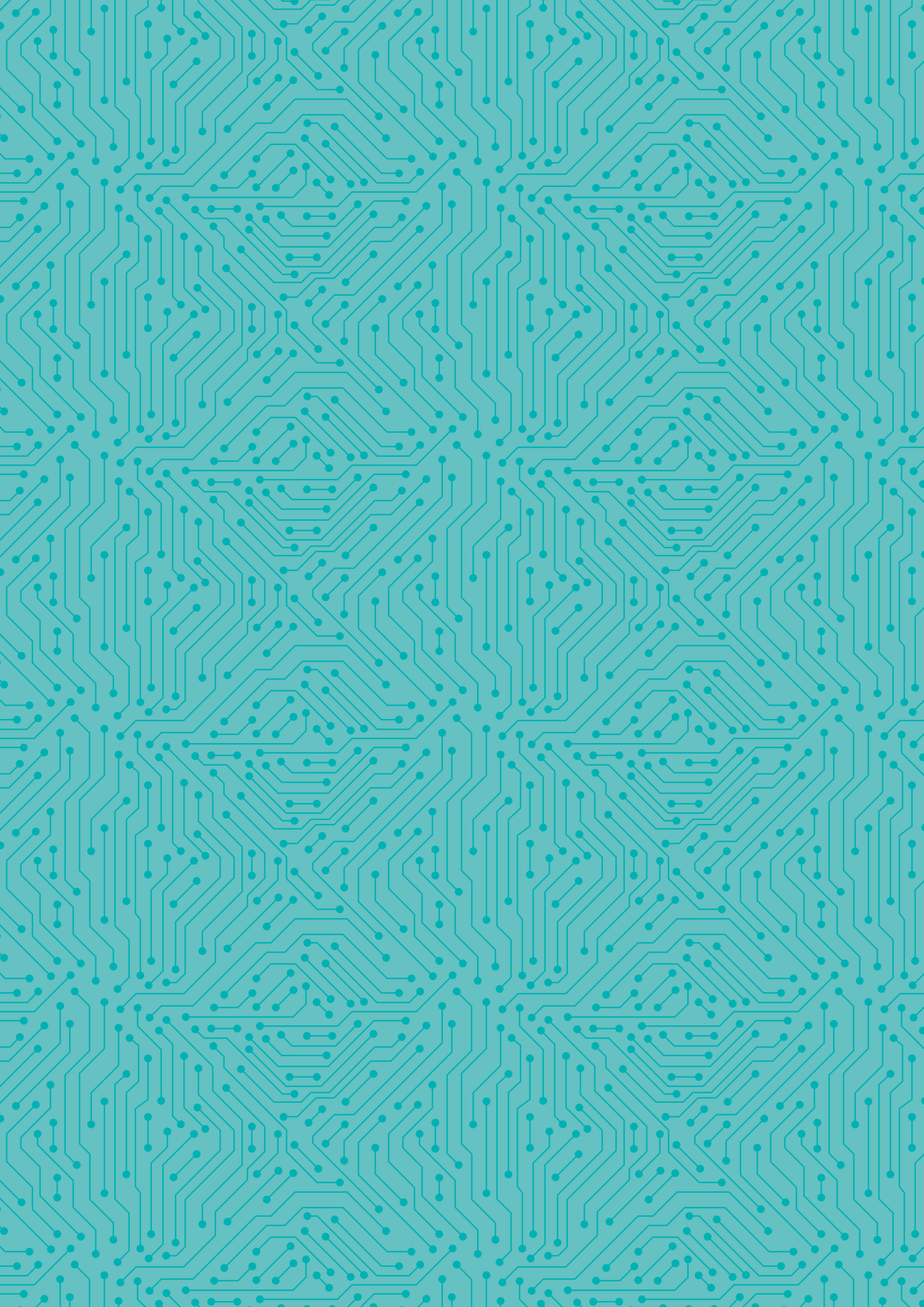# Data Security, Privacy and Innovation Capability in Asia

Findings from a representative survey in Japan, Singapore and Taiwan

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DATA AND INNOVATION IN ASIA-PACIFIC

CONTENT

Digital Innovation and Data Cultures

Digital innovation is as much about technology and data, governments and enterprises, as it is about the people – their trust in digital technologies, the government, companies, and how they perceive their own competence in navigating the digital age. Support from the general population is needed not only for innovations to be widely adopted, but also for motivating people to share the personal and private data that drives digital innovation. As such, it is important to understand how the general population views and deals with data and digitalisation.

This report details findings from a survey of three countries – Singapore, Taiwan and Japan – of perceptions on various issues pertaining to data and digitalisation. From June to October 2020, a representative sample of 1,020 respondents per country participated in a standardised, telephone-based survey interview. In terms of breadth and methodological rigour, this country comparison is the first in the field of data culture.

Findings suggest that data cultures in Singapore, Taiwan and Japan are marked by a wide use of digital technologies and favourable support for innovation. However, there is also widespread concern about the collection and use of personal data by data controllers, especially large technology companies. Despite worries about breaches of data privacy, people do not always act accordingly: a sizeable number consider disclosing data as inevitable, and trade personal data privacy for the convenience of services. While legal regulations may allay fears surrounding data privacy breaches, the perceived adequacy of regulations depends on the incumbent level of trust in the government.

Use of Digital Devices

1. The use of digital devices and online shopping are high in all three countries, and higher in Singapore and Taiwan than Japan. Smartphones, laptops and tablets are most frequently used. Online shopping is also high with most people e-shopping for goods and services up to two or three times a month (50% to 64%).
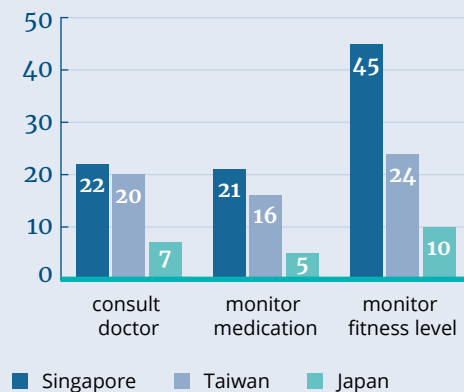
Ownership of digital devices

Legend: ■ Singapore ■ Taiwan ■ Japan

2. Few respondents in the three countries use digital platforms for medical-related matters such as consulting a doctor, monitoring medication or fitness, especially in Japan. Fitness monitoring is however, noticeably common among Singaporeans.
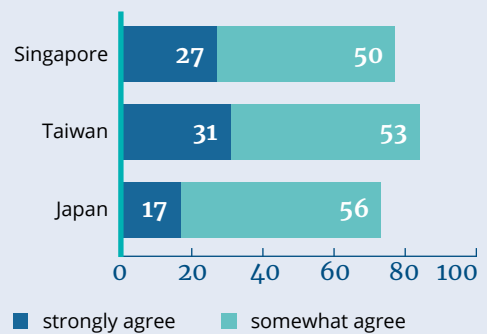
Use of digital platforms for the following activities

Legend: ■ Singapore ■ Taiwan ■ Japan

Technological Innovation

3. Technological innovations are generally agreed to be essential to the development of society, though this sentiment is regarded more cautiously in Japan, where more people somewhat agree rather than strongly agree. In general, it is at least somewhat agreed that technological innovations bring about more benefit than harm.

Digital innovations bring about more benefit than harm.

Legend: ■ strongly agree ■ somewhat agree

Data Disclosure

4. The subject of data sharing yields mixed views. 52% to 64% of people disagree that sharing data with an app yields benefits to them personally, even though they agree that it could have commercial benefits (52% to 66%). The benefit of data sharing towards effective governance is perceived by 70% of Singaporeans and 54% of Taiwanese and 43% of people in Japan.

5. People are more willing to disclose less personal details such as their favourite books, as opposed to personal information like their bank account balance, name and address or medical records. People in Singapore and Taiwan express greater unwillingness to disclose these forms of personal data than those in Japan.

Willingness to Disclose Data

		willing	unwilling
favourite books	JP	56	34
	TW	72	27
	SG	64	28
medical data	JP	40	51
	TW	24	76
	SG	31	68
demographic data	JP	37	55
	TW	31	69
	SG	26	73
bank account	JP	29	65
	TW	15	85
	SG	4	95

■ willing ■ unwilling

---

6. Worries over data misconduct are expressed in all three countries, be it being asked for personal information when performing online registrations of purchases, unauthorised retrieval of medical data, having one's credit card details stolen or identity theft. People in Singapore and Taiwan express more concern over data misconduct than others in Japan.
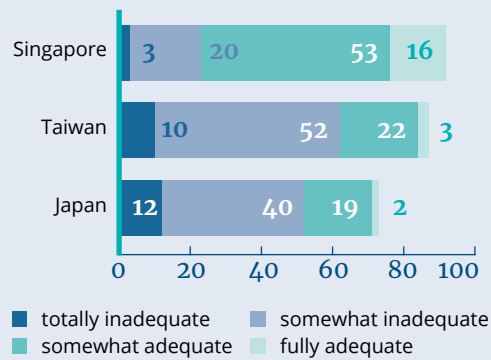
Concern about personal data misconduct

		very concerned	somewhat concerned
identity	JP	31	38
	TW	58	34
	SG	79	16
credit card	JP	45	35
	TW	67	26
	SG	72	20
medical data	JP	28	41
	TW	40	43
	SG	58	30
online registration	JP	30	45
	TW	33	53
	SG	41	41

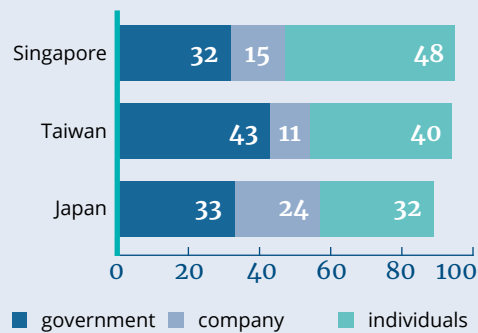■ very concerned ■ somewhat concerned

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Data Protection

7. Legal regulations exist across the three countries to protect citizens' personal data. The perceived adequacy of regulations appears to be associated with general trust in the government. In Singapore where there is high trust in the government (79%), most people consider data privacy regulations to be adequate (69%). Where trust in government is not as high, in Taiwan (53%) and Japan (22%), only slightly over 20% people in each country viewed regulations as adequate.

Adequacy of Data Privacy Regulations

	totally inadequate	somewhat inadequate	somewhat adequate	fully adequate
Singapore	3	20	53	16
Taiwan	10	52	22	3
Japan	12	40	19	2

■ totally inadequate ■ somewhat inadequate
■ somewhat adequate ■ fully adequate

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8. 80% of people in Singapore and 83% in Taiwan attribute responsibility for data privacy protection to either the government or the individual. In comparison, a considerable minority of 24% in Japan also sees companies as responsible.
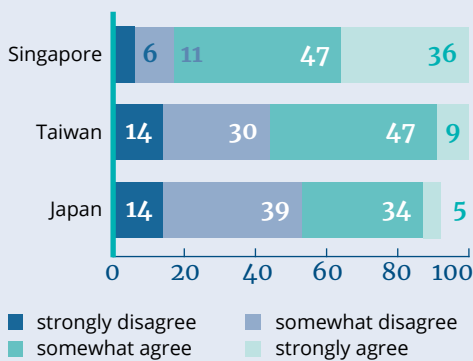
Responsibility for Data Privacy

	government	company	individuals
Singapore	32	15	48
Taiwan	43	11	40
Japan	33	24	32

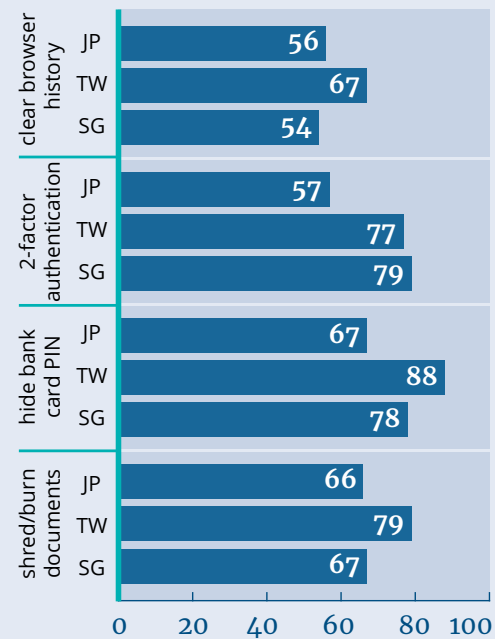■ government ■ company ■ individuals

Data Handling

9. Citizens trust that the government would handle their private data more adequately than companies. In Singapore, there is general trust in the government's data handling (83%), while there is moderate distrust in Taiwan (44%) and more distrust in Japan (53%). Again, the general trust in government appears to be mirrored in these results (see No. 7).

I trust that my personal data is collected and used appropriately by my government.

- strongly disagree
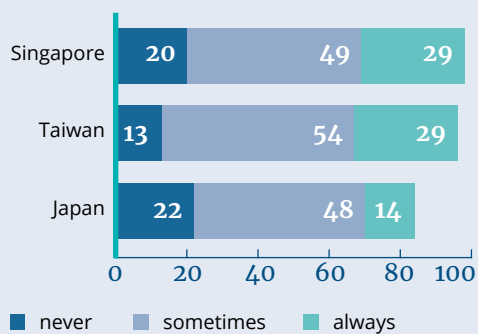- somewhat disagree
- somewhat agree
- strongly agree

10. Despite people's relative lack of trust in companies to handle their private data, a large majority in all three countries acknowledge their dependence on large technology firms such as Google, Microsoft and Facebook, where the sharing of personal data is a prerequisite for using such services. This applies slightly more to people in Singapore (72%) and Taiwan (75%) than to people in Japan (62%). Citizens of all the countries practice some form of data protection habits, both online and offline. These include regularly clearing one's internet browser history, and shredding or burning personal documents. Taiwan, in particular, reported the highest percentage of respondents with such habits.

Data Protection Habits

11. However, at the same time, more than half of the respondents across each country would choose the option to log-in to other digital platforms easily via their social media accounts such as Facebook. This implies that people are willing to choose the convenience of easy log-in options at the expense of data privacy, or are unaware that using this option gives technology companies even more access to their personal data.

Easy Log-In via Social Media Account

- never
- sometimes
- always

1 Digital Innovation and Data Culture

Digital innovation – the application of digital technology to products, processes or practices – is often understood as a material or technical endeavour. This is obviously true, but it is incomplete. In practice and reality, the successful invention and implementation of new digital technology is dependent on a wide range of extra-technical preconditions and collaborations between the public, private and people sectors.
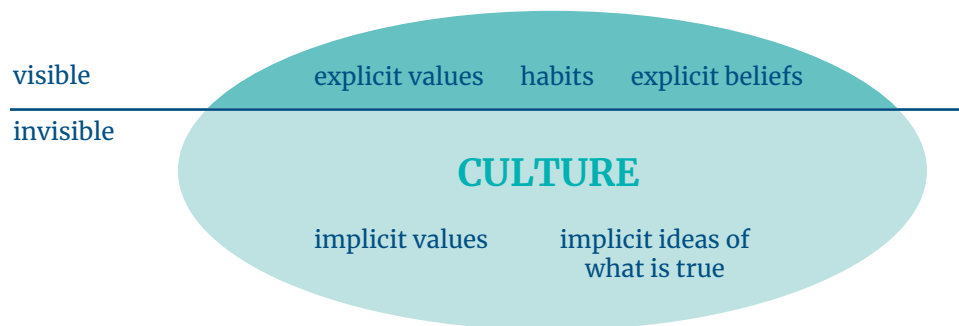
For a country to engage in digital innovation, it needs to consider not only technological and material aspects, but also its own data culture – the configuration of values, norms and interpretation patterns concerning the character and use of data. A country's data culture may hinder or enhance digital innovation, and in various ways. For example, suspicion by the people who are expected to provide the data may lead to less willingness to share data, while trust may increase data sharing. However, data culture goes well beyond trust. Also, habits of handling data, and more widely, attitudes towards innovation, shape the relevant environment for digital innovation.

In this study, we explore data cultures across three Asian countries: Singapore, Taiwan and Japan, spanning attitudes towards digitalisation and data handling, and protection practices employed in daily life. However, the aim of this study goes beyond a mere description of data cultures, towards assessing the impact of data cultures on enabling or inhibiting digital innovation. In other words, we ask: *How are data cultures shaped and in which way are they likely to inhibit or enable technological innovation?*

1.1 The Cultural Side of Data

Culture is understood as the configuration of values, norms and interpretation patterns held by a society, and thus a distribution of mind-sets.[1] Culture contains a wide array of conceptions about how things are and how they should be. A large part of our cultural understanding consists of implicit knowledge which we apply without being able to explicate all its rules or regularities. For example, we are competent in greeting people and do that without long reflection. However, while greeting others, we apply complex rules which differentiate between the greeting of casual or close friends, colleagues, family members of various kinds, people of different ages and so on. We are competent in these rules without being able to elucidate them easily. Accordingly, we cannot ask people directly about these rules – but we can ask them about their habits and their relationships with other people.[2] We only observe the surface of culture and thereby make inferences about the cultural rules beneath that surface (Figure 1).

Figure 1: Concept of Culture

Data culture is a part of the broader culture. It encompasses ideas of what data is, how valuable each kind of data is, concepts of privacy with respect to data, habits of data handling, beliefs about relevant actors in the field of data concerning their motives, characters and trustworthiness, and much more. Some of this can be easily expressed by people while other aspects manifest as tacit knowledge which can only be deduced from statements and action.

With respect to culture in general and specifically data culture, we should not expect a fully consistent configuration of beliefs, values and habits. People hold values and at the same time do things which violate these values. This does not imply the irrelevance of values but we should be cautious to assume direct translation of beliefs and values into action.

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1   For the long discussion on the concept 'culture' so e. g. Crane (1994: 4), van Deth/
    Scarborough (1995), Singer (1968) and Swidler (1986).
2   These arguments are strongly influenced by Giddens (1986), Gerhards (1989) and
    Schein (1991).

