenges in this respect, but also offers new opportunities for data collection. Social media platforms, satellite imagery, administrative data, and information collected through online apps are just a few of the vehicles offering new potential to strengthen statistical infrastructures in a digital world. Such approaches could address the on-going challenge of the timeliness of data in the face of increasing demand for real-time information. However, the utilization of such data raises a broad set of issues regarding individual privacy, data acquisition, and communication strategies between NSOs and the public. Given different legislative environments and cultural contexts across different countries, this takes on added complexity in an international context.

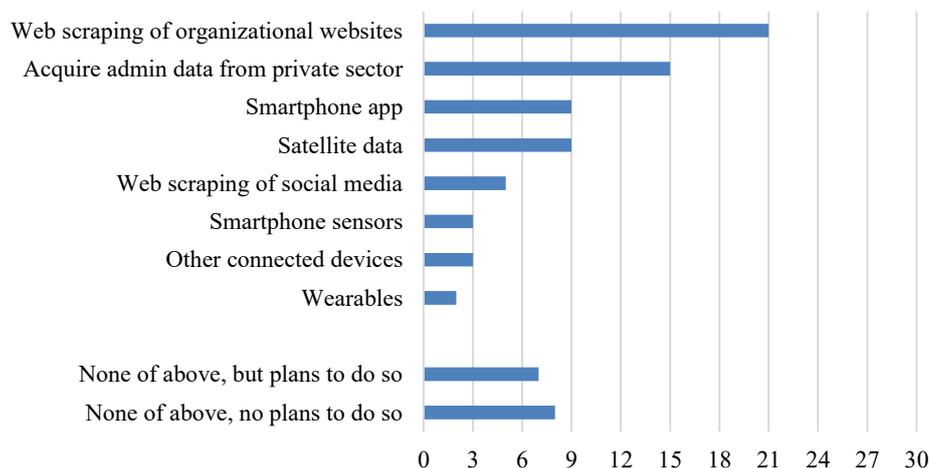
31. Digitalization offers opportunities for NSOs to collect new information on well-being. To shed more light on this, organizations participating in this review were asked if they are “...currently engaged in using any of the following data collection methods?” Results are shown in Figure 3. There is considerable variation in the adoption of ICT-based collection data modes across UNECE countries. Of the 40 countries participating in the review, 15 do not currently use any of the ICT-based collection modes shown; about half of these countries have plans to implement at least one of these collection modes.

32. Of the 25 countries that use at least one of these collection modes, most web scrape institutional or company websites (21) or acquire administrative data from private sector sources (15). Twelve of them do both. In contrast, fewer than ten countries currently use any of the other ICT-based collection modes listed. Data collection using satellites and smart phone apps are most prevalent, used by nine countries.

33. Countries using any ICT-based data collection modes were subsequently asked if information on digitalization and well-being is collected in this way. Only four countries report that it is.

Figure 3

### Number of countries using specific ICT data collection modes



34. The unit of analysis – whether the individual or the group – is a further measurement consideration in the context of big data’. As discussed in Chapter 6 of the 2019 World Happiness Report (Bellet and Frijters, 2019), the use of big data, such as Google search terms and Facebook ‘likes’, does not improve the ‘generally low predictability of individual-level satisfaction.’ In contrast, greater predictive power is yielded from group-level data, such as geographic-area data (e.g. counties) within or across countries. Measuring well-being using alternative sources of big data may offer potential to quantify the impacts of local changes in policy or other ‘shocks’ on well-being across regions or over time.

## VI. Overview of international statistical activities

### A. Organisation for Economic Cooperation and Development

35. In *How's Life in the Digital Age*, the OECD (2019a) has created a “digital well-being wheel” and published a corresponding report that compares 36 countries on their performance in harnessing the opportunities and reducing the risks associated with the digital transformation. The digital well-being wheel includes 33 indicators that span factors such as ICT utilization and skill level and the impact of ICT on employment and earnings, social connections, e-government, and subjective well-being. These indicators are derived from multiple data sources, including the OECD Programme for the International Assessment of Adult Competencies (PIAAC) and the Programme for International Student Assessment (PISA). The PISA provides a rare source of comparative data that contains measures of ICT usage and skill levels and also has explicit measures of well-being, such as students’ life satisfaction, sense of belonging, and school engagement. While the PISA has good country coverage, it covers only 15-year-olds.

