



Valdani Vicari & Associati
ECONOMICS & POLICY



Study for the introduction of an e-labelling scheme in Europe

Research into e-labelling schemes outside the EU

June 2018

DIGITALEUROPE 

MWF
**Mobile & Wireless
Forum**

EXECUTIVE SUMMARY

This document is the final report of the exploratory study “Research into e-labelling schemes outside the EU”, commissioned by DigitalEurope and the Mobile & Wireless Forum. This study was conducted by Valdani Vicari & Associati (VVA).

The report presents evidence on the characteristics, benefits and impacts of e-labelling schemes for ICT products in a selection of non-EU countries (Australia, Singapore & US) that have introduced e-labelling. Each case study is based on a combination of desk research and interviews with market surveillance authorities, trade associations and companies in the consumer electronics sector.

The consumer electronics market encompasses a wide range of goods, including audio and video products, smartphones and printers, which can be used for entertainment, communication purposes or home-office activities.¹

From an economic perspective, the three largest product categories are:

- *Telephony*², which comprises fixed phones and mobile phones including smartphones;
- *Computing*³, including PCs, laptops, tablets and ancillary equipment such as printers or keyboards; and
- *TV/radio/multimedia*⁴, such as TVs, radios, cameras, speakers, headphones, etc.

Together they represent 60% of the product categories in the consumer electronic market.⁵

In terms of economic contributions, **telephony accounts for 43.7% of total European revenues in the three segments** (2016 data). In particular, mobile phones hold the “*lion’s share*” with EUR 69 billion⁶ in revenues across Europe, out of a total of EUR 71 billion⁷ in the entire telephony segment.

¹ Consumer electronics figures in this section do not include electronic household appliances such as washing-machines or refrigerators.

² According to the Statista market definition the telephony market covers landline and mobile, smart telephones. See: <https://www.statista.com/outlook/15020000/102/telecommunication/europe>

³ According to Statista “The Computing segment includes units for processing information (laptops, tablets, etc.) as well as additional equipment that is usually paired with them (printers, keyboards, etc.)”. See: <https://www.statista.com/outlook/15030000/102/computing/europe>

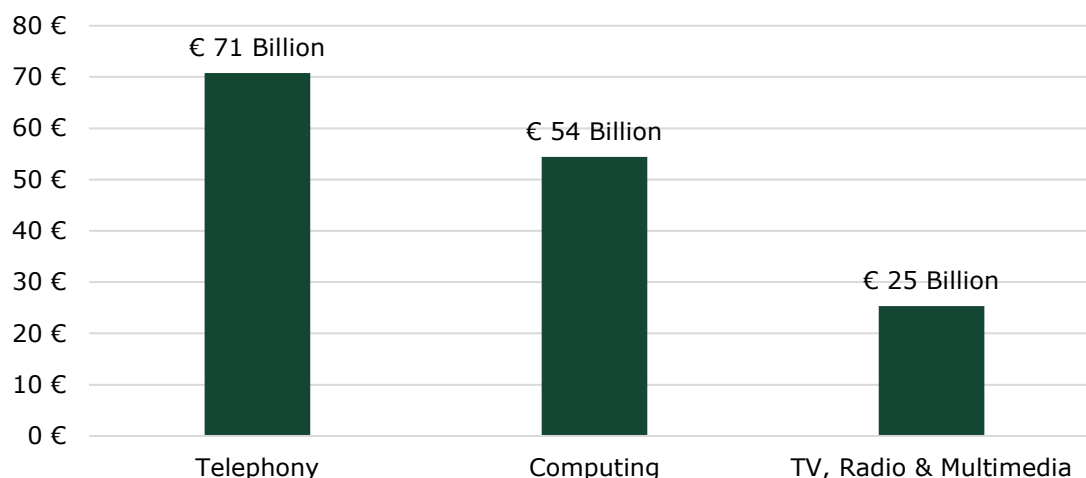
⁴ According to Statista “The TV, Radio and Multimedia segment focuses on equipment designed to be used primarily for entertainment. It includes an array of classic household items, such as television and radio broadcast receivers, as well as their wider definition, including sound systems and loudspeakers”. See: <https://www.statista.com/outlook/15010000/102/tv-radio-and-multimedia/europe>

⁵ estimation based on data from Statista and Eurostat (Prodcom). Note: consumer electronics figures in this section do not include electronic household appliances such as washing-machines or refrigerators.

⁶ US\$ 82.1 billion, Statista, 2017 - <https://www.statista.com/outlook/15020000/102/telephony/europe#>

⁷ Statista, 2017. “Telephony, Europe”. Available at: <https://www.statista.com/study/49837/consumer-electronics-report-telephony/> - US\$ 82.1 billion converted with an exchange rate of US\$ 1= EUR 0,863223 according to the XE website the 19/06/2018.

Figure 1: Economic importance of different segments of the European consumer electronics market (revenues in EUR billion by segment, 2016)



Source: Statista⁸

Like other goods⁹, consumer electronics products must comply with a set of European Directives in order to be placed on the European Union's Internal Market. The key EU Directives that apply to the sector include:

- Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment;
- Directive 2009/125/EC on the Eco-design requirements for energy-related products;
- Directive 2014/35/EU related to Electrical equipment designed for use within certain voltage limits;
- Directive 2014/30/EU on Electromagnetic compatibility;
- Directive 2014/53/EU on Radio equipment;
- Directive 2010/30/EU on Energy labelling;
- Directive 2001/95/EC on General Product Safety.

Each product within the scope of these regulations is marked with a label to indicate compliance with Internal Market rules.

The *Blue Guide on the implementation of EU products rules 2016*¹⁰ lists the types of information that product labels must provide. Manufacturers must ensure their products comply with applicable legislation and, in order to ease the

⁸ Statista, 2017. "Segment shares in total market revenue of the consumer electronics market in Europe in 2016". Available at: <https://www.statista.com/forecasts/759193/segment-shares-in-total-market-revenue-of-the-consumer-electronics-market-in-europe>

⁹ For an overview, see: https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards_en

¹⁰ The 'Blue Guide' on the implementation of EU products rules 2016, available at: http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=7326

traceability of products, labels should provide (among others) the following information:

- Identification of the manufacturer;
- Elements of identification of the product;
- Marks showing compliance with applicable legislation;
- Information about the components of the product.

In Europe, this information is currently provided through the following documentation:

- **The technical product documentation:** Union harmonisation legislation obliges the manufacturer to draw up technical documentation containing information to demonstrate the conformity of the product with the applicable requirements.
- **CE Marking** must be affixed on products and must be visible, legible and indelible. CE marking is a self-certification which proves that a product has been assessed and meets the essential requirements of the applicable Directives.
- **The EU Declaration of Conformity:** The manufacturer or the authorised representative established within the Union must also draw up and sign an EU Declaration of Conformity as part of the conformity assessment procedure provided for in Union harmonisation legislation.
- **Manufacturers have to meet traceability requirements** by indicating their name, registered trade name or registered trade mark and the address where they can be contacted. This information must be displayed on the product, on its packaging or in a document which accompanies the product.

While product labels remain mostly physical in Europe, a growing number of advanced economies have now introduced the possibility for companies to indicate regulatory compliance through electronic labelling.

This study puts forward concrete recommendations on how e-labelling can contribute to a healthy business environment in Europe. The report sets out the lessons learnt in the three case study countries and it defines best practices for a potential e-labelling system in Europe.

KEY FINDINGS

1. **The introduction of e-labelling in the case study countries responds to technological developments.**

- As ICT products are becoming smaller in size, it is becoming ever harder for manufacturers to find space on the device to apply the required physical labels.
- The political debate on e-labelling in all three case study countries started when smartphones were introduced in these markets. Growing smartphone ownership means more people have the ability to easily access information about their products electronically, whether this is on their device or via a link.

- In response, national regulators in the countries reviewed aimed to support companies in the design and manufacturing of their products by allowing them to electronically display conformity marking on a screen rather than placing it on the product.
2. **E-labelling now covers the majority of consumer electronics products in the case study countries**, with large companies being the lead adopters. Indeed, e-labels are used in an estimated:
 - 78%-90% of smartphones sold in Australia, Singapore and the US;
 - 82%-86% of PCs sold in Australia and the US;
 - 81% of tablets sold in 2016 in Australia.
 3. **Industry and public authorities in the case study countries agree that there are significant practical benefits linked to e-labelling.** These benefits can be grouped into three broad categories:
 - Direct cost-savings for industry;
 - Indirect market benefits, such as greater trade and combating counterfeits;
 - Better information for end-users and more informed purchasing decisions.
 4. **The e-label has enabled cost-savings for industry in product design, manufacturing and in updating compliance information.**
 - Because e-labelling is an alternative to physical labels, its introduction did not create any additional administrative burdens for the industry.
 5. **E-labelling does not have any adverse impacts on other types of stakeholders including market surveillance authorities, customs agencies and consumers in the three countries under analysis.**
 - The Congressional Budget Office (based in the US) estimates that implementing the E-Label Act has a negligible effect on net discretionary costs for the Federal Communications Commission (FCC).
 - According to the Australian regulator, e-labelling has had no effect on the market surveillance process itself. The presence of a label on the device does not mean the device is compliant; it is the compliance documentation (test reports, Declarations of Conformity, CB statements etc.) that demonstrates compliance.
 - To minimise any potential negative impact on customs agencies or consumers, US legislation requires a peel-away label on products. On the other hand, Australian and Singaporean authorities require that the equipment packaging contains information on where to locate the electronic compliance label for verification.

LESSONS LEARNED AND RECOMMENDATIONS

This study shows that **the introduction of e-labelling in Europe would respond to technological developments and create significant benefits and cost savings** for industry without leading to adverse effects for other stakeholders. VVA's Cost Benefit Analysis¹¹ estimates that the costs of indicating compliance for the consumer electronics industry are significant at € 797,13 million per year in Europe. E-labelling would reduce these costs by approximately 15%.

To fully exploit the positive potential of e-labelling, the Australian, Singaporean and US experiences indicate that the following good practices should be taken into accounts:

- **Specify scope and requirements for products:** the three countries started by allowing e-labelling on devices with an inbuilt screen and by setting minimum requirements to avoid overly prescriptive settings. Manufacturers are at liberty to provide additional information as part of their customer and after-sales service strategies.
- **Leave flexibility for manufacturers to choose:** the three countries allow manufacturers to use e-labels as a substitute for physical labels to convey compliance and other regulatory information. At the same time, none of the three countries adopted a mandatory approach, and manufacturers can continue to employ physical labelling techniques consistent with existing rules and guidance.
- **Operate a transparent and participatory rule-making process:** in setting requirements, it is important that the process is transparent and participatory, involving all relevant stakeholders, and including a number of opportunities for feedback and engagement. A seemingly small mandatory requirement may have significant cost and design implications for manufacturers. Manufacturers also need time to assess the impact of regulatory changes and regulators should listen to stakeholder concerns about the impact of different technical features of the policy.
- **Security, access and storage:** the three countries set simple but common-sense responsibilities regarding security, access and storage of e-labels:
 1. Manufacturers are responsible for ensuring that the e-label works;
 2. E-label information must be easily accessible and the relevant e-label information is programmed so that it cannot be easily modified or removed by a third party;
 3. Manufacturers must ensure that compliance information remains available throughout the life of the product, including for a period of time after the product has been discontinued.
- **Promote a global approach: to facilitate trade by eliminating duplication,** national regulators should support the global adoption and acceptance of common standards.

¹¹ VVA (2018) "Study for the introduction of an e-labelling scheme in Europe – Cost-Benefit Analysis".

Valdani Vicari & Associati



The VVA Group was established in 1992 by a team of professors from Bocconi University. Over 20 years it has developed into a full-service consultancy with offices in Milan and Brussels. Our in-house team of about 100 consultants, academics, economists and researchers specialises in providing high quality advisory services to public and private sector clients in the following areas:

- Economics and policy
- Market research
- Business Consulting
- Digitisation, digital marketing
- Artificial intelligence solutions

VVA Economics and Policy, the European public policy company of VVA, specialises in advising EU level stakeholders on the policy implications of digital technology and the socio-economic impacts of regulatory interventions in the digital economy. We have extensive expertise working with the European Commission on issues surrounding digital content, online platforms, spectrum, electronic communications, broadband, market access, market surveillance & enforcement and many more.