As digital innovation is dependent on what people think about data and related actors, and also on what they do in relation to data, data culture is highly relevant to increase the probability that digital innovation will occur. The study of data culture focuses on five main areas:

1. Digital affinity: Use of digital devices and digital efficacy

2. Innovation: Perception of the value of innovation

3. Data provision: Preparedness to disclose information/data about oneself, handling of data privacy

4. Regulative environment: Perception of data privacy regulations

5. Actor environment: Perception of data privacy controllers

Data culture is embedded in the general culture. Given the extensive ways that general culture can influence data culture, this report focuses on five areas which are likely to be relevant (see Appendix B for how these dimensions are measured in the study):

- The value of creativity

- The value of adventure

- The value of tradition

- The value of security

- Institutional trust

In principle, there would be a large range of other possible cultural dimensions which might be relevant for innovation processes in the digital sphere and beyond. The approaches to assess culture in general (Hofstede, 1980; Hofstede et al., 1990; Inglehart, 1997; Inglehart & Welzel, 2005; Schwartz, 1992;1999; Schwartz & Bilsky, 1990) provide some suggestions. However, for practical reasons we focus on these five fundamental cultural traits which are the most likely to have a direct link to data culture.

1.2 Data Cultures in Singapore, Taiwan and Japan

Three Asian countries were selected for this study: Singapore, Taiwan and Japan. In these countries, the use of digital devices and tools is widespread, and its people are to some extent, familiar with digitalisation and data handling practices, and therefore are able to form data-related attitudes.

Singapore, Taiwan and Japan are also countries whose economies are highly reliant on innovation. Tokyo and Singapore, for example, have been ranked as the 2nd and 3rd most innovative cities respectively in the global JLL Innovation Geographies index (Jones Lang LaSalle, 2019).[3] In the World Economic Forum Global Competitiveness Report (Schwab, 2019), the innovation capability of Taiwan is ranked as 4, while the rank of Japan and Singapore is 7 and 13 respectively.[4] All three countries are eager to facilitate further digitalisation in research and society, with national-scale plans and governing bodies for digital development which aim to promote collaboration among public, private and research entities and innovation for national good, such as Smart Nation in Singapore, DIGI+Taiwan, and Japan's Science and Technology Basic Plans.

Aside from their commonalities, the three countries differ in two important dimensions which make for particularly promising comparisons. First, while innovation and digitalisation is high in all three countries, it is not on an identical level. General assessments indicate that Singapore and Taiwan are somewhat more digitised than Japan. In the World Values Survey wave of 2010 to 2014, the internet as a source for information was considerably more common in Singapore and Taiwan than in Japan.[5] Other sources report less internet use in Japan than in Singapore and Taiwan in recent years and also less penetration of more specific digital tools, for example, the frequent use of banking apps.[6] With respect to digital innovation, Taiwan has long been recognised as a strong centre of IT manufacturing and digital innovation (Tsou and Chen, 2020). In the IMD World Digital Competitiveness Ranking 2019, Singapore is second, directly after the USA while Taiwan ranks 13th and Japan ranks 23rd out of 63 countries (IMD 2019).[7] Although these data sources suffer from considerable methodological problems, they coincide with qualitative impressions and suffice to support the proposition that relevant differences exist between the countries as to the extent of digitalisation.

The countries additionally differ in terms of institutional trust. Institutional trust is of fundamental importance for a strong data culture, not least because the voluntary entrusting of one's data cannot occur without trust. Findings have consistently indicated a high level of institutional trust in Singapore, a moderate level of trust in Taiwan and a low level of institutional trust in Japan. The World Values Survey (2010/2012) indicates

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3   In the JLL Innovation Geographies index no Taiwanese city is covered. Among the top 20 in this broad assessment of innovation capability, London ranks first and the German cities Berlin and Munich rank 16th and 20th respectively.

4   In this assessment of innovation capability, Germany ranks first out of 141 countries.

5   Own calculation on worldvaluessurvey.org.

6   See datareportatal.com with reference to globalwebindex.com. The data is based on online surveys and should therefore be treated with caution, especially as the form of survey (online) is directly linked to the matter of internet (online behaviour).

7   In this assessment of digital innovation capability, Germany is ranked on place 17.

this pattern for confidence in government,[8] with similar findings also reported in the Asian Barometer Survey (Ikeda, 2012). Although the data is somewhat dated, it nevertheless provides sufficient evidence to expect that the differences in institutional trust between the three countries still exist today. This dimension of institutional trust will be further assessed in this survey.

Taken together, the comparison of Singapore, Taiwan and Japan allows for interesting comparisons between countries marked by different levels of digitalisation and institutional trust. Both dimensions can be expected to influence data culture in very substantial ways, affording specific environments for digital innovation, and more importantly, allowing us to draw conclusions about how digital innovation can best take off, and barriers that may exist. In doing so, the incumbent study is also the first to approach data cultures by way of country-by-country comparisons based on representative population surveys.

At the same time, the study does not aspire to a simplistic explanation of the extent data cultures facilitate or obstruct digital innovation. Innovation is a highly complex process involving a wide array of actors and processes. Data cultures are only one of many factors, although crucial and deserving attention.

1.3 Previous Studies on Data Culture

Disparate aspects of data cultures have been studied before. For example, the level of competency that people have in the use of particular technologies has been measured either by asking about the actual frequency of their use (see Kim et al., 2010; Aleisa and Renaud, 2017) or their perceived level of confidence (see Guidon, 2019).

Studies of perceptions of data privacy have often focused on specific devices, digital tools or platforms, for example, electronic payments (Kim et al., 2010), smartphone apps (Shklovski et al., 2014), or Internet of Things[9] devices (Aleisa and Renaud, 2017). Many of these studies are administered online and/or to a specific group of users such as the clients of a company.

A somewhat broader approach is Buchanan et al.'s (2007) early study, which created general scales for both the level of concern for privacy and protective behaviours in the context of Internet use. Apart from measuring privacy concerns, Bellman et al.'s (2014) Concern for Information Privacy (CFIP) scale sought to understand the drivers of such concerns and proposed that cultural differences, regulatory structures and individual Internet use would have an effect on the level of concern for privacy.

Trust in data controllers and governance is also hypothesised to affect privacy perceptions. Previous studies have assessed both perceptions of the adequacy of regulation and the effectiveness of enforcement. For example, the respondents in a study by Presthus and Sorum (2018) which was conducted in Norway indicated perceptions of the efficacy of the European Union General Data Protection Regulation (GDPR) laws.

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8   Own calculation on worldvaluessurvey.com.
9   Internet of Things, otherwise known as IoT refers to a system of interrelated, internet-connected objects that are able to collect and transfer data over a wireless network without human intervention.

The findings showed that while respondents had a favourable view of GDPR, they were sceptical about its enforcement. Meanwhile, Chellappa and Sin (2005) evaluate respondents' trust in firms which collect their data and the value of services provided by these firms. The study, which was conducted in the United States of America found that consumers may give up some privacy if there are corresponding benefits.

However, not all of these studies test the relationships between different factors and how they affect individuals' levels of concern for privacy and behaviours pertaining to data protection. Among those that do, researchers have suggested that people from countries with a history of strong privacy regulation tend to favour more regulation but have less concern around errors and security of their data, and privacy concerns diminish with competence (Bellman et al., 2014). Chellappa and Sin also found that trust in online data collectors was associated with the use of personalised services and lower privacy concerns, and that privacy is negotiated relative to perceived outcomes in a "privacy calculus" (Culnan and Bie, 2003, cited in Chellappa and Sin, 2005).

The studies provide interesting spotlights on how people deal with data and how they worry about data privacy. However, what we lack are perspectives that links various aspects of attitudes towards data handling in general. Asking about the prospects of digital innovation requires us to go beyond attitudes towards individual applications and devices towards a more basal data culture which shows the deeper traits of assumptions of data transfer, generalised preferences concerning data privacy and a general trust in regulations and surveillance in the data field. Only with information on such a generalised data culture can we draw conclusions for digital innovations. Such data did not exist until the present study, which aims to examine data culture in a holistic manner.

What is also lacking are country comparative studies. Comparisons are particularly useful to spot specificities of data cultures, how they can differ and in which aspects they show similarities.

Furthermore, many studies on the use of, and attitudes towards digital tools and devices rely on online surveys. However, online surveys suffer from limited representativeness, especially with respect to people with limited or no internet usage, and older people. This is particularly problematic as attitudes on digitalisation, digital innovation, data privacy and assessments of regulations on data privacy are likely to differ systematically between users and non-users of digital devices and the internet. People who mistrust data handling online will probably be less likely to come across an online survey and even less likely to participate in such a survey. Thus, we can expect research on attitudes in this field to be biased if it relies on online surveys.

With this study, the Konrad-Adenauer-Stiftung and the National University of Singapore intend to fill these gaps by initiating a country-comparative study on data cultures. The study sheds light on the data cultures of three Asian countries to understand the cultural background for digital innovation in these countries. It covers a wide range of aspects concerning the use of digital solutions and the provision of data, and links these attitudes and practices to the social structure and more general values. This study also constitutes a quantitative complement to another multi-faceted research project on digital innovation in Asia by the Konrad-Adenauer-Stiftung, which uses an in-depth, descriptive, and qualitative lens to view digital innovation and regulatory environments in India, Japan, Singapore, South Korea, Taiwan, China and Hong Kong, focusing on areas such as e-commerce, health, transport, and administration.

1.4 The Survey

The survey covers three countries: Singapore, Taiwan and Japan. From June to October 2020, a total 1,020 respondents per country participated in a standardised, telephone-based survey interview. Respondents were selected by random digit dialling using both mobile and landline numbers, with quotas for age, gender and education across all three countries, as well as specific quotas such as ethnicity (for Singapore only) and region (for Japan and Taiwan only).[10] The data is representative for the population of each country. The questionnaire included questions about awareness of regulations and policies associated with data privacy, subjective competencies and activities, values and attitudes towards data protection and privacy, and levels of trust in data custodians.

The questionnaire has been designed by the team of the Konrad-Adenauer-Stiftung and the National University of Singapore. Interviews were conducted by Blackbox, a Singaporean institute for opinion and market research with experience in international comparative studies. The analysis of the raw data has been conducted by researchers from the Konrad-Adenauer-Stiftung and the National University of Singapore.

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10 See Appendix A for a detailed breakdown of the soft quotas implemented for the study.

2 Digital Affinity

Digital affinity is assessed in two ways. First, it is simply measured by activities, i. e., the devices people own and what they do online. Second, we look at how confident people feel when dealing with new technology.
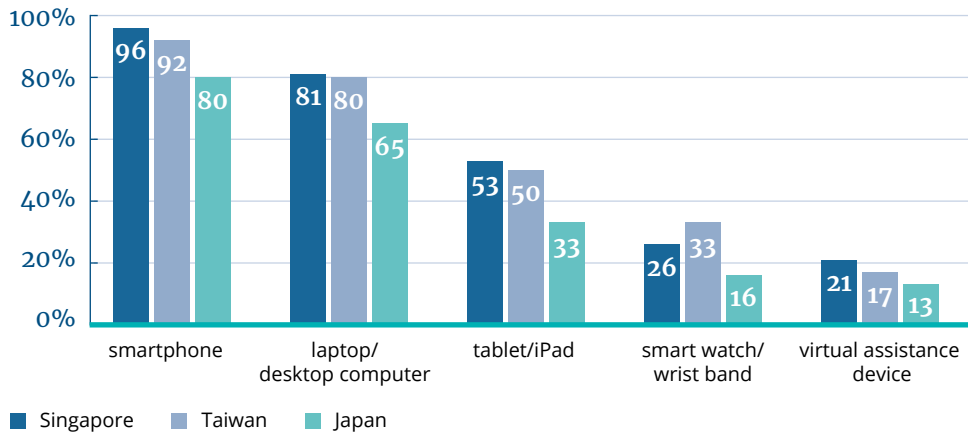
2.1 Living digitally

A wide range of digital devices such as smartphones, laptops, tablets, smart devices and virtual assistance devices are currently on offer in the market. Usage of certain devices is more widespread than others, and in Singapore, Taiwan and Japan, the number of devices sold is bigger than the size of their population.[11] The general approach of a culture to new digital devices can be gleaned from how widely its people use common and less common devices.

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11   For example, datareportal.com reports a penetration with mobile phones of more than 100 percent for all three countries. This is obviously due to people owning multiple mobile phones and tells nothing about the share of population using at least one.

Figure 2: Ownership of Digital Devices
I am going to read out a list of digital devices. Please let me know which ones you own.

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country.

In all three countries people own a wide range of devices (Figure 2), with a large proportion of them owning smartphones and computers. A smaller proportion own devices such as tablets or iPads. Ownership of smart devices such as smart watches and virtual assistance devices like Amazon Alexa or Google Home is less popular.

In general, digital devices are most widely owned in Singapore, followed by Taiwan and Japan. The only exceptions to this pattern are smart watches and wrist bands which are more widespread in Taiwan than in Singapore.
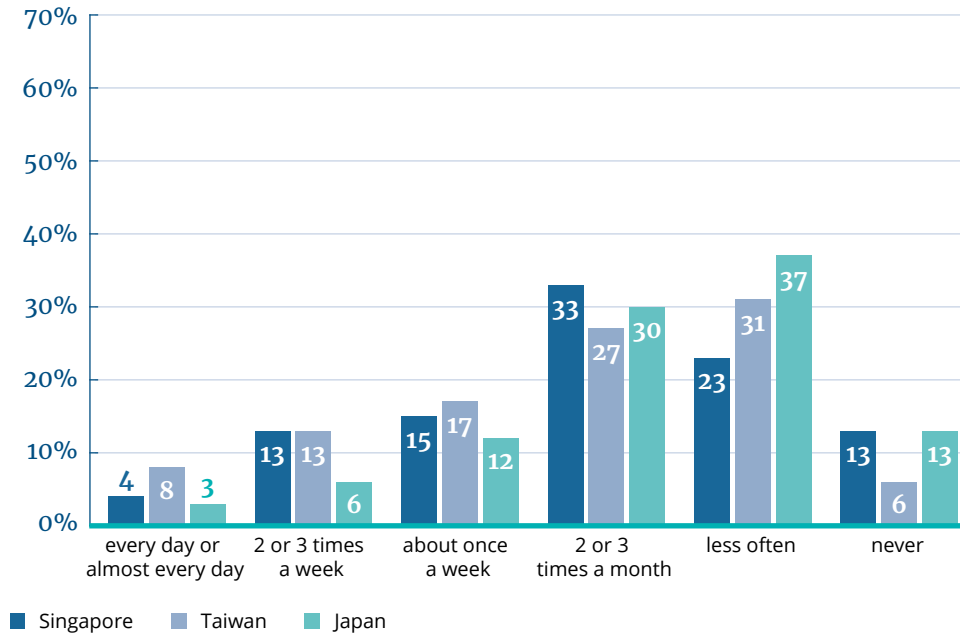
Across all countries, there is an age effect on device ownership, with younger people more likely to own digital devices than older ones. People aged 60 years old and above are especially less likely to own a digital device. For smartphones and tablets, gender differences are small and inconsistent. A smart watch or wrist band is owned more often by men than women. The same applies to virtual assistance devices in Taiwan and Japan, while in Singapore as many men as women reported owning a virtual assistance device. In Japan, computers are owned more often by men than by women with a considerable gap of nearly 10 percentage points in Japan (70 percent men, 61 percent women).

The ownership of digital devices is more common among people with higher educational degrees in all countries. For example, among those with a bachelor's degree in Japan, 78 percent owned either a laptop or desktop. In Taiwan and Singapore, 93 percent and 95 percent of people with a bachelor's degree owned a computer, respectively. Among those with secondary education or lower, computer ownership was 59 percent in Japan, 72 percent in Taiwan and 64 percent in Singapore. Similar differences can be found for all devices in terms of formal education in the three countries.

Owning a device does not determine an individual's online activities. Comparing peoples' online activities such as their online shopping and online medical activities provide some insights into their online habits.

Figure 3: Online Shopping
Please let me know how often, if at all, do you purchase goods and services online, such as clothes, books, tickets, food?
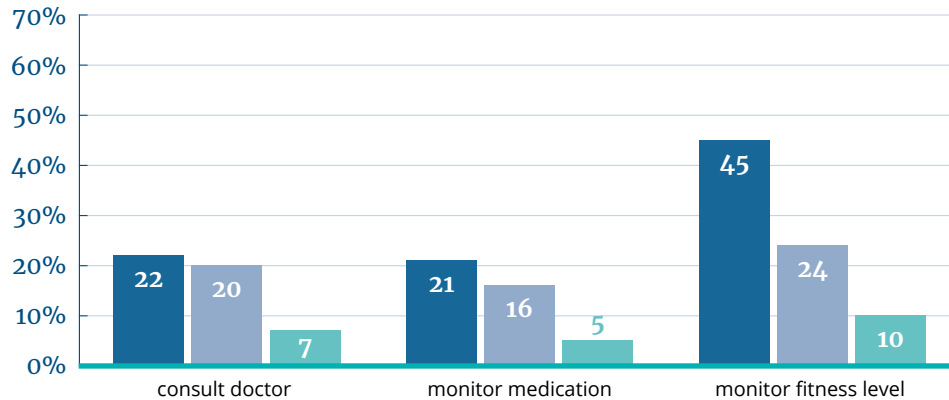

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: don't know, no answer.

Online shopping is somewhat more prevalent in Taiwan than in Singapore (Figure 3). 37 percent of Taiwanese people shop online at least once a week, compared to 32 percent of Singaporeans.[12] The figure is considerably lower in Japan, where only 21 percent indicate they do so. In Taiwan, 36 percent say they shop less often than two or three times a month only. This share is similar to that of Singapore (35 percent), whereas in Japan, half of the population (50 percent) indicate that they shop online less often than two or three times a month.

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12 Differences between this combined figure and the sum of the single figures for each category are due to rounding. This also applies for other figures in this text.

Figure 4: Medical Activites Online
Please indicate, yes or no, if you also use digital platforms for the following activities.
Here: yes.

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country.

In Singapore and Taiwan about one in five consult a doctor on an online platform (Figure 4). This practice is less so in Japan, where only one in fourteen respondents have done so. Unlike in Singapore and Taiwan, telemedicine is only recently gaining popularity in Japan, where there has been recent deregulation of telemedicine brought on by COVID-19.

Monitoring of medication online is somewhat more widespread in Singapore than in Taiwan and Japan. Similarly, the practice of monitoring fitness levels online also differs by country. In Singapore, nearly half of the population (45 percent) monitors its fitness levels online, while only 24 percent and 10 percent of respondents do so in Taiwan and Japan respectively.