36. Measuring the Digital Transformation (MDT): As part of the OECD’s ‘Going Digital’ project, a measurement roadmap was developed, outlining key areas for further development of data collection and methods (OECD, 2019b). This document outlines nine key actions, two of which are directly relevant to this work. The first is to ‘Encourage measurement of the digital transformation’s impacts on social goals and people’s well-being’. This identifies the need for this data and also lays out steps to potentially advance the work including the implementation of new subject matter questions on ICT adoption and use surveys as well as ICT-use variables on household surveys. The development of new statistical survey tools, as well as improved linkages with environmental impacts are also highlighted. The second, ‘Design new and interdisciplinary approaches to data collection’ identifies the need to use digital technologies as part of the solution to capturing the full magnitude of the digital transformation. This is relevant to the work on digitalization and well-being and although examples of this already exist, they will continue to need to be explored and exploited within the context of privacy limitations in order to properly measure these phenomena.

37. At the OECD, the Working Party on Measurement and Analysis of the Digital Economy (WPMADe) is responsible for the Model Survey of ICT Adoption and Use by Individuals. Currently, this questionnaire collects very little information directly related to the impacts of digitalization on well-being. Nevertheless, the survey, which was last revised in 2015, has the potential to be enhanced in order to offer insights on societal issues related to digitalization.

### B. European Commission

38. Since 2003, Eurostat has provided a questionnaire on ICT usage in households and by individuals. The questionnaire is revised annually to respond to changing data needs. To date, the primary focus of the survey has been on ICT utilization and skills, on-line activities, and privacy and security issues. Eurostat has published a Digital Skills Indicator (DSI) that is populated with data from its ICT usage survey. The DSI measures factors such as digital communication skills, data literacy, and problem solving in digital environments. The European Commission has also created the International Digital Economy and Society Index (I-DESI). The I-DESI is a composite index that consists of 24 indicators and is used for comparing and benchmarking the digital performance of 45 countries from 2013 to 2016. The I-DESI has five components: connectivity, human capital, citizen internet use, business technology integration, and public services. While the I-DESI is useful for measuring access to digital technologies and digital skills, which have implications for well-being, it is not designed to measure well-being.

39. Eurostat is in the process of testing innovative tools for collecting information on time use surveys and household spending surveys. Time Use Surveys (TUS) in particular have traditionally been an important source of information on ICT use and well-being measures such as life satisfaction in many countries; the hope is that Eurostat will be able to advise

countries on the best technologies and approaches to data collection for these types of household surveys.

### **C. United Nations Department of Economic and Social Affairs**

40. The United Nations Department of Economic and Social Affairs has developed the E-Government Development Index (EDGI) and the Measurement and Evaluation Tool for Citizen Engagement and E-Participation (METEP). The EDGI is a composite index that consists of an online services index, telecommunication infrastructure index, and human capital index. The UN has conducted a biannual survey since 2001 that assesses the e-government status of UN member states. The 2018 survey examines the trend toward higher levels of online government services and the impact of digitalization on the public sector and the implications for inclusion. The METEP is an analytical framework and tool for measuring and evaluating aspects of the state of e-participation readiness of government institutions.

## **VII. Conclusions and recommendations**

41. The digital transformation and its potential impacts on individuals, communities, and societies are immense – reflecting the breadth of change (i.e. the range of domains impacted by technology); the depth of change (i.e. the transformative impacts of technology within domains); the rapidity of change; and the unknowable nature of change that is yet to come.

42. This raises questions regarding how NSOs ought to conceptualize, develop, and coordinate data collection through different vehicles to best capture information on new technologies and the risks and opportunities they pose. Traditional household surveys may be assigned a different role in the years ahead if information on individuals' frequency and intensity of technology use becomes available through alternative sources. In the meantime, this review yields several conclusions and recommendations.

43. Of the 40 countries participating in this review, 29 field a dedicated internet adoption and use survey. While these surveys collect information on respondents' activities and use of technologies, they appear to collect very little information on respondents' own assessments of the impacts of technology in their lives or on their subjective well-being (SWB). This is a missed opportunity to provide new and valuable evidence on digitalization and well-being. The optimal strategy for addressing these gaps warrants consideration.

44. The degree of integration or coordination between the internet adoption and use surveys and other household surveys fielded by NSOs warrant consideration. Only 20 of the 40 countries participating in this review include technology-use questions on other household surveys. This may reflect a survey design challenge given the large number of questions needed to fully describe a survey respondent's technology use and skills. A solution could be to develop a small subset of technology questions for inclusion on various household surveys. Standardizing these across countries would facilitate international comparability.