Within the VVA Group, apart from our Economics & Policy practice, we also have an in-house digital marketing team which specialises in online social media marketing using a proprietary platform (Rankit: www.rankit.it); a team working on artificial intelligence solutions for private sector clients (ndg.ai) and a team working on tax issues across a wide variety of sectors including digital technology.

Finally, beyond VVA, we have developed a wide ranging network of partners whom we can draw on in our advisory work: we are a member of the European Business and Innovation Centre Network (www.ebn.be), of the European Network for Social and Economic research (www.ensr.eu) and of the Big Data Value association (www.bdva.eu) which provides us immediate access to consultancy partners in all EU countries and globally.

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1 Structure of this report

This draft final report presents the results of our research into e-labelling schemes outside the EU. The document is structured as follows:

- **Chapter 2** highlights the main rationale behind the case studies, the aims and objectives, along with the methodology;
- **Chapter 3** provides a cross-analysis of the three case studies conducted for this study, with an emphasis on the relevance, effectiveness and efficiency of the different e-labelling schemes;
- **Chapter 4** presents conclusions and lessons learnt from the case studies for the potential adoption of an e-labelling scheme in the European Union.

The subsequent chapters present the analysed cases studies:

- **Chapter 5:** USA;
- **Chapter 6:** Australia;
- **Chapter 7:** Singapore;

The **annexes** contain:

- **Annex 1:** Literature;
- **Annex 2:** List of interviewees.

2 Introduction

2.1 Study objectives

The overall objective of this *exploratory study* is to provide illustrative examples of:

- The political debate on e-labelling for ICT products;
- Evidence of the characteristics, the benefits and impacts of e-labelling schemes for ICT products in a selection of non-EU countries;
- Lessons learnt and best practices.

All case studies have been analysed taking into account:

- *Relevance*: relationship between the needs and problems in society/industry and the *design* of the e-labelling scheme;
- *Effectiveness*: relationship between the objectives and results obtained through the *implementation* of the e-labelling scheme;
- *Efficiency*: relationship between inputs into the scheme (e.g. its costs in terms of time, operational and financial resources) and outputs/results obtained (e.g. its benefits);

As set out in the terms of reference for the study, every case study addresses, among others, the following questions:

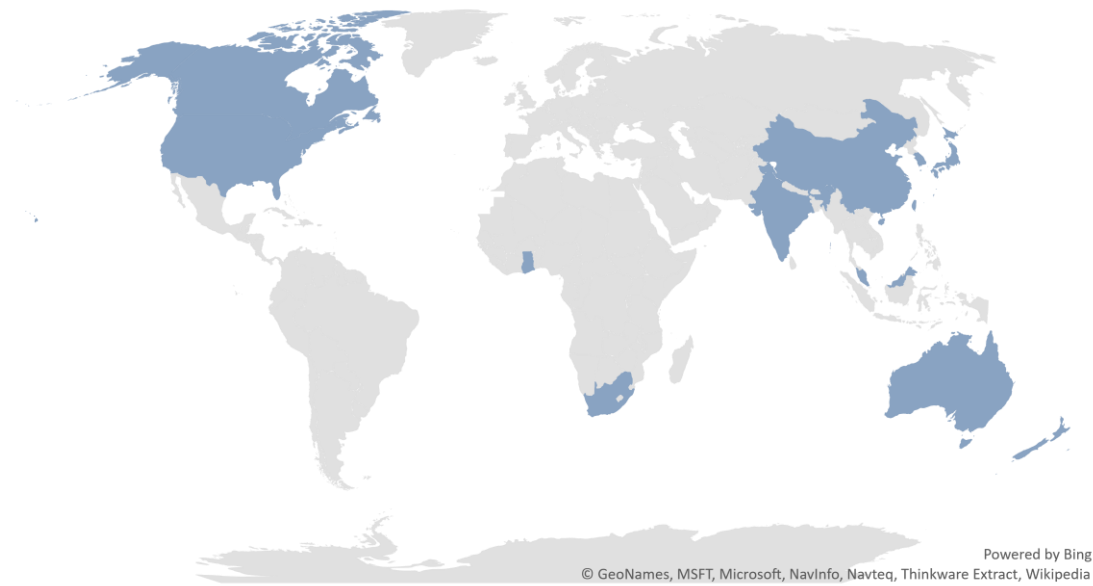
1. When, why, how was e-labelling introduced?
2. What are the benefits of e-labelling in terms of:
 - a. efficiency increase in market surveillance;
 - b. reducing counterfeits by easing detection; and
3. Has e-labelling led to disadvantages for market surveillance authorities compared to traditional labelling?

2.2 Methodological approach

The aim of this *exploratory study* is to gather evidence on the characteristics, the benefits and impacts of e-labelling schemes for ICT products in a selection of non-EU countries, with the objective to put forward concrete recommendations on how e-labelling can contribute to creating a healthy business environment.

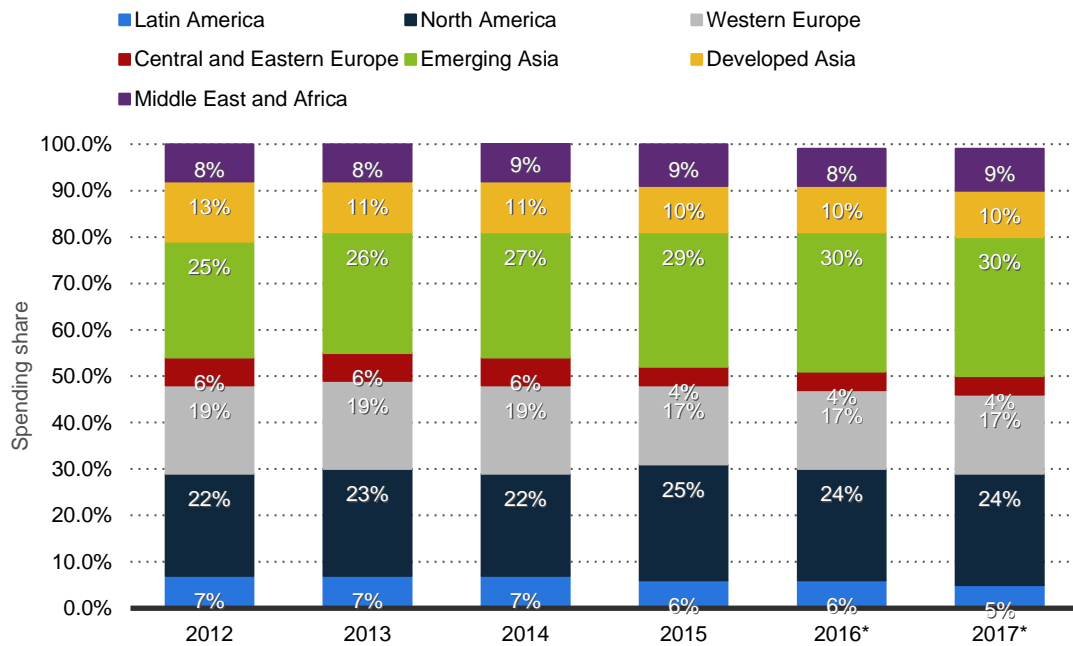
To date, **e-labelling has been introduced in thirteen countries**: Australia (2010), Canada (2014), China (2015), Ghana (2015), India (2017), Japan (2010), Malaysia (2015), New Zealand (2013), Singapore (2012), South Africa (2013), South Korea (2015), Taiwan (2017) and US (2014), **which cover the 45.7% of the global population**.

Figure 2: Geographic coverage of countries allowing e-labelling



North America, Developed Asia and Emerging Asia countries represent 64% of total global consumer technology spending in 2017 (Figure 3), with **USA, China and Japan representing the 48.8% of the global market share** of the information and communication technology (ICT) market in 2017 (Statista, 2017).

Figure 3: Global consumer technology spending share by region from 2012 to 2017



Source: Statista

The European Union on its own is responsible for 19.9% of global market share of the information and communication technology (ICT) market in 2017¹² and for 21.2% of global imports of ICT goods.¹³

Despite a widespread in the major global ICT markets, the e-labelling schemes vary considerably, and some countries impose much more stringent requirements than others. For instance:

- Since 2001, the **USA** has allowed manufacturers of software-defined radios to voluntarily use e-labels¹⁴. If the transmitter uses a display the label must be visible on it or on the device in which it is stored. In 2014, the US allowed e-label¹⁵ for devices with a screen and for those used in a host device with an integrated display¹⁶. Information should be accessible to users in no more than three steps in the device's menu.
- **Australia** has allowed e-labelling since 2010¹⁷. The use of electronic labelling is voluntary and only possible on a product with a built-in display.¹⁸
- **Canada** has allowed e-labelling since 2014 on all devices with an integrated screen. Items without a built-in display can present the information through an audio message or a host device screen if the connection to a device with a display is needed for use¹⁹. The Canadian government requires manufacturers to provide information on how to access the e-label. Besides, users should have access to the information in less than three steps in the device's menu.²⁰
- **China** has allowed electronic labelling since 2015 on telecommunications equipment on which displays cannot be removed.²¹ Users should be able to access such label without additional permissions (such as an access code).

¹²The differences with Figure 3 are due to the inclusion of non-EU Member States in the calculation. <https://www.statista.com/statistics/263801/global-market-share-held-by-selected-countries-in-the-ict-market/>

¹³ <http://unctad.org/en/Pages/PressRelease.aspx?OriginalVersionID=397>

¹⁴ ITIF, 2017, "how e-labels can support trade and innovation in ICT", available at: <http://www2.itif.org/2017-e-label-support-ict.pdf>

¹⁵ Enhance Labelling, Accessing, and branding of Electronic Licenses Act (E)-label act.

¹⁶ See the US Federal Communication Commission Office guidance on electronic labelling (2014), available at:

<https://webcache.googleusercontent.com/search?q=cache:13FzQnfw5uoJ:https://apps.fcc.gov/eas/comments/GetPublishedDocument.html%3Fid%3D369%26tn%3D716718+&cd=1&hl=it&ct=clnk&gl=be>

¹⁷ The Australian Telecommunications (Labelling Notice for Customer Equipment and Customer Cabling) Instrument, 2015.

¹⁸ The Australian Communication and Market Authority, 2016, "product labelling", available at: <https://www.acma.gov.au/Industry/Suppliers/Product-supply-and-compliance/Steps-to-compliance/product-labelling>

¹⁹ Government of Canada, 2016, « Notice 2014-DRS1003 », available at: <https://www.ic.gc.ca/eic/site/ceb-bhst.nsf/eng/tt00099.html>

²⁰ ITIF, 2017, "how e-labels can support trade and innovation in ICT", available at: <http://www2.itif.org/2017-e-label-support-ict.pdf>

²¹ Rheintech Laboratories, 2015, «China-electronic labelling now permitted», available at: <http://www.rheintech.com/china-electronic-labeling-now-permitted>

- **Japan** has allowed e-labels since 2010 for devices with an in-built screen. Information should be provided to the user on how to display such an e-label.²²
- **Singapore** has allowed e-labels since 2012 for devices with an integrated screen. Manufacturers must provide information in the packaging about where to find the electronic label.²³

Based on the above insights and to reflect the diversity of schemes available and their potential relevance to the European context, the following cases were analysed in this study:

Table 1: Geographical scope of the case studies

Country/Agency	E-label scheme	Reference	Link to guidelines
US FCC	The FCC ID and/or the Declaration of Conformity (DoC) logo (if applicable)	KDB 784748 D02 – E-Label Act	https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?switch=P&id=27980
Australia ACMA	RCM Mark, A-Tick and C-Tick	ACMA Information on Labelling March 2014	https://www.acma.gov.au/theACMA/labelling---radiocommunications-products
Singapore IDA	Compliance Label	IDA labelling Rules 4April 2012	https://www.imda.gov.sg/infocomm-and-media-news/buzz-central/2012/4/ida-revises-telecomrelated-requirements

The data collection process combined primary and secondary research, starting with desk research and in-depth interviews. Each case study is based on engagement with the following types of stakeholders:

- A representative of a national digital **trade association**: the trade associations in Australia, Singapore and USA represented the first contact points and they provided a “*helicopter view*” of the wide range of impacts generated by the introduction of e-labelling in their country;
- A representative of the national **market surveillance authority**: the market surveillance authorities provided additional details on how the adoption of their national the e-labelling scheme has changed processes and routines in relation to surveillance and enforcement and what the impact has been;
- A national **e-labelling scheme expert**. These experts are either a consumer association, an academic with a focus on e-labelling or another type of expert. The national e-labelling experts provided insights about the relevance and the effectiveness of the scheme and highlighted strengths and weaknesses.