In the countries studied, there is a difference in the manner in which various age groups use online platforms for their medical activities – monitoring fitness levels online is more common among the younger respondents across the board; monitoring of medication online is more common among the middle-aged population in Singapore in Taiwan, but it is a not very common activity for all age groups in Japan. For consulting a doctor online, the findings for Singapore show those younger and older use online medical consultations less often than middle aged respondents. In Taiwan, consulting a doctor online is more frequent among the young and the frequency decreases continuously with age. In Japan there are no age differences on an overall low level.

In addition, educational degrees do not have an effect on peoples' use of online platforms for their medical activities. The differences are small and inconsistent across platforms and countries.

Considering the high level of digital device ownership and the frequency of use of online platforms, Singapore appears to be the most digitalised among the three countries surveyed, with Taiwan following closely behind. In Japan, digitalisation is considerably less, given lower digital device ownership and less frequent online activities.
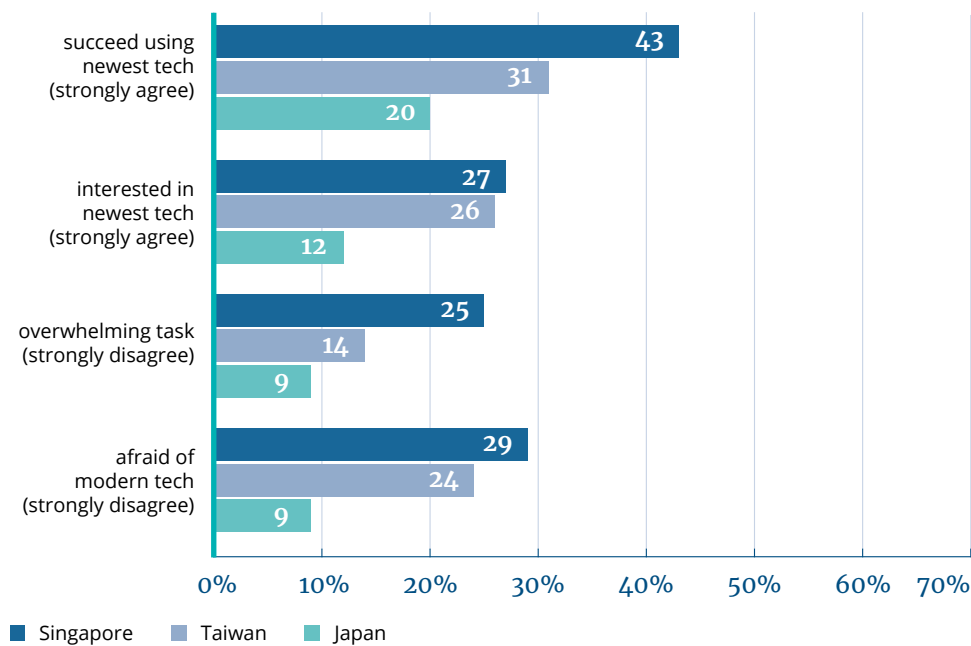
2.2 Technology confidence

Self-assessed competence in dealing with technology and technological innovation complements this finding. Adapting the technology commitment scale by Neyer et al. (2012)[13] we used the assessment of four statements (divided into two negative and two positive attitudes towards new technology) to get an idea of how comfortable people feel about technology. Taken together, these four statements represent a measure of technology confidence.[14]

Figure 5: Technology Confidence

I am going to read out a few statements. For each of them, please tell me whether you strongly disagree, somewhat disagree, somewhat agree, strongly agree.
- I am often afraid to fail when dealing with modern technology.
- For me, dealing with technological innovations is almost an overwhelming task.
- I am always interested in using the newest technological devices.
- Whether I succeed in using new technology depends on myself.

Source: Survey by Konrad-Adenauer-Stiftung e. V. 2020. Values in percent. 3,060 respondents, 1,020 per country.

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13   Neyer et al. (2012) call their scale a technology commitment scale. However, as we focus on those parts of the scale representing the confidence in one's own competence of dealing with new technology, we refer to it as the technology confidence scale.

14   This scale if produced as the mean of the answers to all four items whereas the items "overwhelming task" and "afraid of modern technology" are inversed. The Cronbach's alpha, a reliability measure, is 0.58.

Overall, people in all the countries are confident of using new technology. However, in Singapore, the proportion of respondents who feel confident in using new technology is slightly more than that of Taiwan and considerably more than Japan (Figure 5). When asked whether succeeding in new technology depended on oneself, 43 percent of Singaporeans said they strongly agreed while 39 percent agreed somewhat to the statement ("somewhat agreed" not in the Figure). In Taiwan, the findings showed that 31 percent strongly agreed while 53 percent somewhat agreed to the same statement. In Japan, only 20 percent strongly agreed and 53 percent somewhat agreed to the statement.

This technology confidence is embedded in the more general value system of the people, though not in fully identical ways. In Singapore and Taiwan, people who consider themselves creative, value adventure more and are less committed to tradition, tend to regard themselves as more technologically competent. In Singapore those who value security more tend to have more technological confidence, whereas in Taiwan this connection does not exist. In Japan, the pattern is quite different. Persons who consider themselves creative and value security less, tend to feel more technologically competent. A relation between orientation towards excitement or tradition and technological confidence cannot be found.

Studies have shown that people of different ages and genders interact with technology differently (e. g. Hjorth, 2008; Guerreri and Drenten, 2019; Büchi, Just and Latzer, 2016). For instance, those that are younger have grown up with digital technologies and thus tend to be more confident and aware of the rules governing the technologies they use. The technology confidence scale is correlated to age in all three countries with younger people considering themselves technically more competent than the older ones. This pattern is clearer in Singapore than in Taiwan and Japan.

Across the countries, men consider themselves technically more competent than women. There is also generally a positive relationship between respondents who consider themselves technically more competent, device ownership and online activities. They are more likely to own digital devices, especially common devices such as smartphones and computers, and are more likely to shop online and monitor their fitness online.

In terms of education levels, in Singapore and Taiwan, people with higher education degrees tend to be more confident when it comes to dealing with new technology. There is no such relation in Japan.

The responses to all four statements are combined in a scale of technology confidence. The answers are rated from disagree strongly (1) to agree strongly (4) for the statements affirmative to technology and agree strongly (1) to disagree strongly (4) for the statements indicating little technology confidence. A mean across all four statements

of up to 2.5 is considered to demonstrate lower technology confidence, while a mean above 2.5 is considered to signify higher technology confidence.[15] The measure will be used later in the analysis.

Overall, Singapore and Taiwan are both highly digitalised. They both have a high penetration of digital devices, a widespread use of digital platforms for online shopping and medical activities, and a population which is quite confident with respect to new technology. In both countries this applies somewhat more to the younger population. In Japan, the pattern is slightly different. The penetration of digital devices is also high but slightly lower than in the other two countries. The use of online platforms is somewhat less common and interestingly, the difference between age groups is smaller. A Japanese expert supports this finding with long term comparative observation (Kaigo, personal communication, 2020). For instance, there is still huge reliance on physical cash and hardcopy documents, instead of cashless transactions and paperless filing systems which have been more widely adopted in Singapore and Taiwan. Steps to bring administrative reforms to decrease the use of personal 'stamps' have only just begun with the new Yoshihide Suga cabinet.

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15   As already apparent for the single statements, there is a considerable country difference. According to this measure 33 percent of the people in Singapore and 37 percent of the people in Taiwan belong to the group of lower technology confidence while in Japan it is 58 percent. In turn, in the group of higher technology confidence there are 67 percent of the people in Singapore, 63 percent of the people in Taiwan and 42 percent of the people in Japan.

3 The Cultural Context of Data Cultures

Data cultures are interwoven with the general culture of a country. A myriad of aspects come into play but beyond the link to technology there are two dimensions which seem to be of particular importance to cultivate data cultures: institutional trust and base values.

3.1 Base Values

People adopt values around a wide range of issues, but four aspects of values are of particular interest for data cultures: creativity and adventure as values to find and explore new things, and security and tradition as values to shelter life from changes and threats.[16]

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16 The value dimensions are the most relevant in the value realm developed by Shalom Schwartz (Schwartz 1992, 1999, 2007; Schwartz/Bilsky 1990; Schwartz/Boehnke 2007; Davidow/Schmidt/Schwartz 2008). Schwartz proposed ten value dimensions which adequately describe values in all cultures. The ten dimensions form a universal value space, similar in all cultures, with some values being close and others opposed to each other. This value structure can be reproduced with our data, though not perfectly. However, in Schwartz' first empirical analysis there were also minor deviations from the theoretical structure (Schwartz 1994: 29). Leaving the question of a universal value structure aside, the spectrum of values suggested by Schwartz is the most encompassing and systematically derived (Roose 2012).

Next is institutional trust, measured by people's trust in the government, parliament, administration, political parties and the media. This is a core category for studying data culture as anyone who discloses data to a data controller has to trust that their data is protected, handled, stored and processed appropriately.

While more specific values around data privacy and trust in data are discussed later as part of data cultures, at this point we take a short look at the more general values and institutional trust in the three countries.
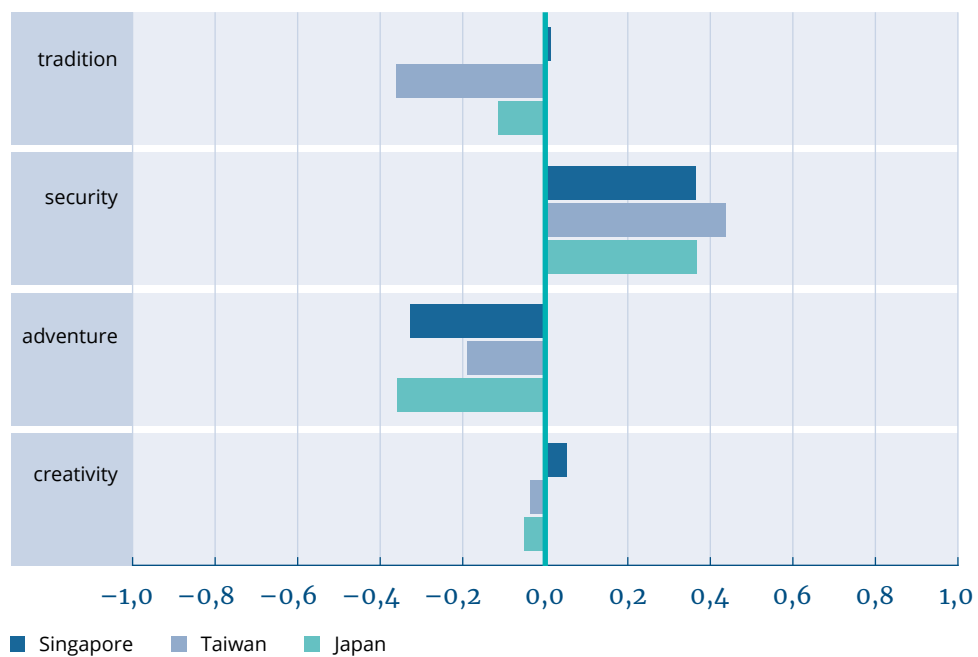
The measurement of values is complex. Beyond the selection of value dimensions, the exact description of the values influences the answers. Also people tend to use the response scale quite differently, rating all values high or all values low. This is why the responses to all values by a respondent are transformed before they are further used for analysis. For each respondent, the answers to all ten value questions have been transformed in such a way that the overall average across all value questions is 0 and all respondents are set to use the same range of answers (z-transformation).[17] After this transformation, the values indicate the relative weight a person gives to a value in comparison to all other values rated.

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17   For respondents who rate all value questions equally, a z-transformation (value minus average divided by the standard deviation) is not defined because the standard deviation is 0. These cases have been set to 0. Schwartz himself suggests for data from the European Social Survey the centering, but not the standardisation (https://www.europeansocialsurvey.org/docs/methodology/ESS_computing_human_values_scale.pdf).

Figure 6: Basic Values

Now I will briefly describe some people. Please indicate for each description whether that person is very much like you, like you, somewhat like you, a little like you, not like you or not at all like you.

- Tradition: Tradition is important to this person; to follow the customs handed down by one's religion or family.
- Security: Living in secure surroundings is important to this person, to avoid anything that might be dangerous.
- Adventure: Adventure and taking risks are important to this person, to have an exciting life.
- Creativity: It is important to this person to think up new ideas and be creative, to do things one's own way.
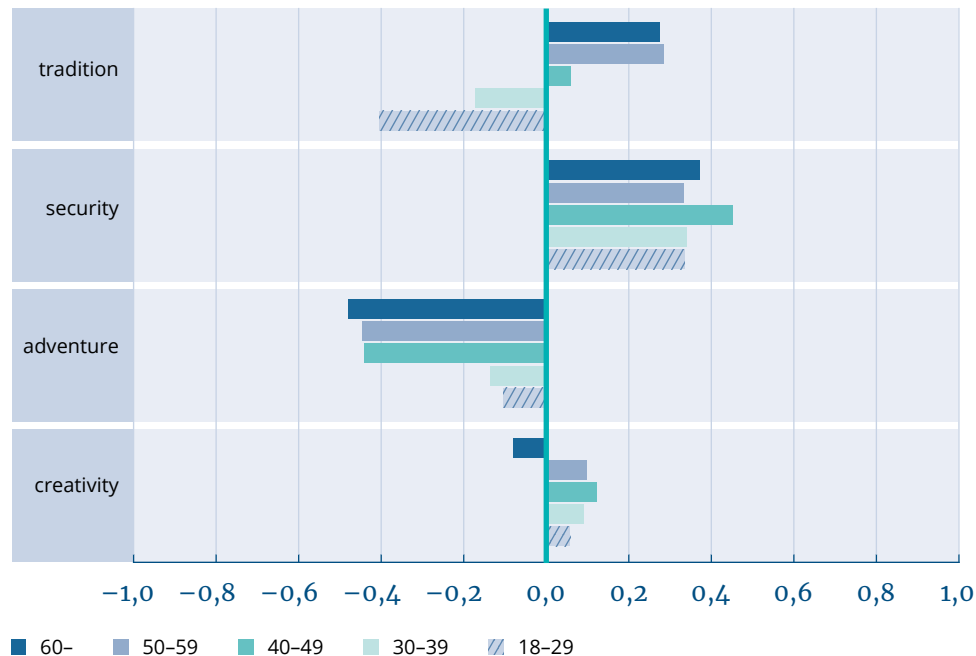
■ Singapore ■ Taiwan ■ Japan

Source: Survey by Konrad-Adenauer-Stiftung e. V. 2020. Value dimensions according to Shalom Schwartz, question wording from World Values Survey. All items z-standardized across all 10 Schwartz value dimensions across each respondent. Here: country averages. Singapore: 1,013–1,016 respondents; Taiwan: 1,016–1,018 respondents; Japan: 1,010–1,012 respondents.

In all three countries the relatively highest weight is given to the value of security, where it is also rated slightly higher in Taiwan than in Singapore and Japan (see Figure 6). In contrast, the value of adventure is rated lower on average in all three countries, although this applies less to Taiwan than to Singapore and Japan. The value of creativity is in the middle, though it is rated somewhat higher in Singapore than in Taiwan and Japan. There is a substantial difference between countries with respect to the value of tradition. While in Singapore tradition receives the average value, in Japan and even more so in Taiwan it is valued considerably lower than average. In comparison to other values, the Japanese and the Taiwanese place less importance on following the customs of previous generations.

Figure 7: Singapore – Basic Values by Age
Now I will briefly describe some people. Please indicate for each description whether that person is very much like you, like you, somewhat like you, a little like you, not like you or not at all like you.

- Tradition: Tradition is important to this person, to follow the customs handed down by one's religion or familiy.
- Security: Living in secure surroundings is important to this person, to avoid anything that might be dangerous.
- Adventure: Adventure and taking risks are important to this person, to have an exciting life.
- Creativity: It is important to this person to think up new ideas and be creative, to do things their own way.

Source: Survey by Konrad-Adenauer-Stiftung e. V. 2020. Value dimensions according to Shalom Schwartz, question wording from World Values Survey. All items z-standardized across all 10 Schwartz value dimensions across each respondent. Here: averages for age groups. 1,011–1,014 respondents.

Figure 8: Taiwan – Basic Values by Age

Now I will briefly describe some people. Please indicate for each description whether that person is very much like you, like you, somewhat like you, a little like you, not like you or not at all like you.

- Tradition: Tradition is important to this person, to follow the customs handed down by one's religion or familiy.
- Security: Living in secure surroundings is important to this person, to avoid anything that might be dangerous.
- Adventure: Adventure and taking risks are important to this person, to have an exciting life.
- Creativity: It is important to this person to think up new ideas and be creative, to do things their own way.
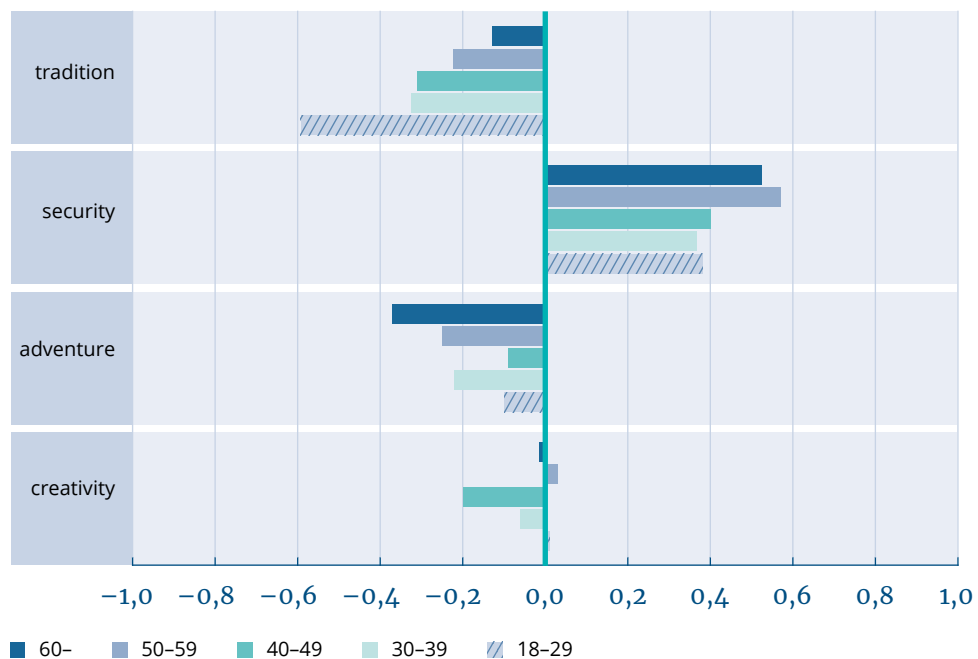

Source: Survey by Konrad-Adenauer-Stiftung e. V. 2020. Value dimensions according to Shalom Schwartz, question wording from World Values Survey. All items z-standardized across all 10 Schwartz value dimensions across each respondent. Here: averages by age groups. 1,016–1,018 respondents.