45. While the digital transformation can be viewed as a driver of social change, it can also be viewed as a vehicle for data collection. This places the emphasis on new operational opportunities for NSOs to measure well-being. Website scraping and acquisition of administrative data are used most broadly across NSOs, while other modes of data collection – such as smart phones, wearables, and scraping of social media sites – are used by far fewer organizations. Strategies for promoting best practices and improving data collection using these modes warrant consideration.

46. In this review, participants were *not* asked about linkages between microdata from internet use and adoption surveys and other sources, particularly administrative data. Linking microdata on digital skills and activities with administrative microdata on household income (e.g. taxation data), health services utilization (e.g. hospitalization data), or educational attainment (e.g. tertiary/post-secondary education data) could allow NSOs to leverage their data holdings and create new opportunities for understanding digitalization and well-being.

47. Measuring the impacts of technology on well-being poses challenges to NSOs in terms of scope – both in terms of the technologies and aspects of well-being to be considered.

The range of domains in which the impacts of new technologies could be assessed is immense, meaning that NSOs face a wide range of data demands and difficult decisions regarding data collection priorities. Recommendations for steps in the short-term are already being voiced. For example, a recent expert panel identified five aspects of well-being that appear susceptible to the impacts of technology but have received little or no attention in well-being frameworks (Gluckman and Allen, 2018). These include: human development (including early childhood learning), mental health across the life span, social inclusion, personal and public security, and governance. Additional priorities would no doubt be identified through consultations with national stakeholders, including government policy departments. NSOs must thus face challenging decisions regarding priorities.

## VIII. Discussion by the Bureau of the Conference of European Statisticians

48. The Bureau discussed measuring well-being in the era of digital society in October 2019 and February 2020. Some of the points raised in October 2019 were:

(a) The discussion should focus on the core business of statisticians: measurement. Based on the many research studies carried out, a range of domains/dimensions for measuring well-being can be identified. These dimensions can constitute a minimum set, not trying to be universal as national circumstances (cultural norms, etc.) have a big impact on well-being. The OECD ‘How is life’ initiative is a good starting point.

(b) Creating another set of indicators is not useful as policies in countries are different.

(c) It is difficult to entangle the effect of digitalisation among the many aspects that impact well-being. Often what can be measured is well-being and not so much the impact of information and communication technologies (ICT) on that. However, national policy makers may be interested specifically in the impact to decide where to invest to have a maximum effect on well-being.

(d) The existing frameworks and dimensions of well-being can be analysed from the viewpoint of how they are covered with existing data sources: what types of surveys and data are needed to fill the gaps.

(e) ICT surveys are not sufficient and combining data from different surveys is needed. It will be good to coordinate sampling schemes of surveys so that they can be linked together easier. A core set of social variables and well-being questions could be included in every survey.

(f) We should look at the frameworks and approaches that countries have already used and tested, try them out in other countries and exchange experience.

(g) Not much work has been done on societal and community wide aspects of well-being and how digitalisation affects that.

49. The Bureau decided to undertake a survey on NSO involvement in measuring digitalisation. The survey was carried out in autumn 2019 (the results are summarised in Section V above). The in-depth review paper was updated to take into account the comments by the Bureau and outcomes of the survey. The following points were raised in the discussion in February 2020:

(a) The starting point for measurement should be the policy needs. Engaging with academia can help to identify the areas of focus for official statistics;

(b) A new framework to measure well-being is not required as there is good convergence around the broad dimensions to consider;

(c) Digitalisation has an impact on all spheres of life and should be integrated in all statistics. Expert groups working in different areas of statistics could be asked to identify the impact of digitalisation in their subject matter areas;

(d) The measurement should have a future oriented view, not be limited to existing time-series and surveys, and not be based on the viewpoint of using specific technologies. The aim is to give a coherent picture;

(e) Looking at the impact of digitalisation on children is important as it helps to foresee the impact on future adults;

(f) For international comparability, it can be helpful to agree on definitions of different variables and even questions in surveys. This may also help in integrating information gathered through different surveys. Longitudinal studies and time-use surveys are very important instruments for collecting information about impact of digitalisation;

(g) It is challenging to communicate the data on digital economy and the linkages between digitalisation and well-being in an easily understandable way.