²² Telecommunication systems division of the Japanese Ministry of Internal Affairs and Communications, 2013, “overview of certification system for terminal equipment in Japan”. Available at: <http://www.tele.soumu.go.jp/resource/j/equ/mra/pdf/24/e-06.pdf>

²³ Infocomm media development authority of the Singapore Government, 2017, “IDA revises telecom-related requirements”, available at: <https://www.imda.gov.sg/infocomm-and-media-news/buzz-central/2012/4/ida-revises-telecomrelated-requirements>

Different interview questionnaires were developed for different stakeholders to reflect the areas where they could best contribute to the study. The final list of interviewees is available in Annex 1.

2.3 The rationale behind product labelling and the e-label

Definition of product labelling

By labelling or a labelling program, we mean any policy instrument of a government or other third party that regulates the presentation of product-specific information (Teils & Roe, 1998). This information might describe use characteristics of the product, such as regulatory compliance or non-use characteristics, such as the environmental impact or moral/ethical elements surrounding the product's manufacturing process.

Labelling policy can differ along three major continua (Teils & Roe, 1998):

1. *Compulsoriness*: i.e. the degree to which firms are required to provide product information. At one extreme, labelling restrictions are mandatory: certain pieces of information are required to be displayed on the product. At the other extreme, labelling restrictions are voluntary: firms chose what information, if any, will be displayed. Most third-party certification programs fall into the voluntary category;
2. *Explicitness*: i.e. the degree of information detail presented to consumers/regulators/customs;
3. *Standardization*: i.e. the degree to which the regulation requires the information to be provided in a presentation format that is standardized and uniform across products. At one extreme, a labelling policy can make presentation format requirements quite explicit, where the firm has no discretion over the presentation.

Economic rationale for product labelling

Every product that is placed on the market anywhere in the world must comply with certain requirements, such as safety, health, or environmental regulations. At the factory gate, manufacturers are the only market participant to hold comprehensive and accurate information on whether and how their products comply with these rules.

Labelling policies improve market efficiency by overcoming information barriers among market participants. By making available compliance information that is initially held only by manufacturers, the product label removes *information asymmetries* or *search costs* for consumers, regulators, or customs authorities (Teils & Roe, 1998). Specifically, product labels may show information about the components of a product, its performance criteria and compliance marks.²⁴

²⁴ In Europe, the main label is the CE marking which signifies that a product meets the required health, safety, and environmental standards to be traded in the Single Market.

Traditionally, labels are printed on paper or presented physically on the product as shown in Figure 2.

Figure 4: Traditional labelling for a computer power supply



Source: ITIF, 2017

Problems with traditional labelling and rationale for e-labels

Over the years, several stakeholders (i.e. manufacturers, industry associations, research institutes²⁵) have argued that such traditional labels are not appropriate for regulatory, technological, environmental or economic reasons. Indeed, they may:

- duplicate marks and confuse consumers or make labels difficult to read,
- be difficult to apply to smaller products,
- generate an environmental cost,
- constitute a barrier to market entry or to innovation.

As a result of such concerns, a number of jurisdictions (see Figure 1) introduced an **e-label** to provide the same information on products and regulatory compliance than a paper/physical label, but to do so electronically.

The information on an e-label can be communicated in three ways:

- Via the **screen** of the product which displays information on the product.
- Via a link to a **website** where the user can find relevant information.
- Via a **scanning device** -such as a smartphone- which scans a barcode or a Quick Response code and returns labelling information or points to a website where such information can be retrieved.

Figure 5 summarizes the different processes for reading an e-label.

²⁵ For instance Dell with its position paper on electronic labelling available at: http://mddb.apec.org/Documents/2017/SCSC/WKSP2/17_scsc_wksp2_010.pdf. Or, the position of the American Association of Electrical Equipment and Medical Imaging Manufacturers on e-labelling benefits, available at: http://mddb.apec.org/Documents/2017/SCSC/WKSP2/17_scsc_wksp2_010.pdf. See also the ITIF position paper on e-labelling mentioned above.

Figure 5: How to read an e-label

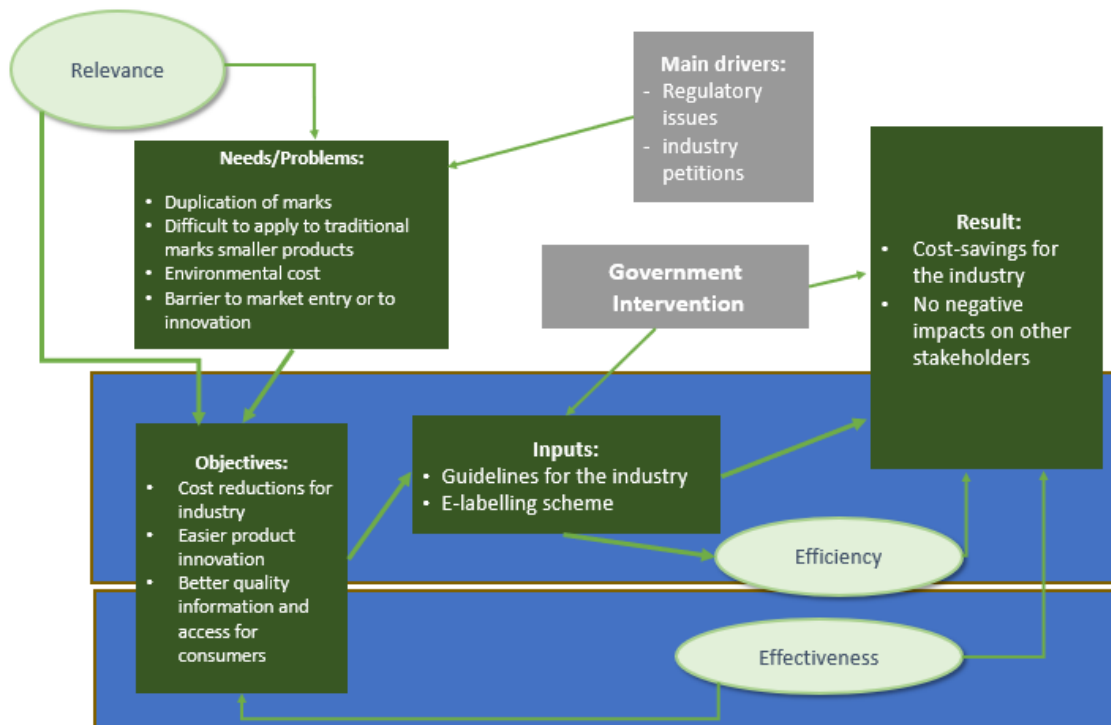


Source: ITIF 2017.26

According to the proponents of e-labelling, such a way to convey information can provide benefits to manufacturers, consumers and authorities alike.

The abovementioned points have been summarized in the following intervention logic:

Figure 6: Intervention logic



²⁶ ITIF, 2017, *E-labelling and the ICT sector: an overview*. Available at: <https://itif.org/publications/2017/08/18/e-labelling-and-ict-sector-overview>

The remainder of this report presents the practical experience with e-labelling in three jurisdictions that have introduced different versions of such schemes. These practical experiences are then drawn together to formulate concrete conclusions and lessons to be learned for a potential introduction of e-labelling in the European Union.

3 Cross-analysis of case studies: main results and findings

This chapter presents an analysis of each of the three case studies conducted for this study. The case studies covered e-labelling schemes in

- USA
- Australia
- Singapore

The full case study reports are in Chapters 5-8.

3.1 Rationale, scope and key features of the e-labelling schemes

A *red thread* running through the experiences of all three case studies (Australia, Singapore and the US) is that the introduction of e-labelling was made possible, in part, by national governments that demonstrated **high levels of digital awareness** and were generally “open” to potential industry solutions. Indeed, according to the United Nations’ worldwide e-government rank²⁷, Australia, Singapore and the USA have always been “*top countries*” in e-government since the beginning of 2000s.

As mentioned in the previous section, the use of e-labelling for ICT products has been allowed in Australia, Singapore and US and since 2010, 2012 and 2014 respectively.²⁸ In all three cases, government action to allow e-labels followed **petitions filed by national trade associations** asking the respective national regulators to permit the use of electronic labels for all radio frequency devices.

In setting the regulatory requirements, the Australian and US regulators adopted a **participatory approach**, involving all relevant stakeholders and several rounds of consultations for feedback and engagement, with the objective to design a “*win-win*” solution for the industry and for other stakeholders who would be indirectly impacted by the measure (i.e. market surveillance authority, customs agencies and consumers). At the same time, in Singapore, the approach was more government-lead, with the regulatory agency setting the agenda and the requirements and leaving industry the possibility to comment.

Although the regulatory approach in designing the scheme was different in each case, the outcome presents several common elements:

1. E-labelling is authorized only for “**electronic equipment that could create electromagnetic interference with an inbuilt screen**”. Only the USA has extended the use of the e-label to two other categories of devices, namely: 1) devices without integrated display that can only operate in conjunction with a device that has an electronic display, 2) modular transmitters where the host has a display;

²⁷ The rankings of the top nations are based on their relative Electronic Government Development Index scores, which reflects measures of electronic engagement with the public (UN). Full description available at:

<http://www.unpan.org/Library/MajorPublications/UNEGovernmentSurvey/PublicEGovernanceSurveyintheNews/tabid/651/mctl/ArticleView/ModuleId/1555/articleId/51150/Default.aspx>

²⁸ Said that, the US regulator (FCC) allowed the voluntary use of e-label on software-defined radios (SDRs) already in 2001. In fact, these micro devices lack physical space to get the FCC’s surface label affixed.

2. The e-label has been designed as an **optional approach** for physical labels. Companies can still use the physical label, if they wish to do so;
3. **Access to regulatory information** must be straightforward, an end user installed pin or password should not apply;
4. The three countries set **only minimum requirements** about compliance information, manufacturers can provide additional information if they wish to do so;
5. In terms of security, accessibility and storage, **manufacturers bear the full responsibility** for managing and hosting e-labelling information.

In addition to the abovementioned points, the *Federal Communication Commission* (i.e. US regulator) imposes more stringent rules. In fact, manufacturers are required to:

- Grant access to the e-label in *less-than-3-steps* from device setup menu;
- Place regulatory information either on the product packaging or on a temporary physical label placed on the device at the time of importation, marketing, and sales.