Figure 9: Japan – Basic Values by Age

Now I will briefly describe some people. Please indicate for each description whether that person is very much like you, like you, somewhat like you, a little like you, not like you or not at all like you.

- Tradition: Tradition is important to this person; to follow the customs handed down by one's religion or familiy.
- Security: Living in secure surroundings is important to this person, to avoid anything that might be dangerous.
- Adventure: Adventure and taking risks are important to this person, to have an exciting life.
- Creativity: It is important to this person to think up new ideas and be creative, to do things one's own way.
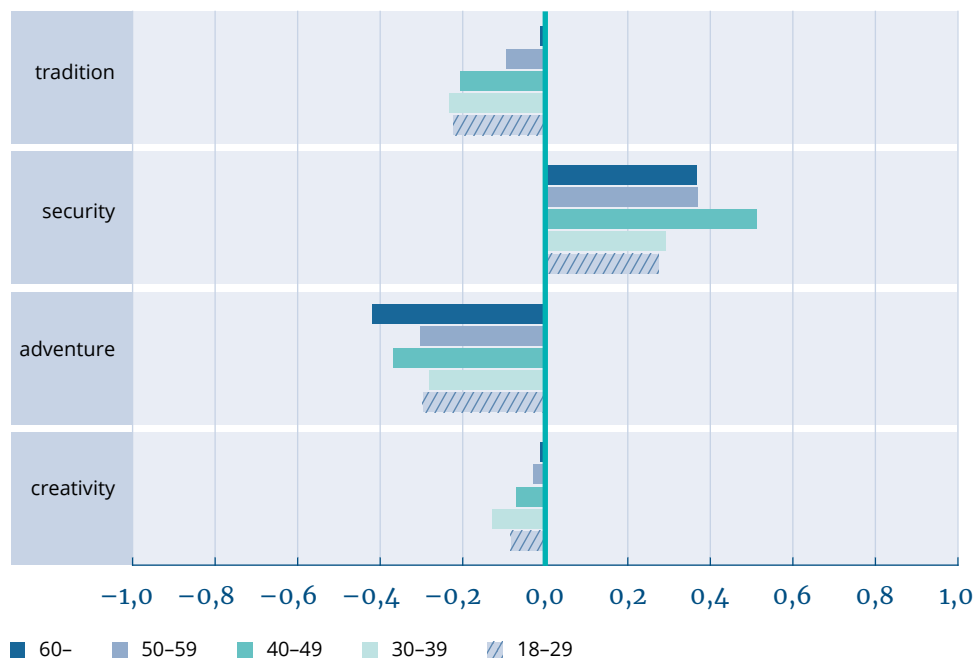

■ 60–   ■ 50–59   ■ 40–49   □ 30–39   ▨ 18–29

Source: Survey by Konrad-Adenauer-Stiftung e. V. 2020. Value dimensions according to Shalom Schwartz, question wording from World Values Survey. All items z-standardized across all 10 Schwartz value dimensions across each respondent. Here: averages by age groups. 1,010–1,012 respondents..

The relative importance of tradition decreases from older to younger people in all the countries (Figures 7 to 9). Adventure on the other hand becomes relatively more important from older to younger persons.

Changes for the values of security and creativity are less consistent. In Taiwan and Japan, the relative importance of security is slightly lower among younger people, while this pattern cannot be found in Singapore. Differences in the relative weight of creativity are small.
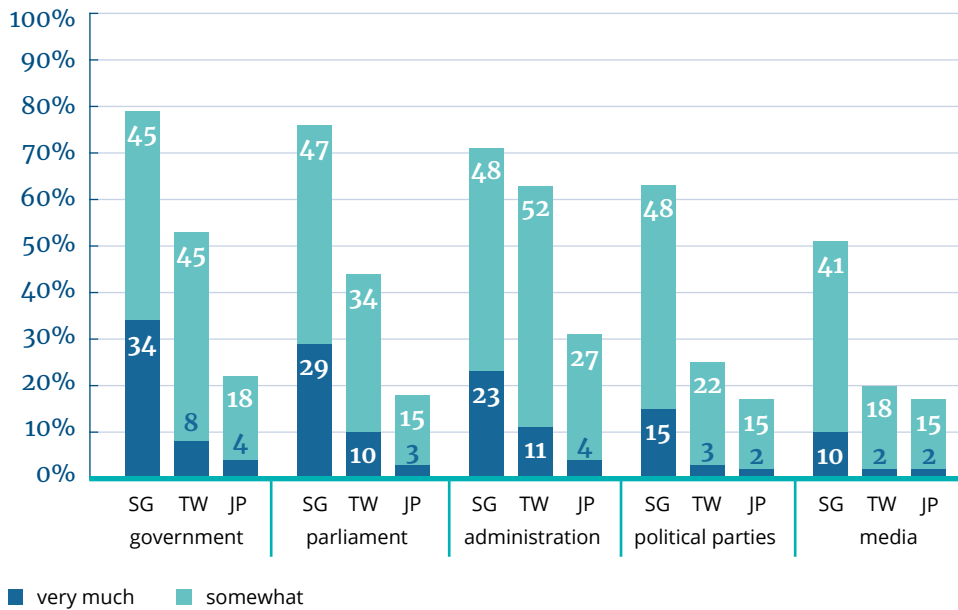
In addition, in all three countries, creativity and adventure tend to be valued higher by men than by women while security and tradition tend to be valued more by women than men.

3.2 Institutional Trust

Trust in institutions is a second fundamental dimension of general culture which creates a relevant environment for data culture. As assumed in our country selection, we find very different levels of institutional trust in the three countries (Figure 10).

Figure 10: Institutional Trust
In general, how much trust do you have in the media and institutions in your country? Please indicate if you trust them very much, somewhat, a little or not at all.

■ very much ■ somewhat

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: a little, not at all, don't know, no answer.

For all five institutions included in the survey there is an identical pattern. In Singapore, we find the highest share of people who trust the respective institution very much or somewhat. Often the difference from the other two countries is large. All institutions are very much or somewhat trusted by a majority of Singaporeans. Japan is the other extreme with low levels of trust for all covered institutions. Administration receives the highest trust with nearly a third who trust it very much or somewhat. All other institutions and the media receive less, often considerably less trust. Taiwan is in the middle, for some institutions closer to Singapore while for others close to Japan. However in all cases, the respective institutions in Taiwan receive more trust than in Japan and less than in Singapore.[18]

The values of tradition, security, creativity and adventure as well as institutional trust form a very general background for the data cultures in each country, which we will further explore in the following sections.

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18   Differences for age, gender and educational degrees are small and inconsistent
       across institutions.

4 Innovation in Society

The broadest cultural enhancement of digital innovation is the desire for innovation itself. Besides political will, initiatives and policies to support innovation are easier to implement if there is broad support from citizens.

Figure 11: Importance of Innovation
Next, I am going to read a few statements. For each of them, please tell me, whether you strongly disagree, somewhat disagree, somewhat agree or strongly agree.
• Technological innovations are essential to the development of our society.

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: somewhat disagree, strongly disagree, don't know, no answer.

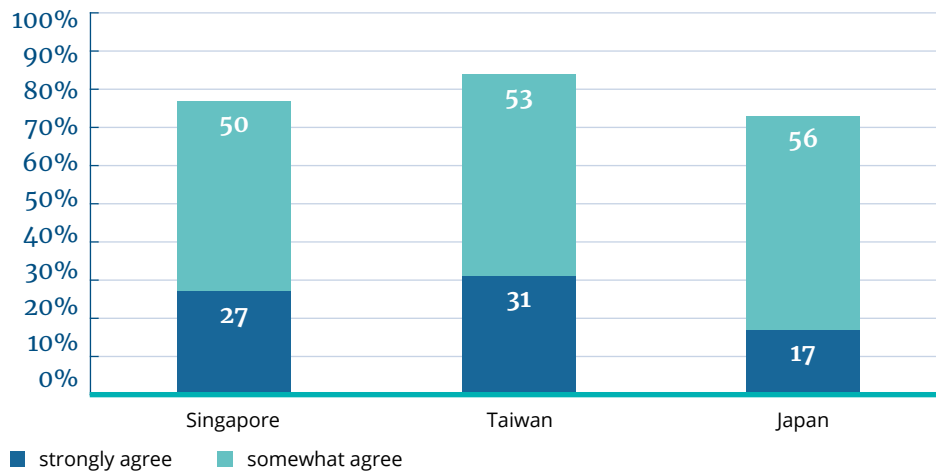The majority of people in Singapore, Taiwan and Japan somewhat agree or strongly agree that technological innovations are essential to the development of society (Figure 11). While the Japanese are somewhat more hesitant to consider innovation as essential for development compared to those in the other countries, their support for this statement remains high at 84 percent. In Singapore, the share is slightly higher with 87 percent somewhat or strongly agreeing with the statement. Singapore is also the only country in which the majority strongly agreed that innovation is essential to the development of society. Nevertheless, the Taiwanese reported the highest proportion of overall support, with 92 percent somewhat or strongly agreeing that technological innovations are essential to the development of their society. This is not surprising given the innovative measures the country has adopted to encourage public deliberation. New digital tools that rely on AI (such as in Taiwan) were created to enable co-creation with citizens, alongside the creation of a network of 70 innovation officers in 32 government ministries to solicit feedback from citizens.

Men are more likely to consider technological innovations as essential for the development of their country compared to women. In Japan, 36 percent of men but only 25 percent of women agree strongly to the statement that technological innovations are essential to the development of society. Similarly, in Singapore, 58 percent of men and 49 percent of women strongly agree to the statement. In Taiwan, however, there is no gender difference for this statement.[19]

Figure 12: Benefit or Harm from Innovation
Next, I am going to read a few statements. For each of them, please tell me, whether you strongly disagree, somewhat disagree, somewhat agree or strongly agree.
- Technological innovations bring about more benefit than harm.

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: somewhat disagree, strongly disagree, don't know, no answer.

19   A difference with respect to formal education is only found for Singapore. 42 percent of people with secondary education or lower agree strongly that technological innovations are essential to the development of society. Among those with a Bachelor's degree or higher it is 63 percent. However, in Japan and Taiwan no differences between educational groups can be found.

The effect of technological innovations can be ambivalent. Therefore, we asked whether people think that technological innovations bring about more benefit than harm.

In all three countries, the majority of respondents agree with the above proposition. However, the enthusiasm for it in Japan is limited, with only 17 percent agreeing strongly, as compared to 27 percent in Singapore and 31 percent in Taiwan.

Men tend to agree more strongly with the benefits brought about by technological innovations across the three countries. In Japan, 22 percent of the men and 13 percent of the women strongly agree that technological innovations bring about more benefits than harm. In Singapore, 33 percent of the men and 22 percent of the women agree strongly with this statement. In Taiwan 35 percent of the men and 27 percent of the women agree strongly that there are more benefits than harm resulting from innovative technology.[20]

This is similar to previous research on gender differences in broader perceptions of technology, which tend to find that men have more positive attitudes towards innovation than women (see Cai, Fan and Du, 2017; Ilie et al., 2005). These reviews and studies have pointed out that gender may moderate the way men and women evaluate technological innovations as men, for example, may place more emphasis on demonstrable results and critical mass attained by the technology, while women may consider ease of use and visibility of the technology more significant (Ilie et al., 2005).

In the three countries, people who are technologically confident are more likely to support innovation and think innovation brings more benefit than harm. However, the need for innovation in a society and the assessment of the potential benefits of innovation are linked to the values of creativity, adventure, security and tradition in different ways in each country. In Singapore, those who favour security and adventure but value tradition less, see innovation as important for a society. Innovation seems to be seen as an adventurous way to secure society's future but implies a renunciation of tradition.

In Taiwan, similarly, people who value security and are less eager to uphold traditions tend to see innovation as important for society's progress. The values of adventure and creativity are not linked to this attitude. Also in Taiwan innovation is considered as a way to increase security although at the expense of tradition.

In Japan, innovation is not seen as a matter of security. There is no systematic link between valuing security and innovation as a way for societal progress. Here, we find that people who value creativity more also tend to see innovation as necessary for society. Additionally, it is those valuing adventure less who tend to see innovation as important for progress. Innovation seems to be considered in Japan as a creative, but not exciting or particularly risky way of achieving progress.

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20 Again, an effect of education is only found for Singapore but not for Japan or Taiwan. In Singapore, 25 percent of people with secondary education or a lower agree strongly that technological innovations bring about more benefits than harm. Among those with Bachelor's degrees or higher, it is 31 percent.

The general assessment of whether harm or benefit is to be expected from innovation differs across the countries as well. In Taiwan, people who value security more tend to see more benefit than harm in innovation. The other values had no such effect. In Japan, people who value creativity see more benefit than harm in innovation. In contrast, respondents who value security tend to see more harm than benefit in innovation. In Singapore, there is no systematic link between the assessment of the effects of innovation and values.

This comparison suggests different perspectives on innovation in the three countries. Singaporeans consider innovation to be an exciting, non-traditional way to achieve progress. In Taiwan innovation is seen as a way to gain security, although it is at the expense of tradition. To the Japanese, innovation is a matter of creativity, but it is not favoured as an adventurous approach to life. Rather it is considered as bearing potential harm which is feared by respondents who value security.

5 Data Provision

Data provision is a crucial step for many cases of digital innovation. Smart applications and algorithms depend on user data.

5.1 Usefulness of Data

A first dimension of data culture is the perceived usefulness of collecting data. The insights gained from analysing the data can be useful for a wide spectrum of tasks, such as targeted marketing or personalised services. However, different actors do not necessarily enjoy the benefits of data processing equally and sometimes, data controllers profit more than consumers do.
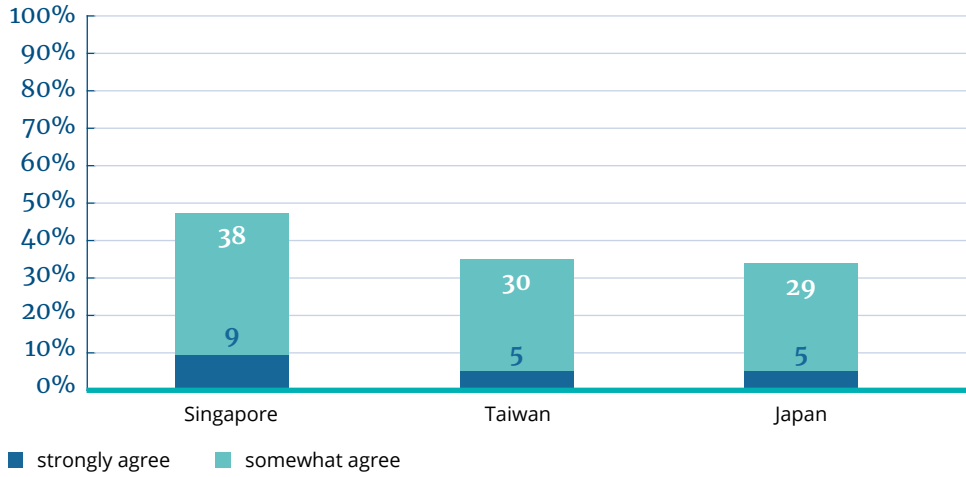
Only a minority of the respondents feel that there is a personal benefit from sharing data (Figure 13). In Singapore, 47 percent somewhat or strongly agree to the statement "When I share personal information for using an app, I benefit". In Taiwan and Japan this opinion receives less support with 35 percent and 34 percent respectively. In addition, the answers do not differ along age, gender or educational degree divides in any of the countries. However, when it comes to values, those that value security less are more likely to agree to the idea of a give and take.[21] In other words, those who are not as concerned about security are more likely to agree to the idea of sharing data for mutual benefits. Individuals who value security more are also more likely to agree that providing data is not considered an adequate exchange for receiving benefits.

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21   Whereas this correlation is significant in Taiwan and Japan, it is not significant in Singapore.

Figure 13: Personal Benefit from Data Sharing

Thinking about the collection of personal data by different parties, please tell me for each of the following statements, whether you strongly disagree, somewhat disagree, somewhat agree or strongly agree.

- When I share personal information to use an app, I benefit.

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: somewhat disagree, strongly disagree, don't know, no answer.

A majority, more in Taiwan and Japan than in Singapore, reject the idea that data sharing against benefits is a fair deal. The core business model of many platforms is rejected by a majority, mostly a large majority.

Figure 14: Data for Better Offers

Thinking about the collection of personal data by different parties, please tell me for each of the following statements, whether you strongly disagree, somewhat disagree, somewhat agree or strongly agree.