50. The CES Bureau asked Canada to formulate concrete follow-up actions in this area for its next meeting in October 2020.

## References

- Abraham, Katharine G., John C. Haltiwanger, Kristin Sandusky, and James R. Spletzer. (2018). "Measuring the gig economy: Current knowledge and open issues." NBER, Working paper 24950.
- Affi, Tamara, et al. (2018). "WIRED: The impact of media and technology use on stress (cortisol) and inflammation (interleukin IL-6) in fast paced families." *Computers in Human Behavior*, 81 (April), 265-273.
- Al Abdulwahab, S. S., S. J. Kachanathu, and M. S. Al Motairi. (2017). "Smartphone use addiction can cause neck disability." *Musculoskeletal Care*, 15(1), 10-12.
- Bellet, Clement, and Paul Frijters. (2019). "Big data and well-being." In *World Happiness Report*, J. Helliwell, R. Layard, and J. Sachs (Eds.). New York: Sustainable Development Solutions Network.
- Carter, Ben, Philippa Rees, Lauren Hale, et al. (2016). "Association between portable screen-based media device access or use and sleep outcomes: A systematic review and meta-analysis." *JAMA Paediatrics*, 170(12), 1202-1208.
- Gluckman, Sir Peter, and Kristiann Allen. (2018). "Understanding wellbeing in the context of rapid digital and associated transformations." The International Network for Government Science Advice.
- Helliwell, John F., and Haifang Huang. (2013). "Comparing the happiness effects of real and on-line friends." *PLOS ONE*, 8(9).
- Helliwell, John F. (2018), "What's special about happiness as a social indicator?" *Social Indicators Research*, 135(3), 965-968.
- Lepp, A., J. E. Barkley, G. J. Sanders, M. Rebold, and P. Gates. (2013). "The relationship between cell phone use, physical and sedentary activity, and cardiorespiratory fitness in a sample of US college students." *International Journal of Behavioral Nutrition and Physical Activity*, 10(1), 79.
- Maras, D., M. F. Flament, M. Murray, A. Buchholz, K. A. Henderson, N. Obeid, and G. S. Goldfield. (2015). "Screen time is associated with depression and anxiety in Canadian youth." *Preventive Medicine*, 73, 133-138.
- OECD. (2019a). *How's Life in the Digital Age: Opportunities and Risks of the Digital Transformation for People's Well-being*. OECD Publishing: Paris.
- OECD. (2019b). *Measuring the Digital Transformation: A Roadmap for the Future*. OECD: Publishing, Paris.
- Pew Research Center, April 2018. "The Future of Well-being in a Tech-Saturated World."
- Primack, B. A., et al. (2017). "Social media use and perceived social isolation among young adults in the US." *American Journal of Preventive Medicine*, 53(1), 1-8.
- Ra, C. K., J. Cho, M. D. Stone, et al. (2018). "Association of digital media use with subsequent symptoms of attention-deficit/hyperactivity disorder among adolescents." *JAMA*, 320(3), 255-263.
- Rosenfield, M. (2016). "Computer vision syndrome (aka digital eye strain)." *Optometry in Practice*, 17(1), 1-10.
- Samaha, M., and N. S. Hawi. (2016). "Relationships among smartphone addiction, stress, academic performance, and satisfaction with life." *Computers in Human Behavior*, 57, 321-325.
- Shakya, H. B., and N. A. Christakis. (2017). "Association of Facebook use with compromised well-being: A longitudinal study." *American Journal of Epidemiology*, 185(3), 203-211.
- Shensa, A., C. G. Escobar-Viera, J. E. Sidani, N. D. Bowman, M. P. Marshal, and B. A. Primack. (2017). "Problematic social media use and depressive symptoms among US

young adults: A nationally-representative study.” *Social Science & Medicine*, 182, 150-157.

Statistics Canada. (2019). “The value of data in Canada: Experimental estimates.” Statistics Canada Catalogue no. 13-605-X. Accessed January 2019. [www150.statcan.gc.ca/n1/pub/13-605-x/2019001/article/00009-eng.htm](http://www150.statcan.gc.ca/n1/pub/13-605-x/2019001/article/00009-eng.htm)

Tromholt, M. (2016). “The Facebook experiment: Quitting Facebook leads to higher levels of well-being.” *Cyberpsychology, Behavior, and Social Networking*, 19(11), 661-666.