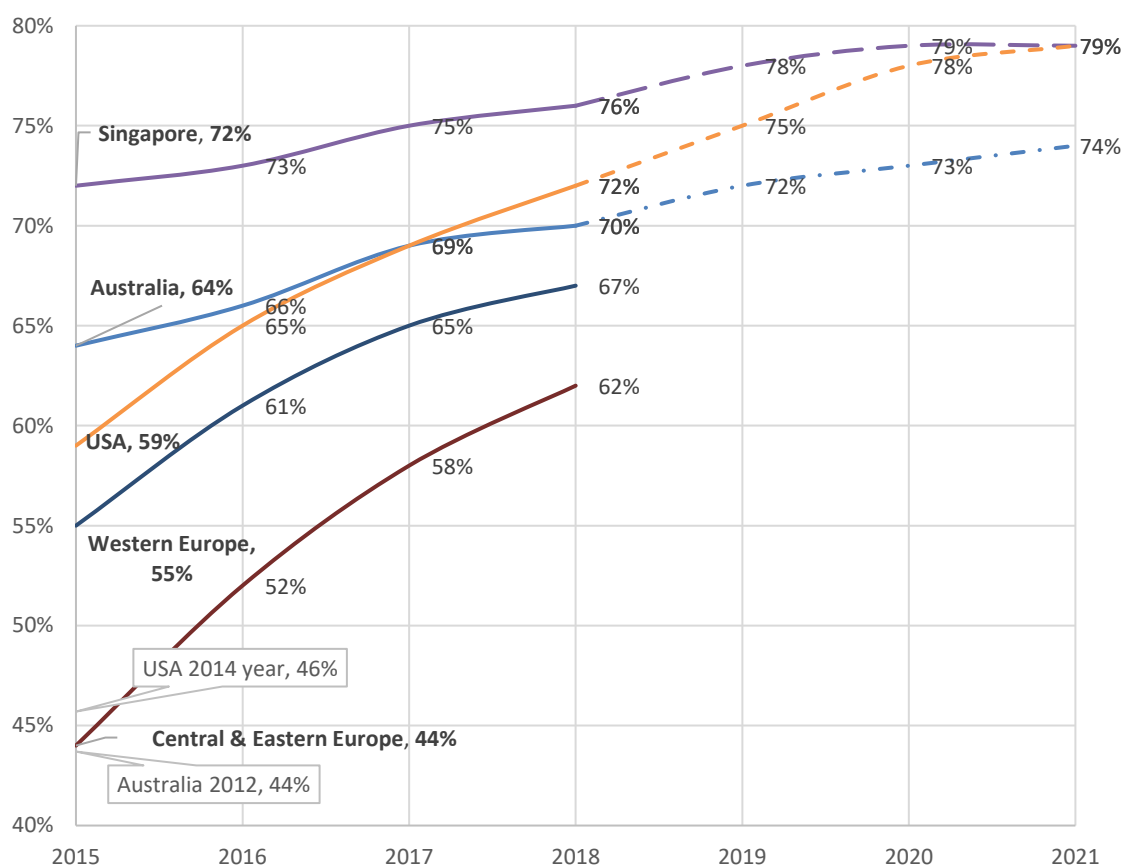
By imposing these additional requirements, the intent of the US regulator was to minimize the burden for consumers and customs officers, especially in the event that the devices cannot be switched on (for whatever reason).

In contrast, in Australia and Singapore, responsibility for the functioning of the device (and the functioning of the e-label) is shifted to manufacturers who must specify in paper instructions how to access the regulatory information.

3.2 Relevance

The case study research has shown that the political debates on e-labelling in all three countries started at the same time as smartphones began to be introduced in these markets. Indeed, from a product compliance perspective, **growing smartphone ownership** means that consumers (and regulators) can easily access information about products electronically (ITIF, 2017).

Figure 7: Smartphone penetration rate as share of the population in Australia, Singapore, USA from 2015 to 2021 and Europe from 2015 to 2018



Source: Statista, 2018

In addition, the global evolution of technology is **towards ICT products that are smaller and smaller in size**. As a result, it is becoming ever harder for manufacturers to find space on the device to apply a physical label at all respectively in a legible or even accessible manner. At the same time, it is difficult for regulators to determine ICT product conformity using both user-friendly and cost-effective tools (APEC, 2017).

Taking these trends into account, **national regulators in the case study countries aimed to support companies** in design and manufacturing by allowing them to electronically display conformity marking or other relevant information on an integral screen rather than affixing it on the product. For instance:

- US legislators saw e-labelling as a relatively modest proposal but **a useful step towards more innovation, lower costs, and better product design**, especially in light of the “*Internet of Things*” revolution, which already touches

many aspects of daily life and impacts most industries.²⁹ Considering the increasing trend toward greater use of ICT in everyday-life, the FCC believed that the e-label was a necessary step to modernize its labelling requirements and keep pace with the industry's technological advancements.

- ACMA (Australian regulator) considered e-labelling an asset to **overcome the challenges faced by manufacturers** with the physical label.
- Considering that ICT products make up almost a quarter of the value of Singapore's GDP (with telecommunications being the third largest sector), the adoption of the e-label was considered to fit well with the country's general regulatory approach, directed towards facilitating and modernising trade³⁰.

3.3 Effectiveness

Most of the stakeholders interviewed (industry and public authority) tend to agree that there are numerous practical benefits linked to e-labelling. Based on all three case studies, these benefits can be grouped into three broad categories:

1. Direct **cost-savings** for industry,
2. Indirect **market benefits** (such as greater trade and combating counterfeits) which stimulate competition and, ultimately, generate benefits for consumers;
3. Wider **societal benefits** through better information for end-users which allows them to make more informed purchasing decisions.

Despite these advantages, trade associations and market surveillance authorities commented that **take-up of voluntary e-labelling schemes has not yet been widespread** in terms of the number of companies that use e-labelling instead of physical labels, especially outside frontier technology industries. This can partly be explained by the fact that e-labelling is still relatively new (for instance, the US Final Order on e-labelling was only adopted in June 2017) and several companies use both electronic and physical labelling as a transition procedure.

However, in terms of the volume of products that are covered, e-labelling take-up can already be considered a success. Indeed, most large, consumer electronics companies (if not all of them) have recognized the value of the e-label and apply it to their products. Estimates produced as part of this study suggest that in the three case study countries, e-labels can be found on (at least):

Table 2: e-labelling on consumer electronics products – case study results

	Smartphones	PCs	Tablet
Australia	78% of the smartphones sold in 2016	85.9% of the PCs sold in 2017 in Australia	81% of tablets sold in 2016 in Australia

²⁹ <http://www.industryweek.com/technology/proposed-e-labeling-act-homerun-internet-things>

³⁰ Interview with a representative from an ICT company.

	Smartphones	PCs	Tablet
Singapore	80-90% of the smartphones sold in Singapore in the period 2013-2016	<i>No data available</i>	<i>No data available</i>
USA	87% of the 14.6 million smartphones sold ³¹ in 2015	82.2% of the 10.796 million PCs sold ³² in 2015	<i>No data available</i>

Source: VVA's estimations based on Statista

It should be noted that, for products developed for global markets, the full potential of electronic labels cannot be realized if physical marks have to be placed on the product anyway to comply with regulations abroad. Therefore, to fully exploit the benefits of this scheme, widespread (i.e. global) international acceptance of e-labelling amongst regulatory agencies is required.

3.4 Efficiency

Industry stakeholders reported that, overall, **the e-label has enabled cost-savings in design manufacturing and in updating compliance information.** For instance, according to some estimates, the US e-labelling scheme has enabled manufacturers to save over USD 80 million a year.³³ Further, by allowing e-labelling as an optional approach to physical labels, its introduction did not create any additional administrative burdens or unwanted adaption costs for industry.

Also, based on the experience of these three countries, **the e-label has not had any indirect impact on other categories of stakeholders.** For example, the Congressional Budget Office (CBO) estimated that implementing the **E-Label Act** would have a **negligible effect on net discretionary costs for the FCC** as complying with the E-Label Act would not have a significant effect on its workload, and thus, its spending.

Similarly, the Australian regulator commented that the **introduction of e-labelling has had no effect on the market surveillance process itself.** Indeed, the presence of a label on the device (electronic or physical) does not mean the device is compliant with the national regulation, it is rather the compliance documentation (i.e. test reports, Declarations of Conformity, CB statements etc.) that shows it. Therefore, when ACMA (Australian regulator) allowed the e-label, the record keeping requirements did not change, like the time required to assess the match between the records and the label (which remains still the same). The electronic label is considered just another way to display information.

³¹ <https://www.statista.com/study/26643/smartphones-in-the-us-statista-dossier/>

³² <https://www.statista.com/forecasts/409568/united-states-computer-storage-device-manufacture-total-value-of-shipments-forecast-naics-334112>

³³ <http://thehill.com/blogs/floor-action/house/217448-house-passes-e-labeling-bill>

In addition to market surveillance authorities, also **customs agencies or consumers** could be indirectly impacted by the e-label. In order to minimize any negative impact on the day-to-day activities of customs officials or lead to any confusion for consumers, the US legislation requires a **peel-away label on products** in the event that they could not be switched on for whatever reason.

The Australian and Singaporean authorities adopted, instead, a **softer approach** by requiring equipment manufacturers or dealers to **ensure that the equipment packaging contains information on where to locate the electronic compliance label for verification**. The Singaporean regulator also offers the possibility to consumers and enforcement officers to verify online whether the telecommunication equipment is registered, through the “*Equipment Search*” function available at its *Telecoms Licensing portal*.³⁴

Based on the experience of these three countries, the e-label is, overall, **a cost-effective measure** that allows cost-saving for manufacturers producing devices with an in-built screen without causing any additional administrative burdens or adaption costs for non-adopter companies, consumers, market surveillance authorities or customs agencies.

³⁴ Launched in 2005, the Telecoms Licensing portal is an online portal which allows suppliers and providers to register their telecommunication equipment and apply and pay for licences via internet.

4 Conclusions & lessons learnt

This section distils the lessons learnt from the case studies to define best practices for use in the potential enactment of an e-labelling system in Europe. Some of these lessons are related to process, while others highlight key issues (in terms of relevance, effectiveness and efficiency) emerging from the case studies, that would need to be addressed as part of an e-labelling system. These lessons should be read in conjunction with the best practice recommendations made by APEC³⁵ and by ITIF³⁶:

Specify which products can use e-labelling and set minimum requirements

The three countries under analysis have extended the use of e-labelling to “*electronic equipment that could create electromagnetic interference with an inbuilt screen*”. Only the USA has extended the use of e-labels to two other categories of devices, namely: 1) devices without integrated display that can only operate in conjunction with a device that has an electronic display, 2) modular transmitters where the host has a display.

E-labelling is a way to streamline and simplify the delivery of information about regulatory compliance. All three case study countries covered in this report set minimum requirements about the compliance information to be displayed in order to avoid overly prescriptive settings and they leave it to manufacturers to use e-labelling for additional information as they see fit. For example in the US, e-labelling minimum requirements include the basic details commonly found on products, such as conformity labels and statements, product details, including manufacturer details and contact information, the product name, model and features. It is left to the manufacturers to decide to provide additional information about warranties, recycling and trade-in opportunities.

Manufacturers should make clear where this information is contained, either in the user manual or other documentation that accompanies the product, as well as put this information on the product website.

Make it an alternative to allow flexibility

All three case study countries allow manufacturers to use e-labels as a substitute for physical labels to convey compliance and other regulatory information and the adoption of the scheme is optional.

The reason is that manufacturers can have vastly different compliance requirements depending on their products and target markets. By making the systems an optional approach, the legislation does not impose any administrative burden/adaptation cost to the industry, thus minimizing its negative impacts.

³⁵ Best Practices for Electronic labelling – available at: <https://www.apec.org/Publications/2017/11/Best-Practices-for-Electronic-Labeling>

³⁶ ITIF (2017) “How E-Labels Can Support Trade and Innovation in ICT” – available at: http://www2.itif.org/2017-e-label-support-ict.pdf?_ga=2.196494636.1408210325.1522049072-689777106.151964509

The optional approach allows flexible uptake and transition periods which are useful in the context of new technologies. In addition, the current experiences in Australia, Singapore and USA show that the adoption rates are high in terms of product volumes since larger companies are likely to be among the first adopters.

Smaller companies could, for instance, be incentivised in a second stage to adopt e-labelling through awareness campaigns run in cooperation with trade and industry associations.

Operate a transparent and participatory rule-making process

In setting requirements for e-labels, the experience in the three case studies underlines the importance of a transparent and participatory regulatory process that includes opportunities for feedback and engagement for stakeholders (such as draft guidelines, followed by feedback, and the release of a revised draft and further feedback such as was the case in the US).

This iterative process is important from an industry perspective, as a seemingly small requirement may have significant costs and design implications for manufacturers. The risk is that if the regulatory requirements ignore industry concerns about the impact of some technical features of the e-labelling scheme, it may ultimately undermine the benefits of e-labelling and negatively affect product design (ITIF, 2017).

At the same time, the regulatory process should take into account the needs and concerns of the other major stakeholder groups that are impacted by e-labelling: market surveillance authorities, customs agencies and consumers.