- Collecting data about consumers enables companies to make better offers to their customers.
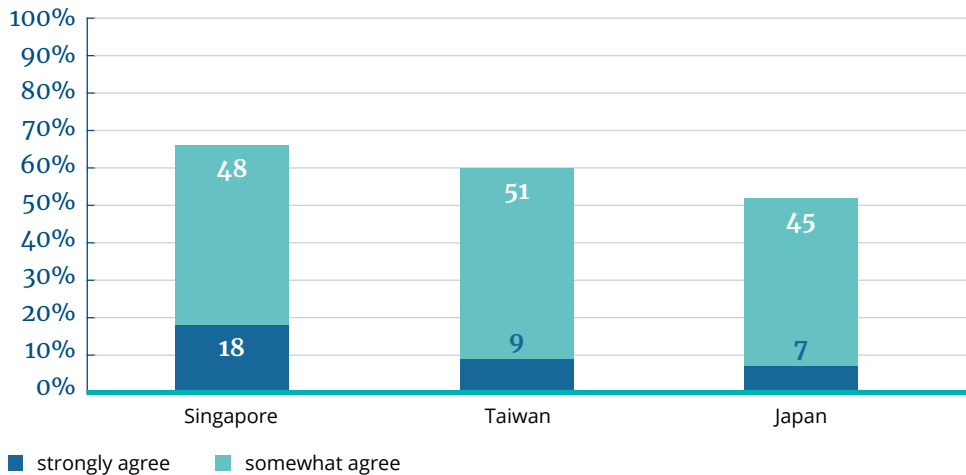

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: somewhat disagree, strongly disagree, don't know, no answer.
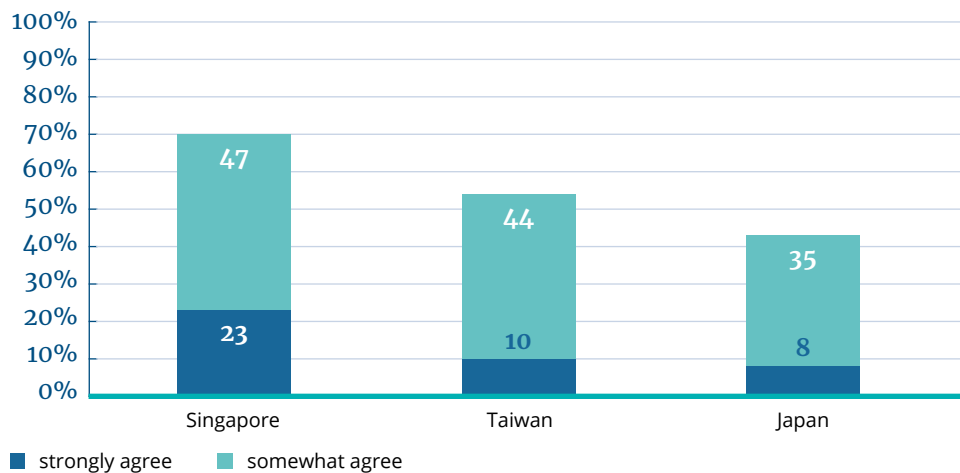
More than half of the respondents in all the three countries somewhat or strongly agree that collecting data about customers allows companies to make better offers – 66 percent in Singapore, 60 percent in Taiwan and 52 percent in Japan (Figure 14).

Common to the three countries is the finding that age has an effect on people's perception of whether collecting data allows companies to make better offers. For instance in Singapore, 24 percent of the people under 30 years old disagree somewhat or strongly with the statement that consumer data helps companies to improve their offers, compared to 45 percent of those aged 60 and above who disagree. In the other countries the age difference is smaller but also visible and significant. Across all countries, people who are more technologically confident are also more likely to agree to the statement above. This is also true for a comparison within each age group, which means that the age difference does not explain the difference according to technology confidence.

Figure 15: Data for Effective Government
Thinking about the collection of personal data by different parties, please tell me for each of the following statements, whether you strongly disagree, somewhat disagree, somewhat agree or strongly agree.
- A government with detailed personal data about its citizens is more effective.

Legend: ■ strongly agree ■ somewhat agree

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: somewhat disagree, strongly disagree, don't know, no answer.

Benefits for an effective governance due to data collection is acknowledged the most in Singapore (Figure 15). 70 percent in Singapore somewhat or strongly agree that a government with detailed personal data about its citizens is more effective. In Taiwan, the proportion who feel the same is 54 percent. The Japanese are more sceptical, with only 44 percent in agreement. The findings thus suggest that the most digitalised country has the largest support for data efficiency of governments.
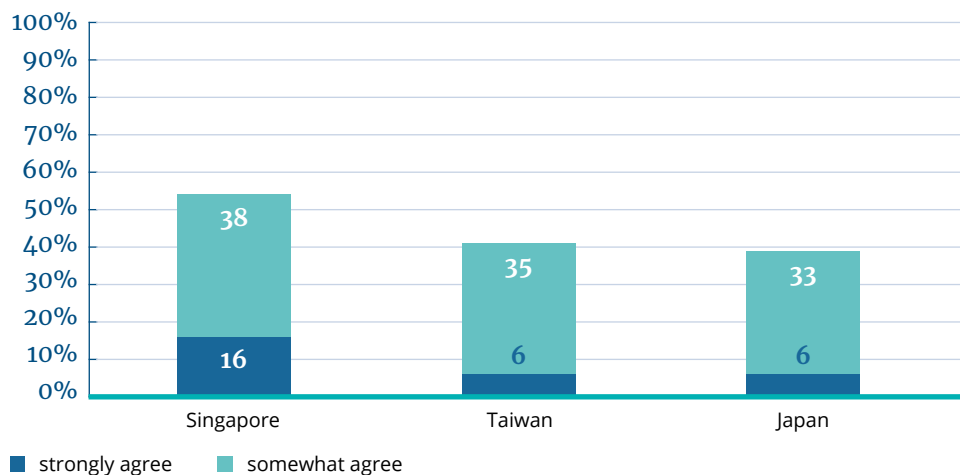
Younger respondents tend to support the gain of government efficiency by data collection more than older ones. In Taiwan, 60 percent of those under 30 years old are in agreement, compared to 49 percent of those aged 60 years old and above. Among the Japanese the age difference is similar while in Singapore there is a tendency in the same direction but it is not significant.

In addition, people who feel more confident with new technology are more convinced that governance becomes more effective if data is widely collected. In Singapore, among those in the lower half of the technology confidence scale, 65 percent agree (strongly or somewhat) that governance effectiveness increases with data collection. In contrast, among those on the upper half of the technology confidence scale, 73 percent agree to the statement. In Taiwan and Japan, the pattern is similar.

Figure 16: Data for Progressing Society

Thinking about the collection of personal data by different parties, please tell me for each of the following statements, whether you strongly disagree, somewhat disagree, somewhat agree or strongly agree.

- The collection of personal data should be as easy as possible for society to progress.

■ strongly agree   ■ somewhat agree

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: somewhat disagree, strongly, disagree, don't know, no answer.

When it comes to whether the collection of personal data should be as easy as possible for society to progress, only in Singapore a majority agreed to this statement (54 percent strongly agree or agree). In Taiwan and Japan, respondents are more hesitant, with only 41 percent and 31 percent in agreement respectively (Figure 16).[22]

Only in Taiwan, younger people tend to favour data collection for societal progress more than older ones. 45 percent of those under 30 years old favour easy data collection for societal progress, as compared to 38 percent of those Taiwanese who are 60 years old and above. There is no age difference for Singapore and Japan.

In addition, agreeing to easy data collection is not correlated with technological confidence in any of the countries under view. And while there was no effect of values on Singapore and Japan, in Taiwan, respondents who value adventure more and security less, tend to favour easy data collection. In all three countries, easy data collection is favoured by people who expect more benefit than harm from technological innovation.

The exchange of data in return for various private or collective benefits is not always accepted by respondents. Though most of those interviewed in the three countries conceded that companies can provide better services and governments can be more effective with comprehensive data collection, most still prefer not to provide their data in order to enjoy these benefits. Furthermore, most of the respondents in Taiwan and in Japan disagree that data collection should be made easier to facilitate social progress.

In Singapore, people are more likely to share their personal data with companies and the government in exchange for benefits. In contrast, people in Japan are more hesitant in their evaluation – only a minority of respondents expect a more efficient governance based on extensive data collection. Taiwan is in the middle, but the findings lean closer to Japan than Singapore.

5.2 Willingness to Disclose Data

Innovation requires data, and while data is collected from various sources, it primarily comes from individuals. Data controllers such as companies and digital platforms collect a wide range of data from users; this data would include social media posts, health data, location data and what users buy online. Most users are not aware of just how much of their information is being collected and how it is then circulated or even sold to other corporations.

To understand people's preparedness to disclose data, we examine a range of factors: What sort of data are they willing to disclose? Which data controller is asking for data? How will the data be used and is this something that is trusted?

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22   In Taiwan, 59 percent disagree (strongly or somewhat) with the statement that
      data collection should be as easy as possible for society to progress. In Japan disagreement is a bit lower with 55 percent, because in Japan 6 percent preferred
      not to answer (0 percent in Taiwan no answer).

Figure 17: Unwillingness to Disclose Data

When you perfrom tasks online, some portals might want to collect data from you to provide better services. Please indicate your willingness to disclose the following information. Are you very unwilling, somewhat unwilling, somewhat willing or very willing to disclose …?

- your demographic data (e. g. your name, your address)
- your favourite books
- your medical records (e. g. X-rays, CT scans)
- your bank account balance.

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: somewhat willing, very willing, don't know, no answer.

People across the three countries are more willing to disclose less personal details about themselves, such as their favourite books, than more personal information such as their bank account balance (Figure 17). In Japan, 75 percent of respondents are somewhat or very unwilling to provide their bank account balance. In Taiwan, 86 percent are somewhat or very unwilling and in Singapore, close to all (96 percent) are unwilling to disclose such information.

The country comparison reveals an interesting finding. In Japan, the unwillingness to disclose data is lower than in Taiwan and Singapore. This does not apply to favourite books, but it applies to all other kinds of data for which the unwillingness is much higher. Disclosing medical data is rejected by 51 percent of Japanese, 68 percent of Singaporeans, and 75 percent of Taiwanese people. Willingness to disclose demographic data shows a similar pattern. 55 percent of respondents in Japan are somewhat or very unwilling to do so, while this applies to 69 percent of those in Taiwan and 73 percent in Singapore. The result is a contradiction at least on the country level: in the countries where more online platforms are used, the rejection of disclosing private information is higher.

While there is no general difference for gender or formal education in the willingness to disclose data in the three countries, in Singapore and Taiwan, older people tend to be more unwilling to share their private data. Those more confident in dealing with technology are also more willing to reveal their favourite books, but there is no consistent pattern for the other kinds of data.

People who value security are more unwilling to disclose their data. Valuing tradition, creativity or adventure does not have an effect on the willingness to pass on data.

5.3 Online Dangers: Perceived Digital Threats

The contradiction between personal privacy and collective benefit is a core issue in the discussions about data privacy. Privacy concerns have to be considered in conjunction with the opportunities and benefits, such as meeting social needs or improving service provision that can come with more innovations, especially in the digital area. New tools and devices can only prosper in the market if people feel safe enough when using them.[23]

Security concerns in relation to private data can occur in various instances. Four examples of data fraud were chosen to assess respondents' concerns about inappropriate use of their private data:
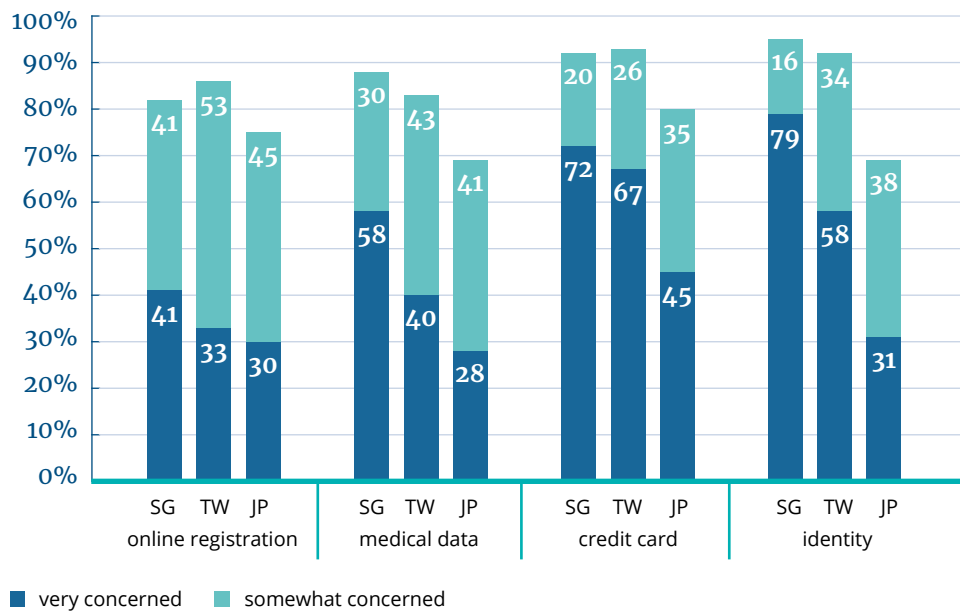
- Being asked for their personal information when registering or making online purchases

- Someone who might access their medical records electronically

- Stealing of their credit card details when making online purchases

- Their identity being used by somebody else.

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23   This is further elaborated in "Data Innovation in a Smart City"
     (Pang & Wong, forthcoming).

Figure 18: Concern About Misconduct of Private Data

I would like to understand your concerns, if any, about data privacy when performing online activities. For each, please tell me if you are not concerned at all, not really concerned, somewhat concerned or very concerned. How concerned are you with …?

- Online purchase: Being asked for your personal information when registering or making online purchases.
- Medical data: Someone who might access your medical records electronically.
- Credit card: The stealing of your credit card details when making online purchases.
- Identity: Your identity being used by somebody else.

■ very concerned　■ somewhat concerned

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: not really concerned, not at all concerned, don't know, no answer.

A majority of people across the three countries are "somewhat concerned" or "very concerned" in each of the four cases of data misconduct (Figure 18). In Taiwan, 86 percent are either very concerned or somewhat concerned about being asked for their personal information when registering or making online purchases; this is followed by Singapore at 82 percent. However, between these two countries, Singapore has a higher percentage of who indicate they are very concerned (41 percent) about this issue, as compared to Taiwan (33 percent are very concerned). Japan has the least number of those who are concerned about this particular privacy issue. Only 30 percent indicate that they are very concerned.

For Singaporeans and Taiwanese, the unauthorised retrieval of medical data is a slightly larger concern than giving data for online purchases, while the difference in Japan is minimal. In Singapore, 58 percent are very concerned about safeguarding the privacy of their medical data, while 40 percent of respondents in Taiwan feel the same way. In Japan only 28 percent indicate they are very concerned about this issue.

Having their credit card details being stolen is a key concern for the majority of respondents in all three countries, with slightly more than 90 percent people in both Singapore and Taiwan citing this as a concern, and 83 percent in Japan. The weight of their concern on this issue is further illustrated by the breakdown of respondents who feel very concerned or somewhat concerned: In Singapore, 72 percent are very concerned while 20 percent are somewhat concerned; in Taiwan, 67 percent are very concerned while 26 percent are somewhat concerned; and in Japan, 45 percent are very concerned while 35 percent are somewhat concerned. [24]

In Singapore alone, the concern about identity theft is larger than the worry about stealing of credit card details. In Singapore there is the highest share of people (95 percent) who are concerned about this particular issue. 79 percent indicate they are very concerned, the highest share in comparison, and another 16 percent are somewhat concerned. These concerns are valid given that there has been an increase in unauthorised use of credit cards and e-commerce scams in Singapore, so much so that there are public campaigns conducted by the public sector to warn and educate citizens about such crimes.

92 percent of the Taiwanese indicate that they worry about identity theft. Of these, 58 percent are very concerned and 34 percent are somewhat concerned. Again, the level of concern is low in Japan. Compared to Singapore and Taiwan, only 69 percent of the Japanese are concerned about this privacy issue, with 31 percent very concerned and 38 percent somewhat concerned.

The country comparison of concerns about breaches of data confidentiality online is remarkable, with Singapore and Taiwan showing higher levels of concern than Japan, alongside higher frequencies of online activities in both countries. The findings suggest that concerns about privacy issues may be higher in countries where online activities are also more pervasive. The implication is that if an individual does not spend much time online, he or she is also not as affected by risks and data breaches. Thus online activity would be a precondition for worries about data fraud. However, the causal relationship could also be the other way round. Concerns about data fraud can inhibit participation and using technologies. Then we would expect that people who are very concerned about being victims of fraud while online shopping, either by misconduct of personal information or theft of credit card details, would abstain from online shopping.

In fact, both these propositions seem to be true. Data misconduct is only a relevant issue in countries where online activities are common. In aggregate, countries with higher rates of online activity (Singapore and Taiwan) are also the countries where worries about fraud in relation to online activities are more widespread. At the same time across all three countries, persons who worry more about privacy breaches while registering or online shopping and theft of credit card details do online shopping less frequently.[25] The same pattern can be seen for online medical activities. People who use online platforms to consult doctors worry less about misconduct of their medical

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24   Differences between the sum of single values and values of combined categories
      are due to rounding. This applies throughout this report.
25   In all three countries the rank correlation between frequency of online shopping
      and concerns about misconduct while doing registrations or online shopping is
      significant. The rank correlation between frequency of online shopping and con-
      cerns about theft of credit card details is significant in Taiwan and Japan.

information.[26] However, less concern does not mean little concern. In Singapore, of those who use an online platform to consult a doctor, 49 percent are very concerned about the confidentiality of medical data online. Among those who do not use such a platform, 61 percent are very concerned. A similar pattern is also found in Taiwan.

People who are technologically more confident tend to have less privacy concerns about online registration and online shopping across the board. However, in Singapore only, the technologically more confident are more concerned about identity theft and stealing of their credit card details.

Although the findings are not significant for each single concern in each country, by and large in Singapore and Taiwan, women tend to have more concerns than men, and older people tend to have more concerns than younger ones. In Japan, the pattern is inconsistent and mostly insignificant.[27]

With the exception of Singapore, people in Taiwan and Japan who consider themselves adventurous tend to be less concerned about being victims of identity theft and data breaches while shopping online or handling credit card information. Though there are a few exceptions, people across all three countries who value security tend to have more concerns about potential data misconducts. Only in Taiwan individuals who value tradition also tend to have more privacy concerns.

Interestingly, expecting more benefit than harm from technological innovations does not imply less concerns about data misconduct. Rather, in Singapore and Taiwan we find a reversed pattern. People who expect benefit from innovation also tend to have more worries with respect to confidentiality breaches online. Though we found substantial support from people for innovation as a way of progress and betterment, they are also critical of it.