Twenge, J. M., G. N. Martin, and W. K. Campbell. (2018). “Decreases in psychological well-being among American adolescents after 2012 and links to screen time during the rise of smartphone technology.” *Emotion*, 18(6), 765-780.

## Appendix

### I. Digitalization and well-being questionnaire (survey carried out in countries participating in CES in autumn 2019)

#### A. Surveys on internet adoption and use

1. Does your organization field a dedicated household survey of Internet Adoption and Use?

- (a) Yes
- (b) No (go to Q4)

2. Does that survey include any of the following measures of well-being?

*Select all that apply.*

- (a) Subjective well-being - Affective wellbeing (e.g. happiness yesterday, happiness in moment)
- (b) Subjective well-being - Evaluative wellbeing (e.g. life satisfaction)
- (c) Housing (e.g. affordability and access)
- (d) Income (e.g. online earnings)
- (e) Jobs (e.g. telework)
- (f) Community (e.g. online social networks)
- (g) Education (e.g. use of online training)
- (h) Environment (e.g. e-waste)
- (i) Governance (e.g. use of e-government services)
- (j) Health (e.g. internet addiction)
- (k) Safety (e.g. cyberbullying)
- (l) Work-Life Balance (e.g. working outside work time)
- (m) Self-perception of impact of technology on well-being

or

- (n) No measures of well-being

3. For each measure in Q2, could you provide information on what is collected (e.g. variables or questions) and what indicators are produced?

*If the functionality exists, the following table should only include items selected in Q2.*

Well-being domain	Questions / Variables	Indicators produced
Subjective well-being - Affective wellbeing (e.g. happiness yesterday, happiness in moment)		
Subjective well-being - Evaluative wellbeing (e.g. life satisfaction)		
Housing		
Income (e.g. online earnings)		
Jobs (e.g. telework)		
Community (e.g. online social networks)		
Education (e.g. use of online training)		
Environment (e.g. e-waste)		

Governance (e.g. use of e-government services)		
Health (e.g. internet addiction)		
Safety (e.g. cyberbullying)		
Work-Life Balance (e.g. working outside work time)		
Self-perception of impact of technology on well-being		

## B. Other household surveys with measures of digital technology

4. Do you collect info on ICT use (e.g. frequency of internet use, perceived impacts of digitalization, etc.) on any other household surveys?

- (a) Yes
- (b) No (go to 6)

If yes:

Please list the surveys (e.g. General Social Survey, etc.)

[open text box]

5. Thinking of these other household surveys that also collect info on ICT use, what well-being measures are collected?

*Select all that apply.*

- (a) Subjective well-being - Affective wellbeing (e.g. happiness yesterday, happiness in moment)
- (b) Subjective well-being - Evaluative wellbeing (e.g. life satisfaction)
- (c) Housing
- (d) Income (e.g. online earnings)
- (e) Jobs (e.g. telework)
- (f) Community (e.g. online social networks)
- (g) Education (e.g. use of online training)
- (h) Environment (e.g. e-waste)
- (i) Governance (e.g. use of e-government services)
- (j) Health (e.g. internet addiction)
- (k) Safety (e.g. cyberbullying)
- (l) Work-Life Balance (e.g. working outside work time)
- (m) Self-perception of impact of technology on well-being

## C. Data indicators and frameworks

6. Does your country produce any of the following?

*Select all that apply.*

- (a) A well-being dashboard (e.g. OECD better life )
- (b) A well-being composite index
- (c) SDG (sustainable development goals) dashboard that includes a life satisfaction measure

or

- (d) None of the above.

#### D. Alternative data collection methods

7. Is your organization currently engaged in using any of the following data collection methods?

Select all that apply.

- (a) Smartphone app (e.g. hybrid or native app)
- (b) Smartphone sensors (e.g. GPS, Camera, Heart rate, blood pressure)
- (c) Wearables (e.g. fitbit, smartwatches, etc.)
- (d) Other connected devices (e.g. smart thermostats, other IOT devices)
- (e) Satellite data
- (f) Web scraping of social media
- (g) Web scraping of company or institutional websites
- (h) Acquisition of admin data from private sector sources (e.g. through APIs)

or

- (i) None, but there are plans to do so (go to end)
- (j) None, and there are no plans to do so (go to end)

8. Are any of these methods (from question 7) used to capture information related to ICT use and well-being?

- (a) Yes
- (b) No

If yes:

Please specify.

[open text box]

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