An open, transparent and inclusive process should help regulators to build their understanding of the technology and be assured that new forms of e-labelling don't undermine their regulatory goals. For instance, a best practice promoted by APEC is to roll out a limited, voluntary pilot, analyse the results of the initiative and adapt guidelines/regulations according to these results.

Security, accessibility, and storage

From a practical perspective, the experience of the three regulators covered in the case studies shows that manufacturers should be accountable for the following aspects (ITIF, 2017):

- Manufacturers are responsible for ensuring that there is a working link between the e-label and the service hosting the relevant compliance information;
- Manufacturers must ensure that accessing e-label information does not require any fees or special access codes, that the e-label information does not have any unnecessary copyright restrictions applied to it, and that it can be accessible by all major IT platforms (e.g., iOS and Android);
- Manufacturers must have the relevant e-label information programmed in such a way that it cannot be easily modified or removed by a third-party;

- Manufacturers should ensure that the compliance information remains available for the lifecycle of the product, including for a period of time after the product has been discontinued;
- Manufacturers must provide accompanying instructions for how users can access the e-label along with the product, whether in the product documentation (such as user manual or as a packaging insert), affixed to the product (such as a peel-away label), or on the product packaging or packing material.

Coordinate regulatory approaches to e-labelling with other countries

Product labels convey compliance information and thereby facilitate market access to a country.

However, many ICT products (especially consumer electronics - products) are made for distribution in multiple markets, meaning that a product can have 20 or more regulatory labels. Complicating this process is that some countries dictate where labels must go physically on the product (ITIF, 2017). Such international differences can create unintentional barriers to trade.

The digitalization of labels can help overcome such barriers but only if regulators coordinate their e-labelling requirements at international level. In order to fully exploit the benefits of e-labeling, regulators need to align their e-labeling approaches internationally including the way that compliance information is indicated and what information is permitted on e-labels.

5 USA

5.1 Background and description of the measure

US regulators have been forerunners in terms of e-labelling regulation for radio frequency equipment. Indeed, already in 2001, the FCC allowed manufacturers of software-defined radios (SDRs) to voluntarily use e-labelling. Indeed, SDRs are micro devices that lack physical space to get the FCC's surface label affixed.

In 2012 the Telecommunications Industry Association (TIA) filed a rulemaking petition asking the Federal Communication Commission (FCC) to permit the use of electronic labels as a voluntary alternative substitute for physical labels for all radio frequency devices, revamping the political debate on e-labelling.

Following this petition, the FCC's Office of Engineering and Technology provided guidance regarding when and how a device's electronic display may be used to convey certain required label information. *KDB Publication 784748*³⁷, which has been effective since July 11th 2014, allows for the electronic display of the FCC ID, the FCC logo and other information required by the FCC's equipment authorization rules to be provided on the surface of the product. *KDB Publication 784748* allowed the e-label as an alternative for manufacturers in the form of a "voluntary measure".

Institutional recognition of the e-label followed with the E-LABEL Act a few months later. The *Enhance Labeling, Accessing, and Branding of Electronic Licenses Act* (E-LABEL Act) was introduced in the United States House of Representatives on July 22nd 2014 by Rep. Robert E. Latta, Senator Deb Fischer and Senator Jay Rockefeller.³⁸

The bill was referred to the *United States House Committee on Energy and Commerce* and the *United States House Energy Subcommittee on Communications and Technology*. On September 11th 2014, the House voted to pass the bill.

The E-LABEL Act required the Federal Communications Commission, by August 26th 2015, "to promulgate regulations or take other appropriate action, as necessary, to allow manufacturers of radiofrequency devices with display the option to use electronic labeling for the equipment in place of affixing physical labels to the equipment". The Act applies to all radiofrequency devices authorized by the FCC that have the "capability to digitally display labeling and regulatory information".

³⁷ FCC's Office of Engineering and Technology Laboratory Division, Electronic Labelling Guidance, Available at: <https://apps.fcc.gov/kdb/GetAttachment.html?id=KvMvDHtHyDtJ4FB3x0mEwA%3D%3D>

³⁸ <https://www.congress.gov/bill/113th-congress/house-bill/5161>

As part of *the Notice of Proposed Rulemaking*,³⁹ the FCC sought comments in a public consultation on its proposed electronic labelling rule (KDB Publication 784748 – Electronic Labeling Guidance)⁴⁰ and associated tentative conclusions. Following the results of the consultation, the FCC concluded that the proposed rule met the requirements of the E-LABEL Act, provided flexibility to manufacturers, while enabling consumers to continue to receive the information required by the FCC’s rules.

The rules permit alternative means of displaying compliance information electronically for approved devices through a display. In detail, the e-label guidance defines:

1. The type of radiofrequency devices authorized, i.e.:
 - Devices with integrated non-removable screens;
 - Devices without integrated display that can only operate in conjunction with a device that has an electronic display;
 - Modular transmitters where the host has a display.

2. The types of information that are required to be displayed, i.e.:
 - FCC ID for Certified devices;
 - Logo for devices subject to Declaration of Conformity (DoC);
 - Any information that FCC rules require to be on surface of product unless the rules allow for the information to be in the manual or packaging inserts;
 - In addition, the FCC proposed to amend the labeling regulations to address devices that are too small to be legibly labeled with an FCC ID by allowing to put statements in manual.⁴¹

3. Additional requirements that must be respected, i.e.:
 - Users must be able to access without special access code in *max-3-steps* from device setup menu;
 - An end user installed pin or password does not apply;
 - Label information must be secured and unmodifiable by third party or end user. There are secure data exchange requirements for a special class of certified transmitter modules that have the ability to replace a control unit from the Front End. The FCC’s rules do not specify the type of such interface and leave it to the manufacturers to demonstrate that they can certify the exchange to be secure. There are no secure exchange interface requirements for certified transmitter modules incorporated in hosts;
 - Access instructions must be provided to users;

³⁹ A notice of proposed rulemaking (NPRM) is a public notice issued by US law when one of the independent agencies of the United States government wishes to add, remove, or change a rule or regulation as part of the rulemaking process.

⁴⁰ FCC’s Office of Engineering and Technology Laboratory Division, Electronic Labelling Guidance, Available at: <https://apps.fcc.gov/kdb/GetAttachment.html?id=KvMvDHtHyDtJ4FB3x0mEwA%3D%3D>

⁴¹ The FCC ID may be placed in the device user manual if the device is too small for the FCC ID to be readable (smaller than 4-6 point font size).

http://mddb.apec.org/Documents/2017/SCSC/WKSP2/17_scsc_wksp2_003.pdf

- Bulk imports and devices not packaged individually must have physical label at time of import, marketing and sales – removable adhesive label that lasts through normal shipping and handling and removed by customer is allowed;
- The proposed rules would not change the requirements to place warning statements or other information on device packaging or in user manuals or make information available at the point of sale.

The FCC emphasized that the electronic labelling rules are permissive (i.e. alternative option in lieu of a physical label or nameplate). Companies may continue to employ physical labelling techniques consistent with existing rules and guidance if they so desire.

Finally, in June 2017, the FCC released new orders that codify and expand the guidance it had previously issued on allowing e-labelling.⁴²

5.2 Relevance of the measure

Generally speaking, a product label is defined as a government instrument to regulate the presentation of product-specific information to consumers (Teisl & Roe, 1998). This information might describe use characteristics of the product, such as price, taste, or non-use characteristics, such as the environmental impact or moral/ethical elements surrounding the product's manufacturing process (Teisl & Roe, 1998).

Labelling policies are meant to make key product information held by the firm available to consumers and regulators and make them more informed about the exact attributes of the product.

The US legislation requires ICT manufacturers to address concerns over safety, electromagnetic interference, energy, materials, and recycling (ITIF, 2017) and before 2014, the FCC required to indicate compliance through physical labels.⁴³

According to industry stakeholders interviewed for this study, physical labels which had to be affixed in such a way that they could be easily located, produced and controlled in the manufacturing process and, at the same time, did not have a negative visual impact. As a result, it was common practice to place product labels on a single panel inside products, such as on the battery, which was not easily accessible for regulators and consumers.

A starting point in the political debate on permitting e-labelling came with regard to smartphones, given device capabilities and the growing number of people around the world using them (ITIF, 2017). Indeed, growing smartphone ownership means that consumers (and regulators) have the ability to easily access information about

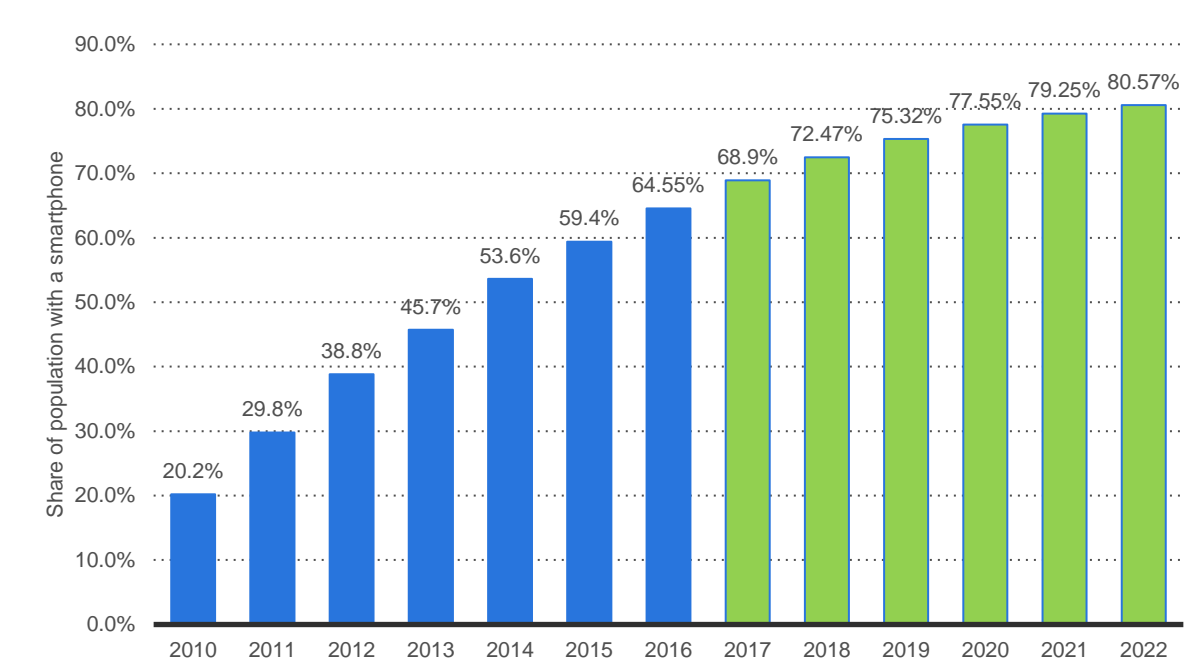
⁴² ET Docket 15-170 issued on 22/06/2017. Available at: https://apps.fcc.gov/edocs_public/attachmatch/DOC-345479A1.pdf

⁴³ Except from manufacturers of software-defined radios (SDRs) which could voluntarily use e-labelling.

products electronically, whether this is on their device or via a link to a webpage on internet.

Figure 8 shows the penetration rate⁴⁴ of smartphones in the United States. Already at the time of the 2012 political debate the penetration rate of smartphones was 38.8%, in 2014 when the e-label was allowed by the FCC as a “*voluntary industry measure*” the penetration rate was above 50% and in 2017 when the final order on e-labelling was issued, over 80% of the US population owned at least one smartphone and used the smartphone(s) at least once per month.

Figure 8: Smartphone penetration rate as share of the population in the United States from 2010 to 2022⁴⁵



Source: Statista DMO

In addition, most of the stakeholders interviewed (industry and public authority) tend to agree that there are numerous practical benefits linked to e-labelling and these can be grouped into three broad categories:

1. Direct cost-savings for industry,
2. Indirect market benefits (such as greater trade and combating counterfeits) which stimulate competition and, ultimately, generate benefits for consumers;
3. Wider societal benefits through better information for end-users which allows them to make more informed purchasing decisions.