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26 The rank correlation is significant for Singapore and Taiwan but not for Japan where much less people consult a doctor online. The monitoring of medication online is not correlated with concern of medical data being stolen.
27 For educational degrees there is no consistent pattern.
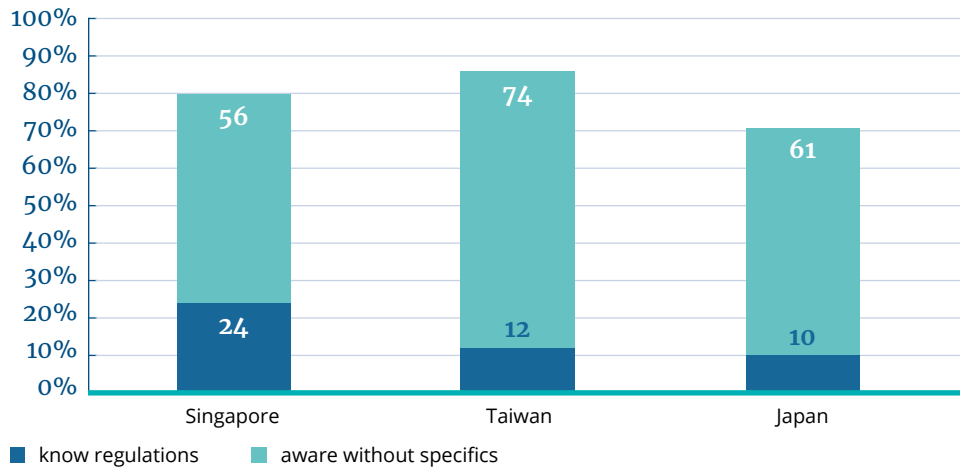
6 Perceptions of Data Privacy Regulations

Each country has some form of regulation to protect citizen's personal data. In Singapore, there is the Personal Data Protection Act 2012 (PDPA). Japan's data privacy is governed by The Act on the Protection of Personal Information, The Act on the Use of Numbers to Identify a Specific Individual in the Administrative Procedure as well as a key guideline titled the Personal Information Protection Commission. In Taiwan, there is the Personal Information Protection Act 2015 and the Enforcement Rules of the Personal Data Protection Act. There are also more specific regulations pertaining to different sectors or types of data.

The majority of citizens are not necessarily experts on data privacy laws and regulations. Some may have a general and vague perception of the law, while others may be highly interested or come across specific regulations on occasion. While we are not concerned about assessing people's factual knowledge about data regulation, we wanted to understand their perceived personal competence and sentiment about such regulations.

Figure 19: Knowledge of Data Privacy Regulations

Are you aware of any regulations in your country that protect personal data privacy and security?

- No, I am not aware of any regulation.
- I am aware that there are regulations, but I am not sure about the specifics.
- I am aware and I know what the regulations are about.

■ know regulations ■ aware without specifics

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: not aware of any regulations, don't know, no answer.
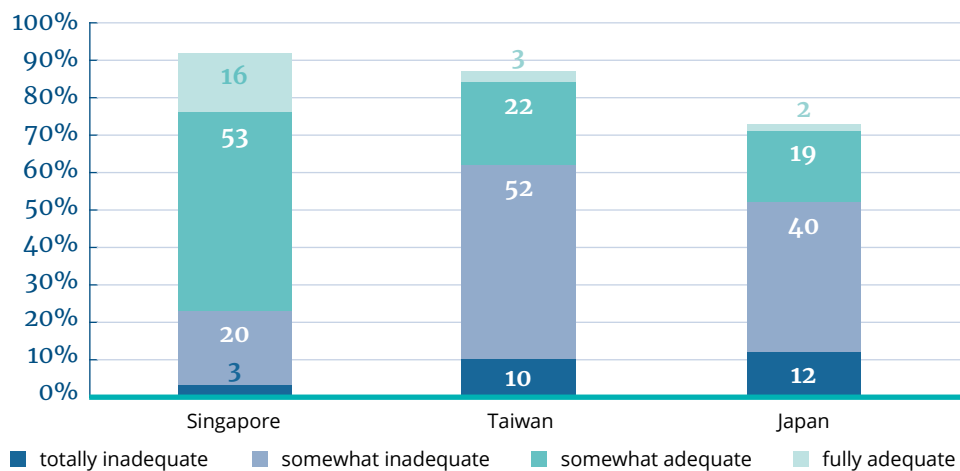
Knowledge about data privacy regulations is at a very high level (Figure 19). In all countries, more than 70 percent of those interviewed claim to have at least a vague knowledge about how data privacy is protected by law. 71 percent of the Japanese claim to know about such regulations. Most of them (61 percent) have only a vague knowledge, but some (10 percent) think they also know the specifics. In Taiwan, nearly 74 percent say they know data privacy regulations but are not sure about the specifics, while only 12 percent say they know the details of the regulations. In Singapore, we find the largest proportion of respondents (24 percent) who indicate they are aware of such regulations and know what they are about. An additional 56 percent said they know of the regulations but are not aware of the specifics.[28]

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28 The exceptionally high awareness with specific knowledge in Singapore could be related to the discussions around large-scale data incidents in recent years that have heightened consciousness about the potential vulnerabilities associated with data held by public agencies (Pang & Wong, forthcoming). Two such occasions were the SingHealth cyberattack of 2018 and the leak of HIV-positive individuals' data. Both events involved unauthorised access to medical data and other personal information of thousands of people. In recent years, audits of the public sector have also found troubling weaknesses in information technology (IT) controls across public sector agencies (Public Accounts Committee, 2020). These developments may have also diminished a gender difference. While large-scale data events have occurred in the other two countries as well, such as the 7-eleven incident in Japan where hackers stole a significant amount of money from users, they may not have been on as much of a prominent national scale as the issues in Singapore.

In Taiwan and Japan, men tend to report higher awareness of data privacy regulations while in Singapore there is no gender difference. In Singapore, where most people have specific knowledge about data privacy regulations, those more concerned about data misconduct also reported better knowledge of them. This pattern is not found in either Taiwan or Japan. In all three countries, people more confident with respect to new technology also reported better knowledge of the regulations surrounding it. In Singapore and Japan, age has an effect on respondents' awareness of data privacy regulations, although in different ways. Among Singaporeans, younger people are significantly more likely to say that they are aware of such regulations.[29] The opposite is reflected in Japan, where older respondents are notably more likely to say that they are aware of such regulations. In Singapore and Taiwan, people with higher educational grades report more knowledge of regulations relating to data privacy.

Figure 20: Adequacy of Data Privacy Regulations
Would you say that the existing regulations in <name of country> for protecting your personal data privacy and security are totally inadequate, somewhat inadequate, somewhat adequate, or fully adequate?

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: don't know, no answer.

Knowing about regulations on data privacy is only a first step to deepening data literacy. It is more relevant to discover to what extent respondents consider these regulations adequate in protecting their personal data. A majority of people in Taiwan and Japan evaluate existing regulations as somewhat or fully inadequate (Figure 20). The results are quite different in Singapore, where 69 percent evaluate regulations as somewhat or fully adequate.[30]

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29 In Taiwan, we find a hint towards a similar relation but it is not significant.

30 In Taiwan out of those who said they are not aware of any data privacy protection regulation, 85 percent responded they could not assess their adequacy. In Japan 77 percent of those unaware of the regulation refused to give an assessment. In Singapore only 31 percent of those who are not aware of legal data privacy protection felt unable to assess their adequacy. The response rate among this special group could be interpreted as an indication of socially expected answers. The given answers indicate a very general perception of governance in the country. In Taiwan and Japan, the most frequently given answer besides "don't know" among those unaware of regulations is "somewhat inadequate", while in Singapore most frequently the answer "somewhat adequate" was chosen.

In Japan and Taiwan specifically, people who know what the regulations are about are significantly more likely to feel that the regulations are adequate to protect their data privacy. For example, in Taiwan, of those who are aware of regulations but not the specifics, 24 percent consider the legal situation as somewhat adequate and another 2 percent see them as fully adequate. Among those Taiwanese who know the regulations in more detail, 36 percent consider them somewhat adequate and 13 percent consider them to be fully adequate. In Japan the pattern is similar.

The assessment of a regulation depends on both how strict the regulation is and how necessary the regulation is perceived to be in the first place. Thus, we would expect people with more concerns about data misconduct to be more critical of the regulations.

For Taiwan and Japan we find this pattern with respect to all the different kinds of data misconduct that was surveyed. For example of those Taiwanese who are not at all or not really concerned when entering their personal data for online shopping or registration, 40 percent consider the regulations to be somewhat adequate and another 7 percent feel they are fully adequate. Among the very concerned, 19 percent consider the regulations to be somewhat and 4 percent think they are fully adequate. In Japan we find a very similar picture. Here, of those not really or not at all concerned while giving personal information for online shopping or registration, 36 percent regard the regulations as somewhat adequate and another 4 percent feel they are fully adequate. Among the very concerned, 19 percent consider the regulations somewhat adequate and 2 percent feel they are fully adequate.

In Singapore, however, the level of concern does not make a difference for the assessment of the regulations. Regardless of whether people are very concerned or not really concerned with respect to the different forms of data misconduct, a majority considers the regulations in Singapore to be somewhat or fully adequate.
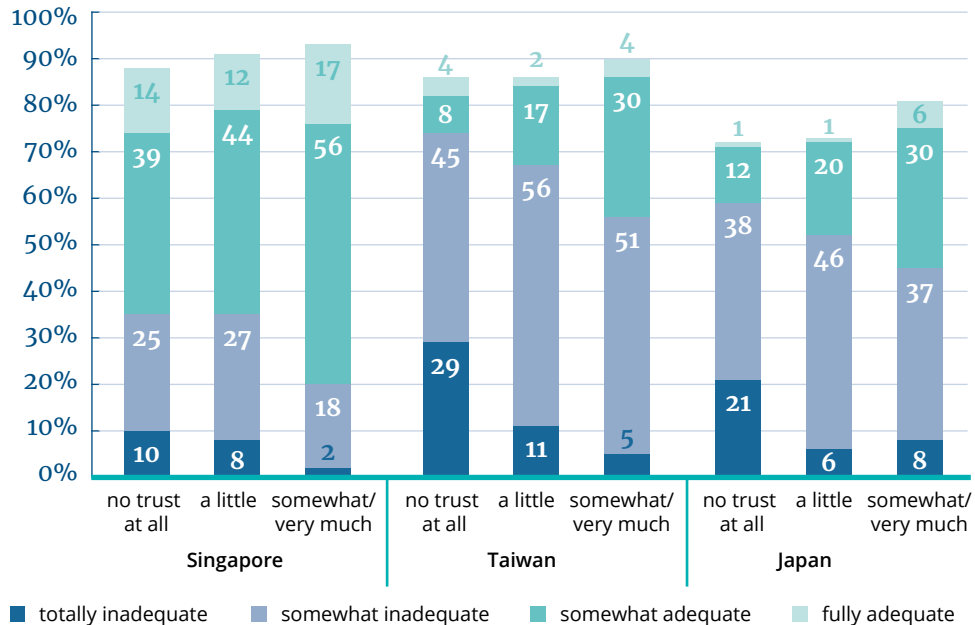
Across all three countries, people's confidence in dealing with new technology is unrelated to their assessment of the regulations. In addition, gender does not significantly affect respondents' opinions on whether the existing regulations in their country are adequate enough to protect their data privacy. While age has no effect on people's opinion on the adequacy of Singapore's data privacy regulations, younger respondents in both Japan and Taiwan are significantly more likely to think that the regulations in their respective countries are adequate. Older respondents are more disposed towards stricter regulations in order to protect their data as they tend to be more concerned about data misconduct.

Given that laws and regulations are under the purview of the government (which proposes the law) and the public administration (which enforces them), trust in government and public administration has an effect on citizens' opinions of the adequacy of data privacy in all three countries. Similarly, people who trust the government and public administration are significantly more likely to agree that the existing regulations are adequate to protect their data privacy.

Figure 21: Adequacy of Data Privacy Regulations by Trust in National Government
Would you say that the existing regulations in <name of country> for protecting your personal data privacy and security are totally inadequate, somewhat inadequate, somewhat adequate, or fully adequate?

- In general, how much trust do you have in the <national> government?

legend: totally inadequate | somewhat inadequate | somewhat adequate | fully adequate

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: don't know, no answer.

The low trust in government and public administration in Japan contributes considerably to the relatively negative assessment of data protection regulations in the country (Figure 21). Among those in Japan who trust the government somewhat or very much, 8 percent consider the data privacy regulations as fully adequate and another 37 percent consider them somewhat adequate. Among those in Japan who trust the government not at all, 2 percent assess the data privacy regulations as fully adequate and 16 percent as somewhat adequate.

In Singapore, the pattern is similar, though on a higher level of approval. Among those who trust the government not at all or a little 14 percent consider the data protection regulations to be fully adequate and another 48 percent feel they are somewhat adequate. 26 percent of those who trust the Singapore government very much regard the regulations as fully adequate and another 56 percent see them as somewhat adequate.
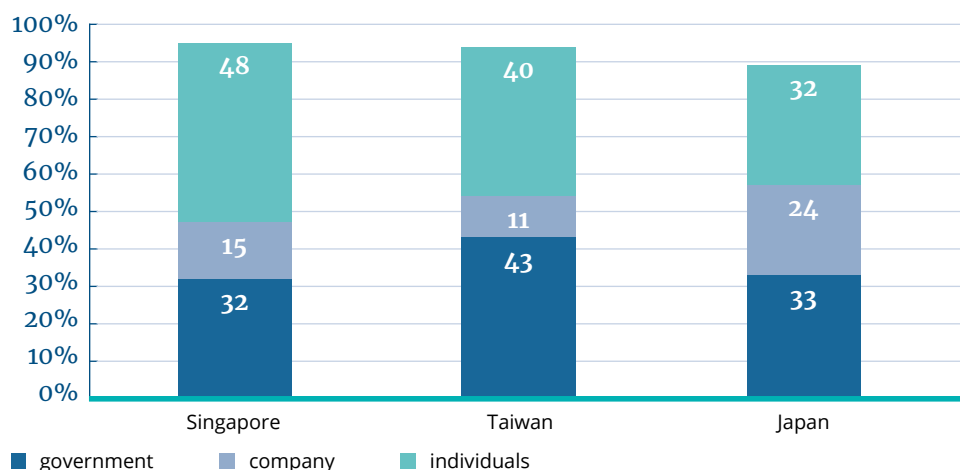
The connection between government trust and assessment of data privacy regulations can explain how people evaluate the legal framework. Furthermore, not only are data protection regulations assessed on their own, but this assessment is embedded in the general impression that people have of the government and the administration.

7 Perceptions of Data Privacy Controllers

Although the legal environment defines the framework for data protection by all data controllers, the actual responsibility for keeping sensitive personal data private can be attributed to various actors: government, companies or the individual.

Figure 22: Responsibility for Data Privacy
In your opinion, who has the primary responsibility to ensure that personal data is kept confidential? Is it the government, the company or individuals?

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: don't know, no answer.

The relative weight given to the different actors with respect to safeguarding the confidentiality of private data differs considerably across the three countries (Figure 22). About half (48 percent) of the Singaporean respondents feel that it was the responsibility of individuals, compared to 32 percent who attribute responsibility to the government. In Taiwan, a larger share (43 percent) sees the government in charge while individuals are chosen about as often (40 percent) but less frequently than in Singapore. The Japanese mention the government as primarily responsible for data protection as often as people in Singapore (33 percent), but individuals are chosen in Japan equally as often (32 percent), while a comparatively large share of the Japanese feels unable to choose (11 percent). Comparatively fewer people in all the three countries think that companies should be in charge – 15 percent in Singapore, 11 percent in Taiwan and 24 percent in Japan.

In Taiwan we see a dominantly government-driven approach, while in Singapore the individual approach dominates. In the latter, the responsibility attributed to the government is relatively low, especially in relation to those people who have an opinion (excluding those who indicated 'don't know' in response to the question). In Japan, the spectrum of opinions is wide and balanced, including the abstentions.

Across all countries, older people prefer a strong role for the government in providing data security. In Singapore and Taiwan, younger respondents have a stronger preference for the individual as primarily responsible, whereas in Japan, the younger ones either prefer the individual or the company. Technological confidence is influential in Singapore. Singaporeans with greater technological confidence are more likely to think that the individual has the responsibility of securing private data, while the less confident have a preference for the government. In the other two countries there is no significant relation between technology confidence and the attribution of responsibility for data protection.

Across all countries, those who value creativity favour the individual as primarily responsible for data protection. In Singapore and Taiwan, those who value tradition expect data privacy protection from the government, while in Japan, they prefer either the government or the company to provide it.

The expectation of providing safety is not equivalent to actually seeing this protection take place. In fact, people show some scepticism with regard to how appropriately their data is handled.

Figure 23: Appropriateness of Data Handling by Government

I am going to read out a few statements, please tell me if you strongly disagree, somewhat disagree, somewhat agree or strongly agree.

- I trust that my personal data is collected and used appropriately by my government.

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: don't know, no answer.

In Singapore, a large majority trusts the government to handle their personal data appropriately (Figure 23). 83 percent agree strongly or somewhat with this proposition. The Taiwanese are much more sceptical, although a majority of 56 percent does expect appropriate data handling by the government. However, 14 percent strongly mistrust data handling by their government. In Japan only a minority of 39 percent expects appropriate data handling by the government. As in Taiwan, 14 percent strongly mistrust the government's data handling and another 39 percent somewhat disagree with the statement about appropriate data handling by the government.

Figure 24: Appropriateness of Data Handling by Companies

I am going to read out a few statements, please tell me if you strongly disagree, somewhat disagree, somewhat agree or strongly agree.

- I trust that my personal data is collected and used appropriately by private companies.

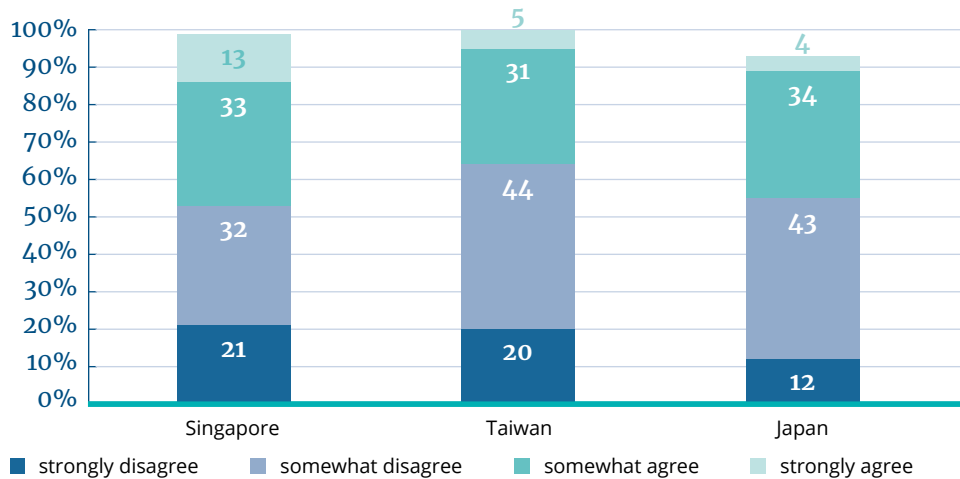■ strongly disagree ■ somewhat disagree ■ somewhat agree ■ strongly agree

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: don't know, no answer.