⁴⁴ Defined as percentage of individuals of any age who own at least one smartphone and use the smartphone(s) at least once per month.

⁴⁵ Forecasted estimates for the years 2017, 2018, 2019, 2020, 2021 & 2022.

The box below provides examples for each type of benefit.

Table 3: Examples of benefits of e-labelling for industry, consumers and society

Direct cost savings for industry:

- **Cost-savings in design manufacturing:** as ICT devices have become smaller, etching the labels requires more design time and expensive equipment. E-labelling dramatically reduces or eliminates these costs. Rep. Bob Latta, the measure's sponsor, argued that "*not only does it give greater flexibility to design consumer products, by some estimates, e-labelling will save manufacturers over \$80 million a year*";⁴⁶
- **Additional cost-savings in updating compliance information:** e-labels can be updated remotely typographical errors. Physical labels are static and problematic in terms of updating. Indeed, it represents a substantial cost in terms of time and money to recall products, scrap and replace physical labels;
- **More aesthetically appealing products:** no need to place regulatory labels on a product makes products look better.

Indirect market benefits which stimulate competition

- **Detection of counterfeits:** labels are generally seen as a way to prevent counterfeiting. However, some industry stakeholders commented that physical labels are not very effective in this fight, as they are very easy to copy. E-labelling offers an additional layer of protection because it is embedded in the product itself rather than outside. According to 2014 data from U.S. Customs and Border Protection, the categories of products "*Computers/Accessories*" and "*Consumer Electronics/Parts*" represented 11% of the total seized goods for a total value of \$193.6 million (based on the manufacturer's suggested retail price).⁴⁷ Although e-labelling doesn't eliminate the problem in full, industry stakeholders argue that it can significantly mitigate the issue;
- **Trade facilitation:** as mentioned above, labels convey compliance information and thereby they facilitate market access to a country. Many ICT products (especially consumer electronics - products) are made for distribution in multiple markets, meaning that a product can have 20 or more regulatory labels. Complicating this process is that some countries

⁴⁶ <http://thehill.com/blogs/floor-action/house/217448-house-passes-e-labeling-bill>

⁴⁷ The other most counterfeited products are: *Footwear* - total value of seized goods \$54.9 million / 3% of total seized goods, *Pharmaceuticals/Personal Care* - total value of seized goods \$79.6 million / 5% of total seized goods, *Wearing Apparel/Accessories* - total value of seized goods \$116.2 million / 7% of total seized goods. Full article available at: <https://www.usatoday.com/story/money/business/2014/03/29/24-7-wall-st-counterfeited-products/7023233/>

dictate where labels must go (ITIF, 2017). Thus, such label overregulation can create unintentional barriers to trade.

Wider societal benefits through better information

- **More information to consumers than is conveyed today:** beyond the required certification information, details can be added by manufacturers regarding device warranties, recycling and trade-in opportunities. According to some industry stakeholders, the true potential of e-labelling lies in the amount of data and documentation that can be displayed;
- **Environmental impacts:** allowing additional information to be displayed with an e-label can reduce packaging waste and more information about recycling can be made available to consumers than through physical labels.

Furthermore, industry stakeholders argue that e-labelling does not undermine each country's right to regulate ICT products for public health, safety, and other reasons. It is simply a way to convey information to consumers and regulators more effectively and efficiently than is possible with physical labels.

Instead, e-labelling can be seen as part of a broader trend toward greater use of ICT in our daily lives and jobs and regulatory compliance issues for ICT products will only become more important (ITIF, 2017).

Thus, one of the reasons for the FCC to allow e-labelling was to keep pace with technology advancements and to ensure that its rules and procedures take advantage of modern technology and are as user-friendly as possible. As stated by FCC Commissioner - Mr. Michael O'Reilly in the FCC Blog in 2014: "...*wireless devices have changed substantially over the last two decades. Consumers have migrated from block-like flip-phones with monochromatic screens to advanced, all-in-one smartphones, tablets, and even wrist devices. As these devices continue to shrink, their functionality continues to grow. To keep pace with these technological advancements, I believe it is time for the FCC to consider modernizing our labelling requirements...*".⁴⁸

5.3 Effectiveness of the measure

Despite the above listed advantages, trade associations and market surveillance authorities interviewed for this study commented that take-up has not been widespread in terms of the number of companies that have adopted the e-label, especially outside cutting-edge-technology⁴⁹ industries such as more traditional manufacturing.

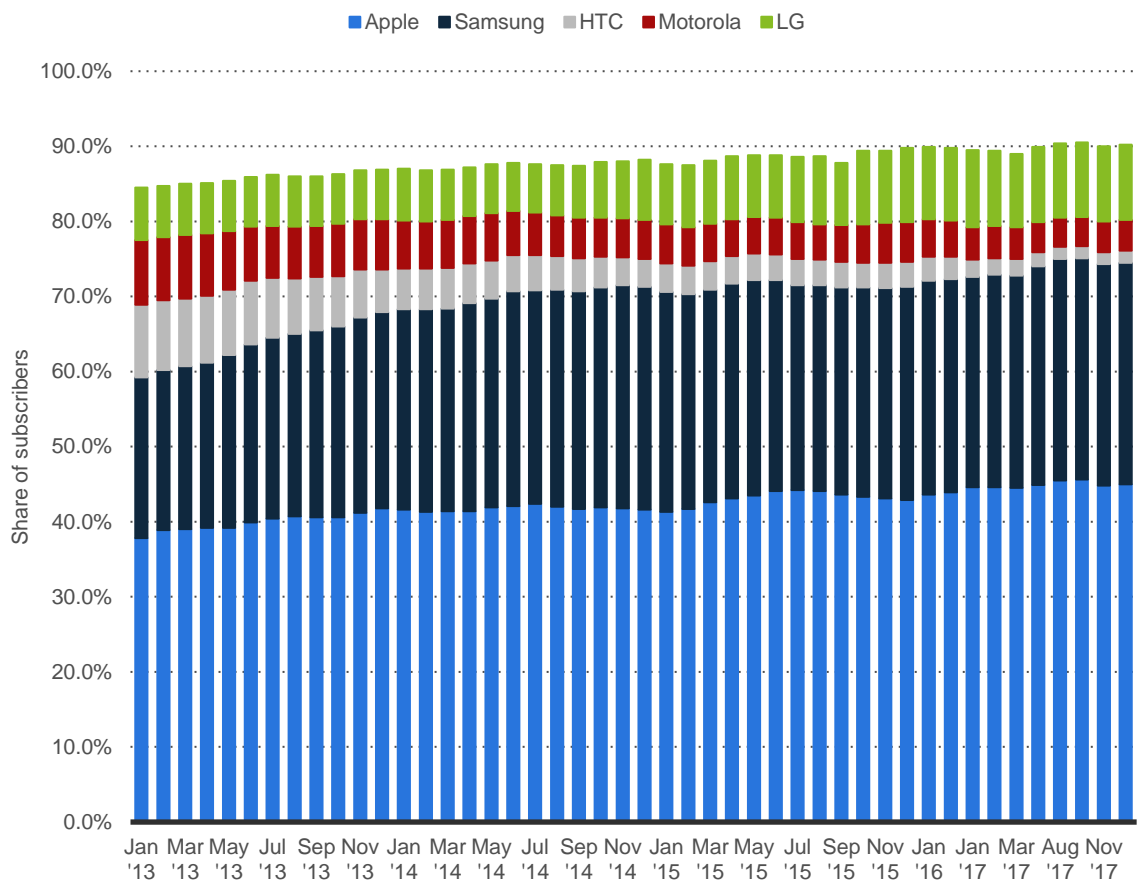
⁴⁸ <https://www.fcc.gov/news-events/blog/2014/04/25/e-labeling-deserves-serious-consideration>

⁴⁹ Cutting-edge technology refers to technological devices, techniques or achievements that employ the most current and high-level IT developments; in other words, technology at the frontiers of knowledge.

Indeed, e-labelling in the US is still considered a relatively new approach to conveying compliance information to regulators and consumers (the final order was only adopted in June 2017) and there are several companies which use both electronic and physical labelling of devices as a transition procedure.

However, the list of the e-label adopters definitely includes all the major ICT producers⁵⁰ which, in turn, cover most consumer electronics markets in the US. For instance, an estimated 14.6 million⁵¹ smartphones were sold in the US market and the total sales amounted to USD 55 billion. In terms of market shares, 5 companies accounted for 90% of the market in November 2017 (Figure 9).

Figure 9: Manufacturers' market share of smartphone subscribers in the United States from 2013 and 2017, by month



Source: Statista, 2017

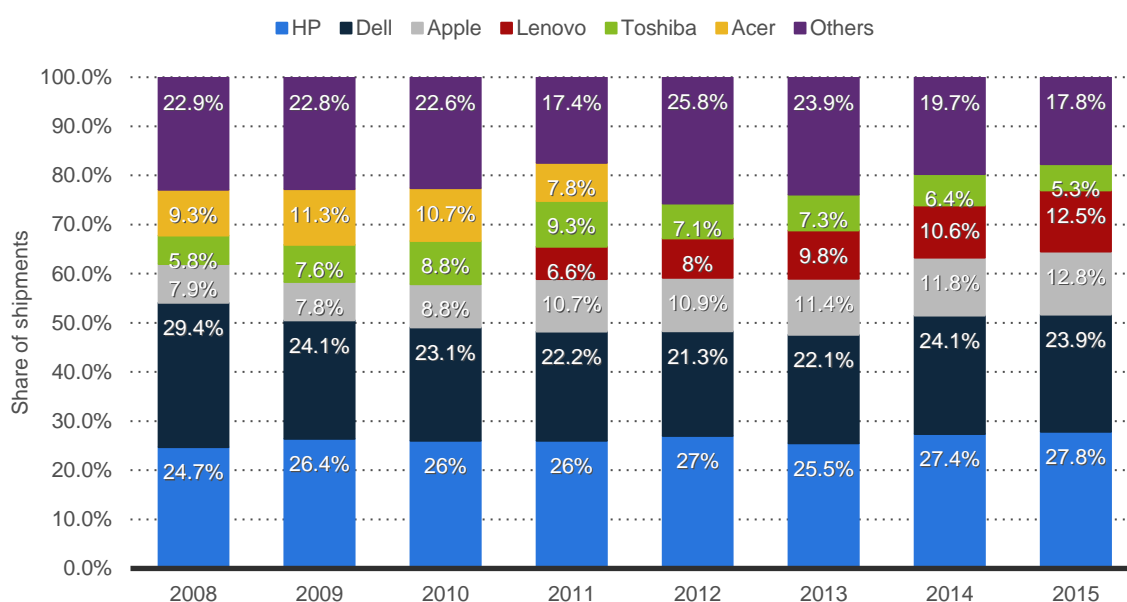
⁵⁰ Most of the major US and international ICT producers are members of the Information Technology Industry Council (ITI), which is an advocacy and policy organization representing companies on the cutting edge of technology. Its members are the most important companies ranging from hardware to software industry. ITI stated that most of its members (if not all of them) use e-label for their products.

⁵¹ According to data from Statista, in 2015 there were 14.6 million unlocked smartphone unit shipments in the United States, we used this information as proxy for products sold

Considering that all 5 above mentioned companies make use of the e-label on their products⁵², **we estimate that approximately 90% of smartphones in 2016 included an e-label.**

Similar conclusions are also valid for the market of personal computers. As Figure 10 shows, **in 2015 the market was concentrated around 4 large vendors.** These 4 vendors make use of the e-label for their products.⁵³ Therefore, it is possible to conclude that **in 2015 (at least) 82.2% of the personal computers sold in the US were provided with an e-label.**

Figure 10: Market share held by personal computer (PC) vendors in the United States from 2008 to 2015



Source: Statista, 2017

As the examples of smartphones and personal computers show, even if the adoption in terms of the number of companies has not been widespread, in terms of the share of products covered, the e-label has been applied on most consumer electronics products sold in the US.

One of the limitations reported by industry stakeholders is that for products developed for global markets, the potential of electronic labels is not realized in full

⁵² As the companies are members of the Information Technology Industry Council (ITI) and it was confirmed that most of ITI members have adopted the e-labelling scheme. Therefore, we presume that their products are provided with e-label.