With the exception of Japan, the findings also show that respondents generally rate companies as less trustworthy than the government (see Figure 24). In all three countries, a majority disagrees with the statement that private companies would handle personal data appropriately. In Singapore, it is 52 percent who distrust private companies and in Japan, it is about the same share (55 percent) while in Taiwan nearly two thirds (64 percent) tend to distrust private companies' data handling. Thus, while with respect to governments, where respondents in Taiwan and Japan especially tend to be somewhat sceptical, in relation to private companies the mistrust in data handling is a mass perception in all three countries.

In Singapore we find a correlation between trust in data handling and ascribed roles in data protection. Among those who see the government primarily responsible for data protection 52 percent of them strongly agree that the government is handling personal data appropriately. Among those who see the primary role resting with companies or individuals, only 27 and 30 percent respectively strongly agree. The trust in companies' data handling corresponds to this. Among those seeing companies as primarily responsible for data protection, 40 percent strongly agree that private companies handle data appropriately while among the others who see the government or individuals as primarily responsible only 9 percent and 6 percent respectively strongly agree.

However, in Japan there is a reversed pattern. Of those who see the government in charge of guaranteeing data privacy, 20 percent strongly disagree that the government is handling data adequately. Among those Japanese who think that companies or individuals are primarily responsible, 9 percent and 13 percent respectively disa-

gree strongly that data handling by the government is adequate. In Japan the expectation of data protection attributed to the government seems to increase expectations and the government is perceived as not delivering on those expectations.[31]
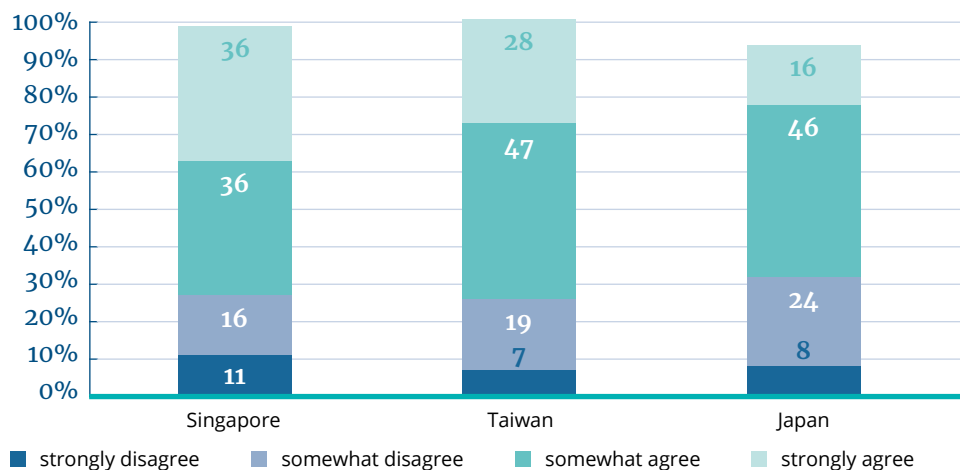
Younger people of all three nations are somewhat more optimistic than older ones with regards to both the government and the companies. While they are still not strongly trusting they distrust data handling by governments and private companies less.[32] The trust in adequate data handling is not linked to technological confidence or basic values.

Considering the distrust in government and private companies with respect to data handling, people seem to have to rely on themselves regardless of whether they favour this strategy or not. However, the perceived individual control over personal data is also low.

Figure 25: Dependence on Large Technology Firms
For the following statements, please tell me whether you strongly disagree, somewhat disagree, somewhat agree or strongly agree.
- I am dependent on large technology firms in my daily life, for example Google, Microsoft, or Facebook.

strongly disagree ■ somewhat disagree ■ somewhat agree ■ strongly agree

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: don't know, no answer.

Around two thirds of the population of each of the three countries somewhat agreed or strongly agreed that large technology firms are an inescapable part of their daily lives (Figure 25). In Japan 62 percent agree somewhat or strongly that they are dependent on large technology firms. In Singapore this figure is 72 percent and in Taiwan it is 75 percent. As such, despite their concerns about data privacy and their reluctance to share

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31   In Taiwan, there is no significant connection between the attribution of responsibility for data protection and trust in the government's data handling.

32   For the trust in the governments' data handling in Singapore there is no age difference. All other correlations between age and agreement/disagreement to the described statement on appropriate data handling by the government or private companies are significant.

their data, respondents recognise that they are dependent on large technology firms in their daily lives. Even though giving data, mostly personal or even very private data is a prerequisite for using the respective services, a large majority in all three countries feels unable to avoid giving their data to the companies due to this dependence.

The technologically more confident feel more dependent on the large technology firms. This applies to all three countries. In Singapore, among those in the lower half of the technology confidence scale, 21 percent agree strongly that they are dependent on the large technology firms, while 43 percent of those in the upper half of the scale strongly agree. In Taiwan and Japan, we find the same pattern. In addition, those who consider themselves competent in dealing with new technology consider themselves even more dependent on the large technology firms than the technologically less confident. The lower confidence with regards to new technology may correspond to less sensitivity for the role of the large technology firms and thus also a lower feeling of dependence. It also may go hand in hand with less digital activity and therefore less dependence. However, also among those in the lower half of the technology confidence scale, a majority feels somewhat or strongly dependent on the large technology firms.
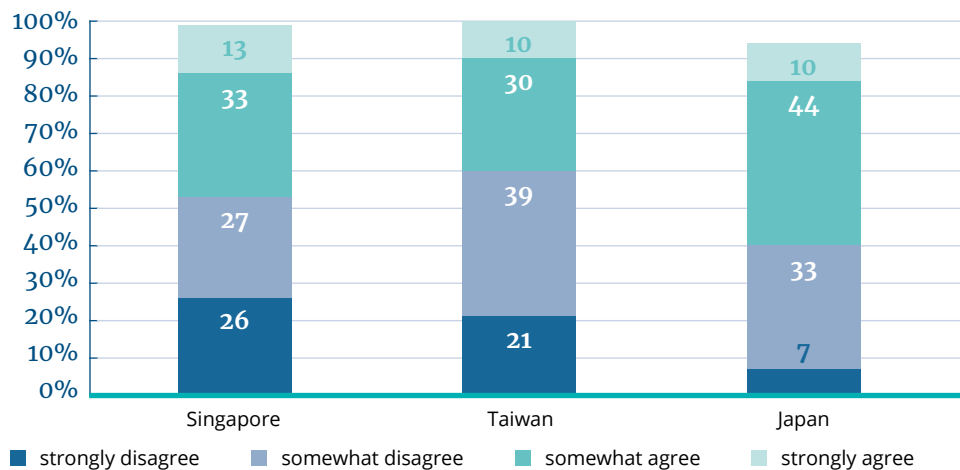
While there is no gender difference in the feeling of dependence on the digital giants like Google, Microsoft or Facebook, there are considerable differences according to age and education. The younger respondents feel more dependent on these companies than the older ones. Also people with higher formal educational grades tend to feel more dependent on them.

In Singapore and Taiwan the feeling of dependence on large technology firms is stronger among people who particularly value security and value tradition less. The less traditional in the two countries seem to have less digital tools and devices woven into their life while respondents who are more concerned about security in general tend also to have a critical view on their dependence on large technology firms.

Figure 26: Uncontrolled Data Collection by Companies
For the following statements, please tell me whether you strongly disagree, somewhat disagree, somewhat agree or strongly agree.
• I have no choice in how much my personal data is collected by companies.

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: don't know, no answer.
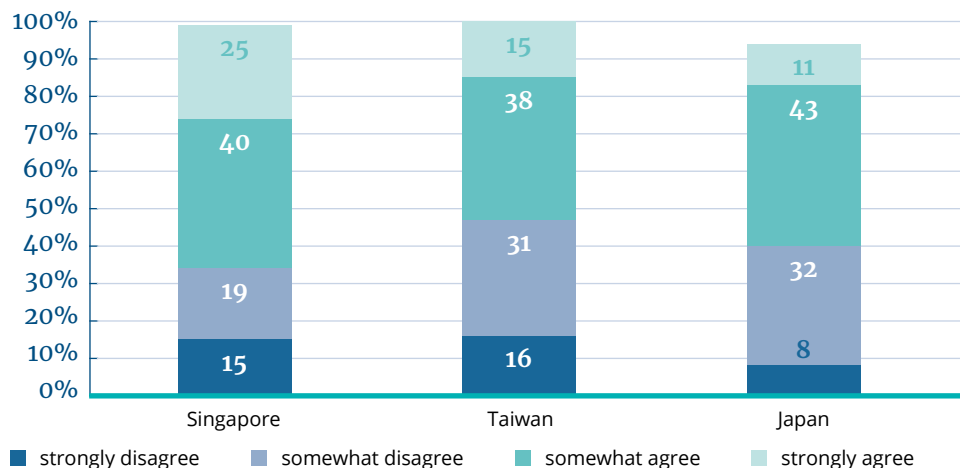
Dependence on large technology firms is closely related to the extent to which they feel that they have control over the data passed on to them. The statement "I have no choice in how much my personal data is collected by companies." is strongly agreed to by around 10 percent people in each country (Figure 26). In Singapore and Taiwan another third of the population agree somewhat (Singapore 33 percent; Taiwan 30 percent). Among the Japanese, 44 percent agree somewhat. In addition, in Singapore, a quarter of the population feels in control of which personal data they pass on to companies. In Taiwan, this applies to a fifth of the population, but in Japan, only 7 percent feel they can fully control which personal data they give to companies.

Technology confidence has a differing but telling effect in each country. In Japan, the more technologically confident feel more able to control which personal data they pass on to companies. Among the people on the lower half of the technology confidence scale, 36 percent tend to disagree (somewhat or strongly) and thereby indicate that they have a sense of at least partly controlling the flow of their personal data. Among the people on the upper half of the scale, 46 percent feel they can control at least partly which personal data they pass on to companies. In Singapore, the relation is reversed. Among the people with lower technology confidence, 58 percent think they can at least partly control which personal data they give to companies while among the more confident, 50 percent are convinced, they control the passing on of data. In Japan, where digital tools are not as pervasive as in Singapore and Taiwan, technologically competent people feel more able to control their data flow, while in Singapore where digital tools are more ubiquitous the technologically more confident see in a clearer way how little control they have.[33]

Figure 27: Uncontrolled Data Collection by Government

For the following statements, please tell me whether you strongly disagree, somewhat disagree, somewhat agree or strongly agree.
- I have no choice in how much my personal data is collected by the government.

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: don't know, no answer.

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33   In Taiwan differences are too small to become significant.

When it comes to data collection by the respective governments of the three countries, more than half of the respondents are quite sceptical about their prospects of data control (Figure 27). In Japan and Taiwan, 54 percent and 53 percent of people respectively agree somewhat or strongly that they are unable to control which of their personal data is collected by the government. In Singapore the share is considerably higher at 65 percent. 25 percent agree strongly that they have no choice in how much data is collected by their government.

As we have seen from the findings on data collection by companies, Singaporeans who feel more confident dealing with new technology tend to be of the opinion that they cannot control data collection by the government. However, in Japan and Taiwan technology confidence is unrelated to the assessed control of the government's data collection. Again, there is a tendency of younger and people with higher education to express a feeling of less control over data collection by the government, but the pattern is not fully consistent over the countries.[34]

In all three countries, people feel uneasy about the collection of their personal data by data controllers such as the government and companies. A majority in all countries do not trust companies to handle their data adequately. At the same time people feel dependent on large technology firms such as Google, Facebook and Microsoft, and they feel unable to control the types of data collected by these firms. With respect to the government collecting data, the findings suggest that the Japanese and Taiwanese feel the same in principle. Around half of the people distrust data handling by the government, but at the same time, they also feel that they are unable to control which personal data is collected by their government. In Singapore, things look a bit different. People trust the Singaporean government highly and while they also feel that they are unable to control which personal data is collected by the government, a large share of the population believes the government will adequately handle their data.

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34   Younger people tend to disagree with the statement "I have no choice in how much my personal data is collected by the government" more in Singapore and Japan, but not in Taiwan. People with higher formal education tend to disagree more to the statement in Singapore and Taiwan, but not in Japan.

8 Doing Data Protection: Data Privacy Habits
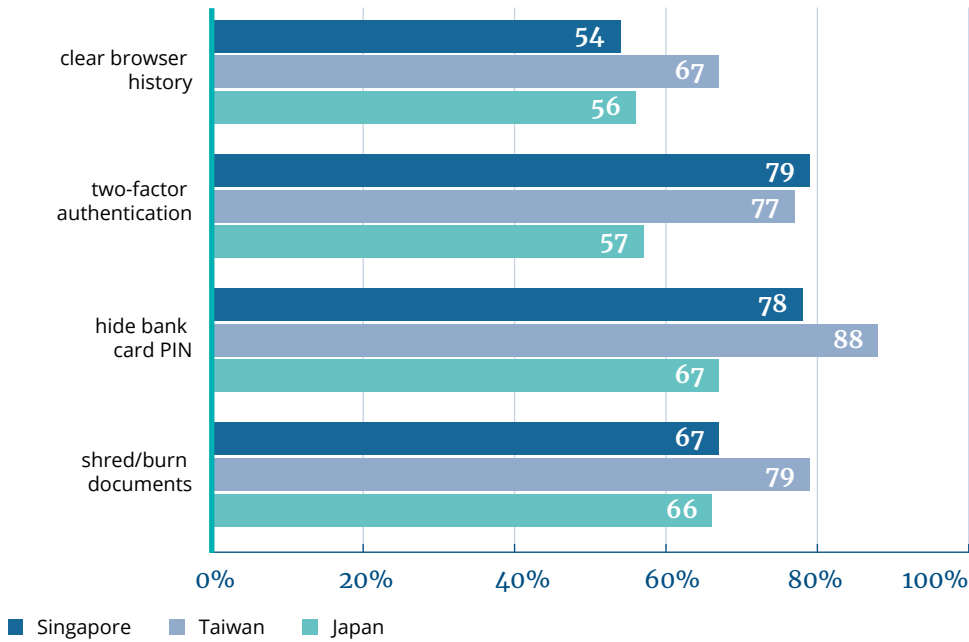
Besides attitudes and concerns about privacy, respondents also have their own agency to protect their personal data. As we have seen earlier, a third to a half of the respondents in the three countries under review consider data protection as the responsibility of individuals. (Figure 22 in Section 7) Thus, to what extent do individuals actually practice data privacy habits?

Figure 28: Data Protection Habits

I am going to read out some habits of how people manage private data. Please indicate if you do the same or not. Here: yes.
- Do you shred or burn your personal documents when you are disposing of them?
- Do you hide your bank card PIN number when using cash machines or making purchases?
- Do you enable two-factor authentications whenever the option is available?
- Do you clear your internet browser history regularly?

■ Singapore ■ Taiwan ■ Japan

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country.

The majority of respondents put into practice some form of data protection habits such as clearing their internet browser history regularly (Figure 28). Singaporeans in particular, reported widespread use of two-factor authentication.[35] Similarly, offline practices are also often employed, such as shredding or burning personal documents and hiding pin numbers when using cash machines.

In the country comparison we have a fairly consistent pattern. The Taiwanese employ more data protection habits, offline as well as online. Shredding or burning personal documents, hiding one's bank card PIN and clearing their internet browser history is most common in Taiwan. Just like Singapore, the Taiwanese also frequently use two-factor authentication. While shredding/burning personal documents is equally common in Singapore and Japan, hiding one's bank card PIN and especially two factor authentication is more widespread in Singapore than in Japan. Clearing one's browser history regularly is as common in Singapore as it is in Japan.

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35   The high share of Singaporeans employing two-factor authentication may be influenced by the fact that the majority of government e-services such as logging on to check an individual's income tax or their social security require the use of 2FA.

In Singapore specifically, people who consider protecting one's data is an individual responsibility are also more likely to hide their PIN numbers when using their cards and enable two-factor authentication, than those who see institutions like the government or companies as primarily responsible for data protection. However, there is no significant effect with regard to destroying personal hard-copy documents or clearing internet browser history. In Japan and Taiwan, however, attribution of responsibility for data protection did not have a significant effect on whether respondents engaged in any of the four data privacy behaviours. Thus, we cannot identify a consistent effect of the attribution of responsibility towards the individual and data protection habits.

In all three countries, the highly technologically confident people use two factor authentication more frequently than others. However, the findings also show that among the Japanese who are technologically more confident, the regular clearance of internet browser history is more common. There is no such significant effect in Taiwan and Singapore.[36]

In Taiwan and Japan nearly all data protection habits are more common among the higher educated.[37] In Singapore this applies only to hiding one's bank card PIN and the two factor authentication. In addition, while hiding the bank card PIN, enabling two factor authentication and clearing the internet browser history is more common among the younger Singaporeans, this does not apply to Taiwan and Japan.

The findings also show that there is no consistent association between valuing security and applying data protection habits.

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36 In Singapore and Japan people with higher technological confidence also shred/burn their personal documents more often and in Singapore and Taiwan they hide their bank card PIN more often. Technological confidence possibly makes people generally more aware of data protection problems.

37 For Taiwan the association between shredding/burning personal documents and education is insignificant whereas in Taiwan all other and in Japan all data protection habits are significantly associated with education.

Figure 29: Easy Log-In via Social Media Account

When you are offered the option to log-in via your social media account, for example Facebook or Google, do you use this option always, sometimes, or never?

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: don't know, no answer.

While the aforementioned data protection habits require specific action, not using the convenience of logging in via a social media account (e. g., Facebook or Google) is a non-action for data protection. People who avoid linking their social media account with their accounts on other platforms are a small minority (Figure 29). In contrast, more than half the respondents choose to do so sometimes or always – 78 percent in Singapore, 83 percent in Taiwan and 62 percent in Japan. Considering the low trust that respondents have in companies' adequate data handling practices, they seem to be either willing to choose the convenience of easy log-in options at the expense of data privacy, or are unaware that using this option gives technology companies even more access to their personal data.

Singaporeans who feel that they are technologically more confident tend to use this option even more often than those who are less confident. There is no significant finding in Japan and Taiwan.