⁵³ As the companies are members of the Information Technology Industry Council (ITI) and most of ITI members have adopted the e-labelling scheme, we presumed that their products are provided with e-label.

if they have to place physical marks on the product anyway to be able to export to other geographical markets. Likewise, if some national regulatory agencies allow for e-labelling and others do not, the digitalisation of the system has only limited cost-saving impacts.

Along with the benefits for industry outlined above, the content of the regulatory labels is an important means to notify consumers, Customs and Border Protection (CBP) officials, and Enforcement Bureau investigators that the devices meet the technical requirements of US rules. The FCC sought in its public consultation ways to address identified drawbacks affecting consumers and customs. For instance, it was argued that e-labels would be unavailable to CBP officials if devices could not be switched on for whatever reason (e.g., new, broken, or lost power). Likewise, when a consumer is considering purchasing a device they cannot usually switch on the device and use the electronic display to access the label and regulatory information. To provide information prior to purchase, to avoid a hazard, or when devices are imported, the FCC imposed rules for manufacturers to put a peel-away screen label with the appropriate labelling information on newly deployed devices or, for devices in protective packaging, a label on the protective packaging.

Therefore, devices displaying labelling and regulatory information electronically must also place this information either on the product packaging or on a physical label placed on the device at the time of importation, marketing, and sales. In this way, the e-label scheme was deemed to have no impacts on the activities of customs officials and on consumers.

An additional layer of protection to consumers is also offered by rules which require additional or special information to be displayed at the point of sale to help potential buyers make informed decisions. Such information is not required to be attached to the product as a label, but it can be provided in the label as supplemental information. According to the FCC, certification is a critical process to confirm compliance with FCC rules, to prevent harmful interference, and to transmit important information about wireless devices to consumers. The e-labelling scheme (as it has been designed by the FCC) does not undermine compliance with FCC rules and at the same time it allows cost-savings to the industry.

5.4 Efficiency of the measure

As seen in the chapters above, electronic labelling has effectively decreased cost for device manufacturers, since companies no longer have to affix permanent labels to devices.⁵⁴ In addition, considering that the US e-labelling scheme was designed as an optional approach, the legislation has not imposed any administrative burden/adaptation cost to the industry. Thus, e-labelling, as implemented in the US, has had an overall positive cost impact for industry, especially for FMCE companies.

⁵⁴ However, the companies interviewed found impossible to provide an estimated in monetary terms about the cost-reduction following the introduction of e-labelling.

Furthermore, the Congressional Budget Office (CBO) estimated that implementing the E-Label Act would have a negligible effect on net discretionary costs for the regulator (the FCC) over the 2015-2019 period.⁵⁵ Indeed, any additional actions that FCC would take to comply with the E-Label Act's requirements would not have a significant effect on the its workload, and thus, its spending. Specifically, the CBO concluded that the E-Label Act "*contains no intergovernmental or private-sector mandates as defined in the Unfunded Mandates Reform Act and would not affect the budgets of state, local, or tribal governments*". The conclusions of the CBO were also confirmed by a representative of the FCC interviewed for this case study, who stated that the e-labelling scheme has not had any effect on the agency's day-to-day activities or market inspections.

As outlined in its consultation phase, the FCC foresaw that the e-label would have indirect impacts on two other categories of stakeholders, namely: customs (U.S. Customs and Border Protection) and consumers. To mitigate this impact, the peel-away screen label was introduced as a mitigating measure to ensure that the introduction of the e-labelling scheme would not have any impact on the day-to-day activities of customs officials or lead to any confusion for consumers.

Overall, the US e-labelling scheme is a cost-effective measure that has allowed cost-savings in terms of ICT device manufacturing (see also section on relevance) without causing any additional administrative burdens or adaption costs for industry, consumers, market surveillance authorities or the customs agency.

5.5 Conclusions

Manufacturers incur significant expense for the creation, control, maintenance, and production of product markings, packaging, and instruction sheets that have traditionally been used to convey required certification or conditions-of-use information.

Considering the increasing trend toward greater use of ICT as part of people's daily lives and jobs, the FCC believed that the e-label was a necessary step to modernize its labelling requirements and keep pace with technological advancements.

The US has been frontrunner in terms of e-labelling regulation, as already in 2001 the FCC allowed to apply an e-label on software-defined radios (SDRs). However, it is only in 2014 that the base of products was extended. Indeed, following an industry petition, e-labelling has been allowed under a voluntary alternative scheme to be applied on:

- Devices with integrated non-removable screens;
- Devices without integrated display that can only operate in conjunction with a device that has an electronic display;

⁵⁵ H.R. 5161, Enhance Labelling, Accessing, and Branding of Electronic Licenses Act of 2014. Available at: <https://www.cbo.gov/publication/45666>

- Modular transmitters where the host has a display.

In doing so, manufacturers must respect the guidance and information requirements of the FCC and they are fully responsible for the security of the information.

Although it has been argued that the e-label would bring several advantages for industry, take-up has not been widespread in terms of the number of companies. Indeed, the e-label is still considered a relatively new approach and some companies are using both labels. However, the e-label has been widespread in terms of the volume of products that are covered. Indeed, due to the structure of the US market for mobile communication devices, the implementation of e-labelling quickly reached about 90% of the market volume since all major suppliers adopted this new opportunity. According to our estimates, (at least) 87% of the smartphones sold in 2016 and (at least) 82.2% of the PCs sold in 2015 displayed compliance information through e-labelling.

Industry stakeholders reported that, overall, the e-label has enabled cost-savings in design manufacturing and in updating compliance information. At the same time, it has had no negative impact on market surveillance authorities, customs or on consumers.

While the US experience is a success story, it should be noted that, for products developed for global markets, the full potential of electronic labels cannot be realized if physical marks have to be placed on the product anyway to comply with regulations abroad. Therefore, to fully exploit the benefits of this scheme, there must be a widespread acceptance amongst countries and regulatory agencies at a global level.

6 Australia

6.1 Background and description of the measure

Out of the three countries covered by the case studies, Australia is the first to have allowed an e-label in 2010. This case study therefore assesses the benefits and drawbacks of this scheme after a decade of implementation.

The introduction of e-labelling in Australia was mainly industry-driven.⁵⁶ Indeed, the Australian Information Industry Association -AIIA-⁵⁷, the Australian Lighting Council⁵⁸, the Consumer Electronic Supply Association, and other trade association, relayed their positions to the ACMA through a petition,⁵⁹ backed up by behavioural studies on consumer perceptions of an electronic label.⁶⁰

As mentioned by one of the stakeholders interviewed for this study, such industry pressure is common to countries that have introduced e-labelling⁶¹. This is mainly explained by the fact that manufacturers, through the production process, are the main actors impacted by a change in the labelling scheme⁶².

While industry representatives were the main initiators, it should be said that ACMA had adopted a very open position with regard to the industry's requests. Indeed, already in 2009, ACMA launched an industry consultation to have a better overview of the ICT sector's opinion on e-labelling. Following the positive outcomes of this consultation, the e-label was allowed in April 2010.⁶³

According to the new rules established by the regulatory agency, the electronic label was introduced as an optional approach to physical labelling for radiocommunications and telecommunications devices with a built-in display. The requirement for an *integrated* screen excludes devices connected to an external display.⁶⁴

⁵⁶ Interview with a representative from an ICT company.

⁵⁷ See for instance the position of the AIIA. Australian Information Industry Association, 2013. Digital label guidelines comments from AIIA.

⁵⁸ See Lighting Council Australia, 2009. Response to the Australian Communications and Media Authority discussion paper.

⁵⁹ AIIA, 2013. Digital label guidelines. Comments from AIIA.

⁶⁰ According to a representative from an ICT company interviewed, some companies organised trials of an electronic label or mystery shopping activities before presenting the findings to ACMA.

⁶¹ Interview with a representative from the Information Technology & Innovation Technology foundation.

⁶² Ibid.

⁶³ E-label was introduced in Australia with the following amendments: Radiocommunications Labelling (Electromagnetic Compatibility) Amendment Notice 2010 (No.1), Radiocommunications Devices (Compliance Labelling) Amendment Notice 2010 (No.1), Radiocommunications (Compliance Labelling – Electromagnetic Radiation) Labelling Amendment Notice 2010 (No.1), Telecommunications Labelling (Customer Equipment and Customer Cabling) Amendment Notice 2010 (No.1).

⁶³ ACMA, 2010. Electromagnetic compatibility, compliance and labelling information for supplier of electrical and electronic devices, vehicles and devices with internal combustion engines in Australia.

⁶⁴ ACMA, 2010. Electromagnetic compatibility, compliance and labelling information for supplier of electrical and electronic devices, vehicles and devices with internal combustion engines in Australia.

However, regardless of the labelling form used, a supplier/manufacturer must comply with the Australian regulatory requirements. In detail:

- A supplier/manufacturer must establish compliance records showing the device complies with all the applicable ACMA mandated radiocommunications, telecommunications, electromagnetic compatibility and electromagnetic radiation equipment standards;
- These compliance records must include the identification of the product (brochure, photograph, user's manual etc.), a declaration of Conformity (declaring conformity with the applicable mandated equipment standard(s)), a proof of the applicable test report(s) to the relevant standard(s)⁶⁵.
- The electronic label – if used – must display the Australian Regulatory Compliance Mark -RCM- symbol. The format must be minimum 3mm high⁶⁶.
- The supplier/manufacturer must ensure that the documentation that accompanies the device sets out clear explanations on how to access the e-label⁶⁷.
- There are no requirements that the user should be able to access the e-label in less than three steps⁶⁸.
- Although there are no specific requirements regarding the storage of the e-label, Art. 3.6A(3) of the Radiocommunications Labelling (Electromagnetic Compatibility) Notice -2017- states that *"the compliance label must be applied to the device in a way that would make it difficult to prevent the display of the label when the method set out in the documentation is used"*.
- It is the responsibility of the supplier/manufacturer who is trading the device within the Australian market to ensure compliance of the e-label with the legal requirements⁶⁹.

6.2 Relevance of the measure

When the discussion about the adoption of an e-label sparked in Australia, the ACMA was acknowledging the issues faced by manufacturers of ICT devices when etching a physical label. On the other hand, the built-in screen present on a significant share of ICT products provided an alternative way to display information about the product. In that sense, the electronic label was considered as a relevant measure as it has the potential to overcome the challenges induced by the physical label.

⁶⁵ Interview with a representative from the Market Surveillance Authority.

⁶⁶ ACMA website. EMC labelling requirements. Available at: <https://www.acma.gov.au/Industry/Suppliers/Regulatory-arrangements/EMC-Electromagnetic-compatibility/emc-labelling-requirements>

⁶⁷ See Radiocommunications Labelling (Electromagnetic Compatibility) Notice 2017.

⁶⁸ In these countries, the user shall be able to access the e-label in less than three step, the first is to access the settings menu.

⁶⁹ ACMA, 2013. Information on labelling and record-keeping. Electromagnetic compatibility requirements- for suppliers of electrical and electronic devices, vehicles and devices with internal combustion engines in Australia.

One of the main rationales behind the adoption of the e-label in Australia was the diminishing size of electronic products with technological advancements. Due to this design constraint, it became difficult for manufacturers to apply the compliance label on the external surface, which increases manufacturing complexity.⁷⁰

At the same time, while product size was diminishing rapidly, the compliance requirements were increasing. The multiplication of compliance marks to apply on ICT products was considered as a drawback also aesthetically speaking⁷¹ and too many marks could make it difficult to convey the right information to users.⁷²

In addition, it was commented that most ICT companies are global players, and physical labels could impede their ability to trade and export. Indeed, companies shipping to different markets had to adapt the labels present on their products to the different national requirements. This process could be burdensome and costly for the manufacturers.⁷³ In this regard, an Australian trade association commented that e-label eliminates this type of technical barriers to trade.

Along with these challenges, the physical label was deemed to be ecologically costly.⁷⁴ The physical label often requires being printed or glued to the device, which can have a negative impact on the environment with regards to the waste produced, the materials used or the replacement of the old label. In comparison, an e-label only requires being embedded in the firmware which is most likely to be waste-free. The absence of space constraints in the e-label scheme can also be an asset to include details to consumers on how to environmentally dispose of the product.