In addition, in all three countries, younger people log in via their social media account more often than older ones.[38] Educational background or gender does not have a significant effect on this action. In Singapore, people who value security more tend to avoid logging in via a social media account, but in Taiwan and Japan there is no such pattern. As such, the findings suggest that while people are highly concerned with data privacy in general, and specifically companies' collection and use of their data, this concern does not translate into stricter data protection habits.

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38   This association is analysed only for people who stated they have a social media account.

9 Data Handling in Crisis: COVID-19 as a Case Study

At the time of this study, Singapore, Japan and Taiwan were in the midst of the COVID-19 pandemic, and governments were relying on technological solutions such as digital contact tracing to help contain the virus. However, the use of such technology required citizens to share their personal data. For instance, in Singapore, the Trace-Together app[39] required users to share their location data. And in Taiwan, access to citizens' medical data allowed the government to proactively identify patients with severe respiratory symptoms to test for COVID-19.

These measures raised questions about the collective value of personal data for public good – in this case, access to data is required in order for governments to mitigate the spread of the virus.

Three scenarios of data collection were evaluated by the survey respondents, which differ in the extent to which personal data is retrieved:

- In the context of coronavirus/COVID-19, governments may only ask individuals to provide information voluntarily

- It is legitimate for governments to automatically retrieve personal data

- Governments should have full access to data from private companies such as GPS location, mall surveillance, and banking transactions

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39   The TraceTogether app is a digital system by the government of Singapore to facilitate contact tracing efforts in response to the COVID-19 pandemic.

Figure 30: Covid-19 Data Provided Voluntarily to Government
For the following statements, please tell me whether you strongly disagree, somewhat disagree, somewhat agree or strongly agree.
- In the context of COVID-19, governments may only ask individuals to provide information voluntarily.
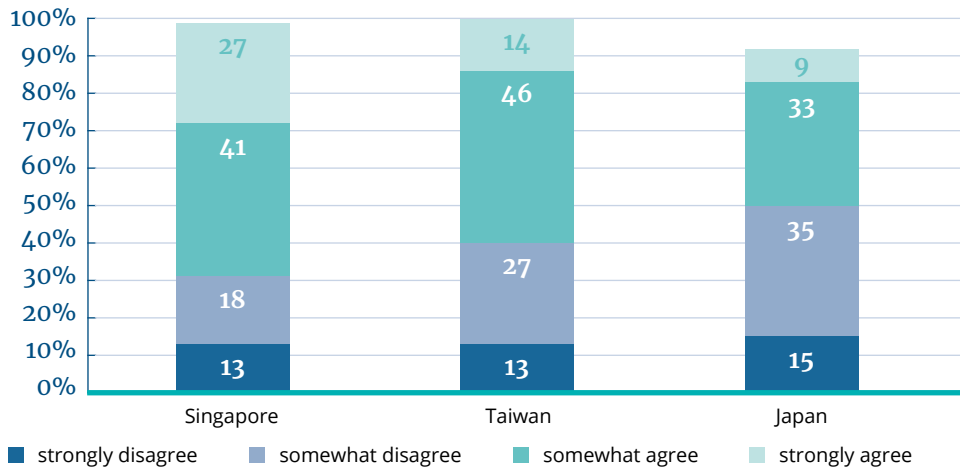

strongly disagree ■ somewhat disagree ■ somewhat agree ■ strongly agree

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: don't know, no answer.

Data provided voluntarily for use in the COVID-19 pandemic is a proposition supported by the majority of respondents in all three countries (Figure 30). The support is strongest in Singapore, with 76 percent of its citizens in agreement, followed by Taiwan at 61 percent and Japan at 58 percent.

Figure 31: Covid-19: Automatic Data Retrieval by Government
For the following statements, please tell me whether you strongly disagree, somewhat disagree, somewhat agree or strongly agree.
- In the context of COVID-19 it is legitimate for governments to automatically retrieve personal data.
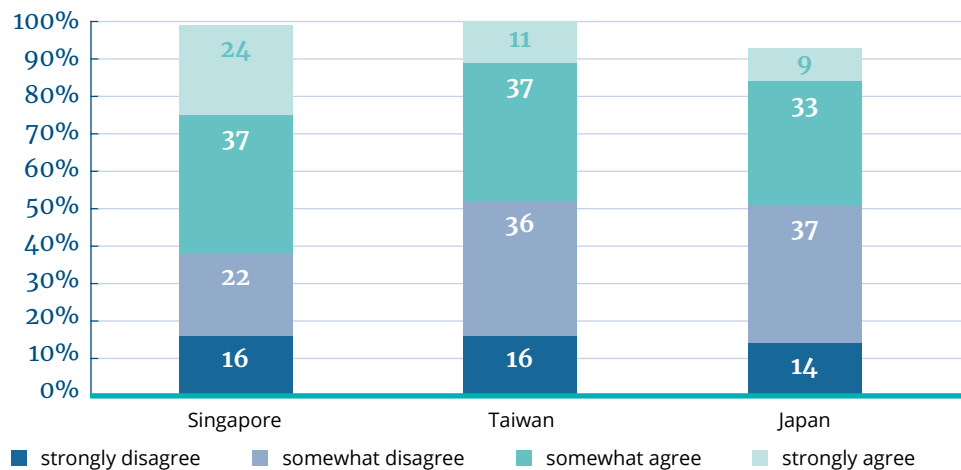

strongly disagree ■ somewhat disagree ■ somewhat agree ■ strongly agree

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: don't know, no answer.

Automatic retrieval of data by the government receives less support (Figure 31). Nevertheless, in Singapore, 68 percent supported this scenario, followed by 60 percent of Taiwanese. In contrast, less than half (43 percent) of the Japanese feel the same way. While the use of voluntarily provided data is strongly rejected only by a small fraction in all three countries (6 to 9 percent), the automatic retrieval of data is strongly rejected by a larger share (13 to 15 percent).

Figure 32: Covid-19: Extensive Data Access by Government
For the following statements, please tell me whether you strongly disagree, somewhat disagree, somewhat agree or strongly agree.
- In the context of COVID-19, governments should have full access to data from private companies, for example GPS location, mall surveillance, banking transactions, etc.

Source: Survey by Konrad-Adenauer-Stiftung e. V. Values in percent. 3,060 respondents, 1,020 per country. Missing to 100%: don't know, no answer.

The third scenario describes a more invasive approach to data collection, where all data from private companies becomes accessible to the government. This scenario is supported by a majority of Singaporeans (61 percent), but only 48 percent of Taiwanese (Figure 32). The level of support decreases further in Japan, with only 42 percent of people agreeing with the statement. Decisive rejection, however, is similar to the previous scenario with 14 to 16 percent in all three countries.

In the first scenario based on voluntary data provision, trust in the government is significantly associated with agreeing with the idea of the voluntary provision of data only in Taiwan. For the other two scenarios with more extended governmental data use, trust in the national government in all three countries increases among those who support the scenarios.

In special circumstances such as the COVID-19 pandemic, a considerable share of people were prepared to share their personal data with the government. However, even under such circumstances, some hesitation persists. While in Singapore the openness to data provision and the trust in the government leads to relatively wide support for the government to have access to their data, in Taiwan and more so in Japan, people are more reluctant.

10 Digital Innovation and Data Culture – Conclusion

Singapore, Taiwan and Japan are countries that rely on innovation to boost their economies, improve governance, and transform the everyday life of citizens. The bedrock of these innovations is data; specifically, data that is generated by individuals.

People have ideas about what data is, how they value data; they have conceptions about the use of data in society and habits in dealing with their personal data. In short: they form a data culture, described as the pattern of values, norms and interpretation patterns concerning the character and use of data in a population. For digital innovation, this data culture is a crucial factor. People's perceptions towards how data is collected, processed and used are critical in enabling or restricting innovation.

The aim of this study was to understand how people in Singapore, Taiwan and Japan think about data – its potential, and potential concerns – and how they navigate these issues in an increasingly digital world. These countries were selected as they are highly innovative and highly digitised in any global comparison: penetration of smartphones, computers and tablets is high, internet connection is available throughout the countries, and a wide array of digital tools is available.

Findings revealed that the three countries differ in two major ways. First, digitalisation has not permeated the countries to the same extent, with Singapore and Taiwan being ostensibly more digitalised than Japan, at least in terms of digital device penetration and the use of digital platforms and tools, which are higher in Singapore and Taiwan than in Japan.

Second, trust in institutions differs considerably between the three countries. The level of trust in political institutions and the media is highest in Singapore followed by Taiwan, and is the lowest in Japan. The comparative similarities and differences between Singapore, Taiwan and Japan form interesting insights.

On the public perception of innovation, results suggest that innovation is highly valued in all three countries. Respondents display positive perceptions on the necessity of technological innovation and tend to agree that innovation brings more benefits than harm. However, this perspective is more common in Singapore than in Taiwan, and more common in Taiwan than in Japan.

However, disclosing personal data, a crucial starting point for a lot of current innovations in the digital realm, is not overly favoured. People tend to be unwilling or very unwilling to disclose personal or financial data. This unwillingness is linked to the concerns people have about data misconduct, with a very large majority in each of the countries being somewhat or very concerned about data being used inappropriately by the government or private companies. In various instances, such as providing information for online shopping, respondents clearly indicated their unease at providing personal information as part of the e-shopping process.

Comparisons further suggest that Singaporeans and Taiwanese are more concerned about data misconduct than the Japanese. Considering the differences in digitalisation of everyday life and the differences in institutional trust, this pattern is notable: it is not the (relatively) less digitalised Japan where people are most concerned, but in the more digitalised countries, Singapore and Taiwan, where we find a higher level of public concern.

Differences in institutional trust are mirrored in the assessment of data privacy regulations. While a majority of Singaporeans consider incumbent regulations as somewhat or fully adequate, assessments in Taiwan and Japan are much less positive. This could be due to the different content of the regulations, but taking into account that there is limited knowledge of these regulations' specifics, assessments likely reflect a more general attitude towards the institutions that promulgate those regulations.

There is no broad consensus in any of the countries on who is responsible for data protection. In Singapore and Taiwan, respondents ascribe this responsibility to the individual, but many also think it is the responsibility of the government. In contrast, Japan reported a large proportion of respondents who also think that companies should safeguard users' personal data.

The reality of data handling by the government or companies appears somewhat different based on the beliefs of the people. While in Singapore many trust the government to deal with personal data adequately, in the other countries mistrust is much more widespread. Data handling by private companies is regarded with great suspicion in all the three countries, and this influences people's willingness to share their personal data.

Despite their distrust over how personal data is collected and used by the government and companies, respondents generally feel that they have no say over how much of their data is collected by these data controllers. Although findings suggest that many try to exert some sort of control over their data by cultivating data protection habits such as regularly cleaning their internet browser history or enabling two-factor authentication, a large proportion of respondents across the three countries would also choose the option to log in to various platforms via their social media accounts.

The significance of this last observation, in particular, is that despite being mistrustful of data controllers and practising some data protection habits, many would also trade data privacy for convenience (an easy log-in) – or are unaware that this option gives companies even more access to their personal data.

10.1 A Country-by-Country Spotlight

On the whole, digital innovation that is premised on the sharing and use of personal data is a challenging issue: Distrust is common in all three countries and people are concerned about sharing their personal data with data controllers, especially companies.

In Singapore, data culture is marked by high concern about data privacy and high trust in the government. While people do worry about the confidentiality of their personal data, they trust the government to regulate the digital field and to handle their data adequately. Mistrust is focused more on companies and their handling of personal data.

In Taiwan, worry about data handling by data controllers is also high, with a fair degree of concern about data handling by both companies and the government. While respondents employed both offline and online data protection habits, they also seemed resigned to data fatalism – and viewed problems about data as inevitable.

Japan is the least digitalised country among the three and a digital lifestyle seems still to be something regarded as extraordinary, adventurous and untraditional. Nevertheless, concerns about violations of data privacy are also widespread, especially as trust in institutions is low. At the same time, however, data protection habits are less common, perhaps because the use of online tools and platforms is also less pervasive than in Singapore and Taiwan.

Based on the findings, we detail the different environments for digital innovation in the three countries.

Digitalisation is rampant in Singapore. People live online and use new technology with confidence. Although they are concerned about breaches of confidentiality and distrust companies, there is a relatively deep trust in the government. This trust in the efficiency of governance likely compensates for the uneasiness linked to disclosing personal data online. The remaining concerns are considered as an individual problem although this does not result in additional online security measures beyond the normal and the externally required. Digital innovation of state services is premised on citizen trust in the government, while innovation by companies has to be sufficiently convenient and trustworthy for data suspicions to be addressed.

In Taiwan, digitalisation is also widespread and the use of digital solutions in everyday life is evident. At the same time, data provision in the context of online solutions is met with concerns. People worry about the use of their personal data. Companies, but also the government, are considered not overly trustworthy in their dealings with citizens' private data. Data protection is expected from the government but respondents perceive current regulations as inadequate. Digital innovation can tap into existing habitual use of digital solutions and therefore should find fertile ground. However,

companies are met with suspicion, and digital innovations and innovators have to overcome this suspicion by offering trustworthy services. The current situation of data fatalism is shaky ground which can prove highly problematic as soon as viable alternatives show up.

Compared to Singapore and Taiwan, findings suggest that Japan is more hesitant with digitalisation. Digital devices and tools have not permeated Japanese society as much as in Singapore and Taiwan. Rather, living digitally is seen as a non-traditional and non-normative approach. While general concerns about disclosing data also apply to Japan, the Japanese tend to be more prepared to pass on personal information online. Currently, online solutions are a way to depart from tradition while technological confidence is primarily found with the younger generation. Digital innovation in this regard has to contend with the relative lack of digital competence, and to overcome established habits. Concern over how personal data is collected and handled is also prevalent, though at a much lower level compared to the other countries, and there is a lack of trust in the government that citizen data would be protected and handled appropriately.

10.2 Conclusion

Overall, the findings suggest that no data culture seems to have reached a stable equilibrium which provides safe ground for digital innovation. In all three countries, concerns about disclosing personal data online are widespread and are only partly addressed. The popularity of digital practices seems not to reduce respondents' concerns about data privacy, but to increase their worries as individuals become more aware of the risks involved. Although digital innovation and development can still persist despite these concerns, the lack of trust that people in each of the three countries have in how companies and government adequately handle their data, remains unresolved.

To alleviate persistent feelings of unease with regard to data controllers – in particular large technology companies – and their data collection activities, innovation needs to take place in a corridor of adequate and enforceable regulation, by institutions that actively cultivate citizen trust. Comprehensive and sustained digital education that is commensurate with ongoing digital transformation might be another path towards a more digitally-informed populace, addressing more than technological specifics and know-how. This could engender more digitally-informed, critical and autonomous citizens of the digital age who are aware and cognisant of technologies and their pros/cons, and who can make more informed choices in an ever-digitalising world. Both elements, trust in data controllers and regulatory institutions on one hand, and digital competence on the other, are critical to digital innovation going forward.

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A.

The table below breaks down the soft quotas implemented for the study. We had quotas for age, gender and education across all three countries, as well as specific quotas such as ethnicity (for Singapore only) and region (for Japan and Taiwan only). The age and gender distribution for the survey matched the quotas set for the study.

Table 1: Quotas implemented

	Singapore (%)	Japan (%)	Taiwan (%)
Age			
18–29	20	15	33
30–29	18	14	18
40–49	18	17	17
50–59	18	15	16
60 and above	26	39	16
Gender			
Male	48	49	50
Female	52	51	50
Education			
No formal schooling	19	23	17
Primary education			
Secondary education	27	44	46
Post-secondary non-tertiary education			12
Short-cycle tertiary education	27	14	–
Bachelor or equivalent	27	19	25
Master/PhD or equivalent			
Ethnicity			
Chinese	76	–	–
Malay	12	–	–
Indian	12	–	–

	Singapore (%)	Japan (%)	Taiwan (%)
Region (Japan)			
Chubu	–	17	–
Kanto	–	34	–
Kinki/Kansai	–	18	–
Kyushu/Okinawa	–	11	–
Chugoku	–	6	–
Tohoku	–	6	–
Hokkaido	–	8	–
Shikoku	–		–
Region (Taiwan)			
Northern region	–	–	46
Central region	–	–	24
Southern region	–	–	27
Eastern region	–	–	3
Kinma area	–	–	

B.

These are the four values that are most likely to have a direct link to data culture. For each description, respondents were asked to indicate whether that person is very much like you/like you/somewhat like you/a little like you/not like you/not at all like you.

- Self-Direction (Creativity): It is important to this person to think up new ideas and be creative, to do things one's own way.

- Stimulation (Adventure): Adventure and taking risks are important to this person, to have an exciting life.

- Security: Living in secure surroundings is important to this person, to avoid anything that might be dangerous.

- Tradition: Tradition is important to this person; to follow the customs handed down by one's religion or family.

People differ in the extent to which they use the breadth of the scale to rate values. While some use the extremes, others use only the middle range of the scale. To understand the relative relevance of values, the answers on all ten value questions of the Schwartz scale by one respondent have been z-transformed (subtraction of the mean and division by the standard deviation).[40] Thereby the measures indicate the personal relative relevance of the value in comparison to all other values.[41]

To measure their level of trust in institutions in their country, respondents were asked to indicate if they trust them very much, somewhat, a little or not at all.

- The media

- The political parties

- The public administration

- The government

- The parliament

---

40 For respondents who rate all value questions equally, a z-transformation is not defined because the standard deviation is 0. These cases have been set to 0. Schwartz himself suggests for data from the European Social Survey the centering, but not the standardisation (https://www.europeansocialsurvey.org/docs/methodology/ESS_computing_human_values_scale.pdf).

41 The other values of the Schwartz scale, not analysed in this report, are conformity, benevolence, universalism, hedonism, achievement and power.

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Digital innovation is as much about technology and data, governments and enterprises, as it is about the people – their trust in digital technologies, the government, companies, and how they perceive their own competence in navigating the digital age. This report details findings from a representative survey of three countries – Singapore, Taiwan and Japan – of perceptions on various issues pertaining to data and digitalisation.

How widespread is the use of digital devices and online platforms? How worried are people about the confidentiality of their data? Are people aware of data protection regulations and do they protect their data themselves? The study analyses these and further questions and relates them to general values and trust in relevant institutions. It sketches out the data culture in the three countries and its potential impact on innovation in the field of digitilisation. In terms of breadth and methodological rigour, this country comparison is the first in the field of data culture.

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