The ACMA considered that the fact that *"it is increasingly common for electronic devices that are subject to the Labelling Notices to contain an integral in-built display (for example, mobile phones and laptops)"*⁷⁵ was an asset to overcome the challenges faced by manufacturers with the physical label. Thus, in response to these changes, it was *"proposed to amend the Labelling Notices to allow suppliers to include the compliance label in device's operating system, software or firmware for viewing on the device's built-in electronic display"*.⁷⁶ In addition to the fact that items such as smartphones can provide a label electronically, they also have the advantage to be used by a growing number of people.

Figure 11 shows the penetration rate of smartphones in Australia. Although no data were available for 2010 -when the e-label was adopted-, the penetration rate of smartphones in Australia has been constantly growing since 2012 (43.7%). As shows Figure 12, in comparison with the rest of the world Australia was the country with

⁷⁰ Ibid.

⁷¹ Interview with a representative from an ICT company.

⁷² Interviews with two representatives from ICT companies.

⁷³ Interviews with representatives from a Market Surveillance Authority and an ICT company

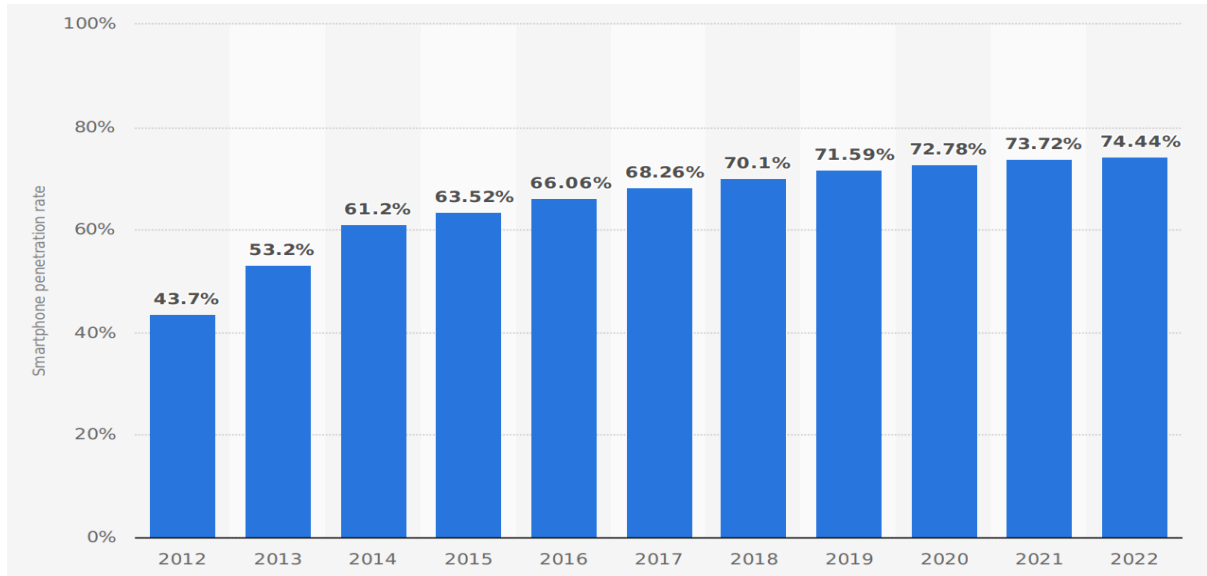
⁷⁴ Interview with a representative from an ICT company.

⁷⁵ ACMA, 2010. Electromagnetic compatibility, compliance and labelling information for supplier of electrical and electronic devices, vehicles and devices with internal combustion engines in Australia

⁷⁶ Ibid

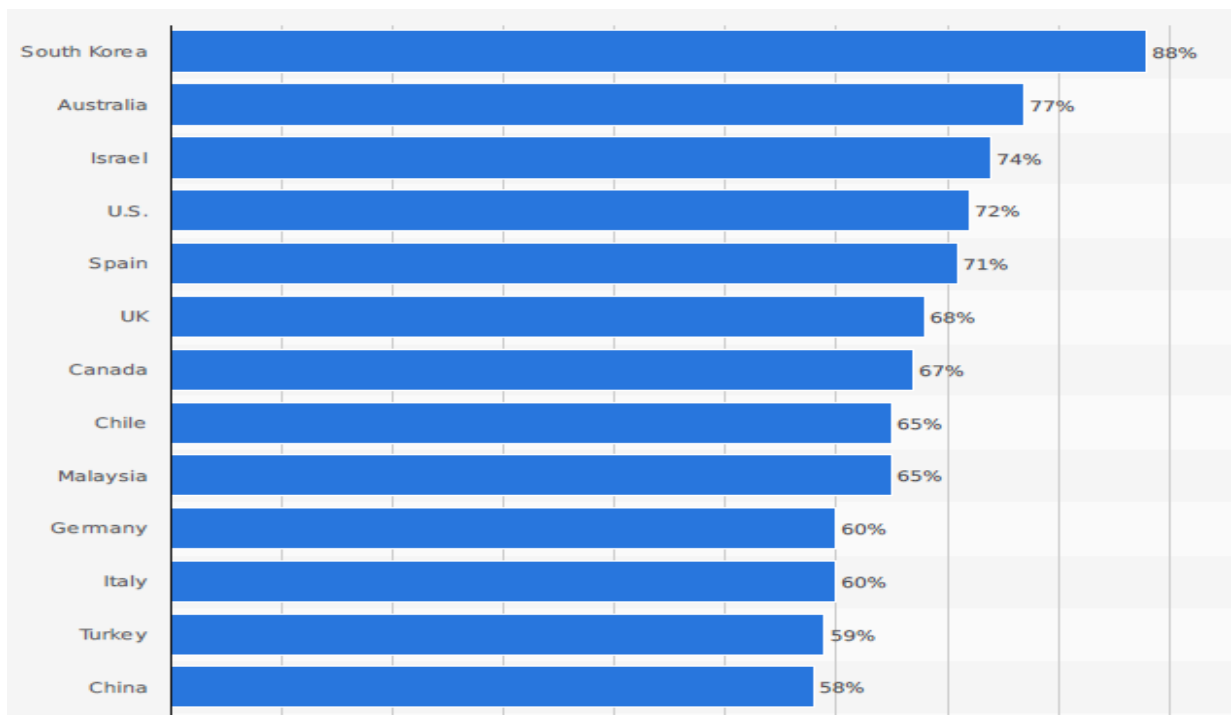
the second-highest penetration rate of smartphones in 2015. By 2022, about 74.4% of the Australian population is expected to own at least one smartphone and use it at least once per month (Figure 11).

Figure 11: Smartphones penetration rate as a share of the population in Australia from 2012 to 2022



Source: Statista DMO

Figure 12 Penetration rate of smartphones worldwide by country in 2015



Source: Statista

6.3 Effectiveness of the measure

In interviews conducted for this case study, manufacturers and market surveillance authority identified three types of positive impacts of e-labelling:

1. Cost reductions for industry;
2. Facilitation of product innovation; and
3. Better quality information and easier access for consumers.

The box below provides a number of examples for each of these impact types.

Table 4: Overview of key benefits of e-labelling

<p>Cost reductions for industry</p> <ol style="list-style-type: none">1. Fewer design constraints: As the label is electronically embedded in the firmware, manufacturers do not need to find space on the external surface to affix it⁷⁷ which eases the manufacturing process and thereby reduces costs, and leads to better, more aesthetically appealing products.2. The e-label is more complex to counterfeit: an e-label requires specialised equipment and knowledge to be faked⁷⁸. Better protection leads to higher compliance which means less interference with radiocommunications services, fewer hazardous effects on users' well-being and fair competition among manufacturers.3. The updating process for the e-label is more flexible: instead of adding a new compliance mark to a physical label, manufacturers can update it electronically. This is especially convenient for companies that export and need to update the label according to the requirements of the national market they are trading in⁷⁹. <p>Easier product innovation</p> <ol style="list-style-type: none">4. The electronic version of the label eases innovation of the product: one stakeholder mentioned that the electronic version of the label has contributed to innovation as one of the main design innovation is to reduce the size of the device⁸⁰. <p>Better quality information and access for consumers</p> <ol style="list-style-type: none">5. The e-label is more user-friendly⁸¹: under the physical label scheme, the multiplication of compliance marks coupled with the limited space could obstruct the information to be conveyed to the end user, limiting (instead of supporting) his/her decision-making
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⁷⁷ Interview with a representative from an ICT company.

⁷⁸ Interview with a representative from an ICT company.

⁷⁹ Interview with a representative from an ICT company.

⁸⁰ Interview with a representative from Information Technology & Innovation Foundation -ITIF-.

⁸¹ Interview with representatives from an ICT company and a Market Surveillance Authority.

process. One of the main impacts of the electronic label has been to ease the readability of the label for the user.

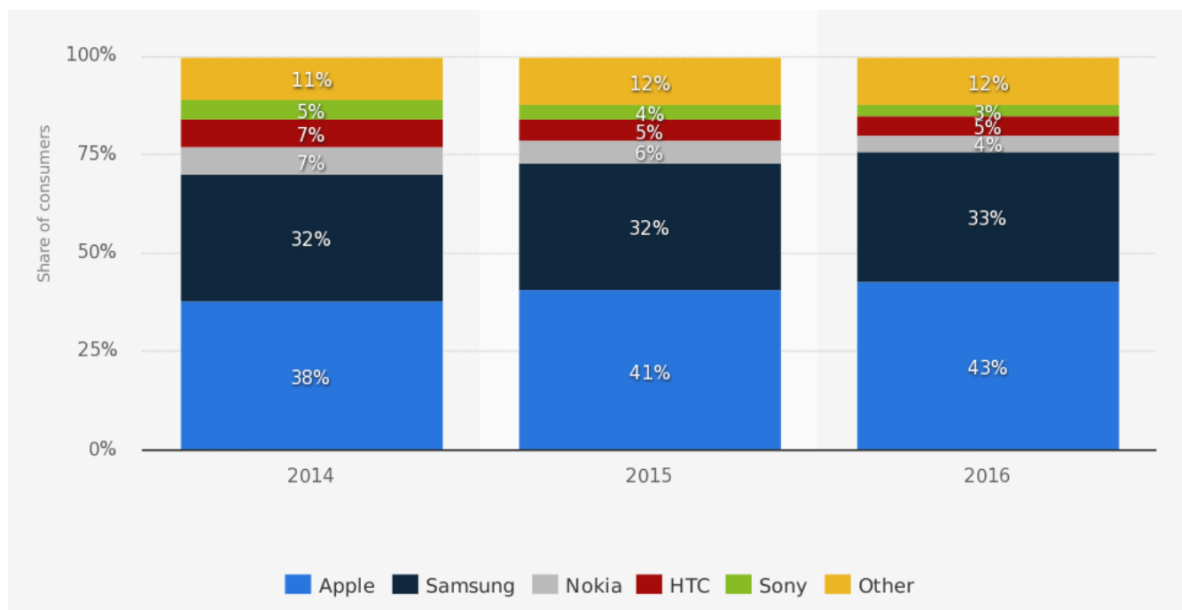
6. **The e-label is longer lasting than the physical version:** a printed label can be peeled off or easily damaged. In addition, some users take off the glued label after the purchase for aesthetical reasons⁸². This practice can damage the product and the information present on the label is no longer of any use for the consumer. With an electronic label, it is harder to erase or damage the compliance marks.

Given the above advantages, most of the main ICT companies have adopted e-labelling.⁸³

Said that, ICT manufacturing is not one of the Australian leading industry and the country is net importer of ICT products⁸⁴. Therefore, the scheme results to be mainly adopted by multinational players.

Figure 13 and Figure 14 respectively show the market share of smartphones vendors in Australia for 2014-2016 and of tablets vendors for 2015-2016. In 2016, 43% of the smartphones and 47.45% of the tablets owned in Australia were Apple devices.

Figure 13: Market share of smartphones vendors in Australia (2014-2016)



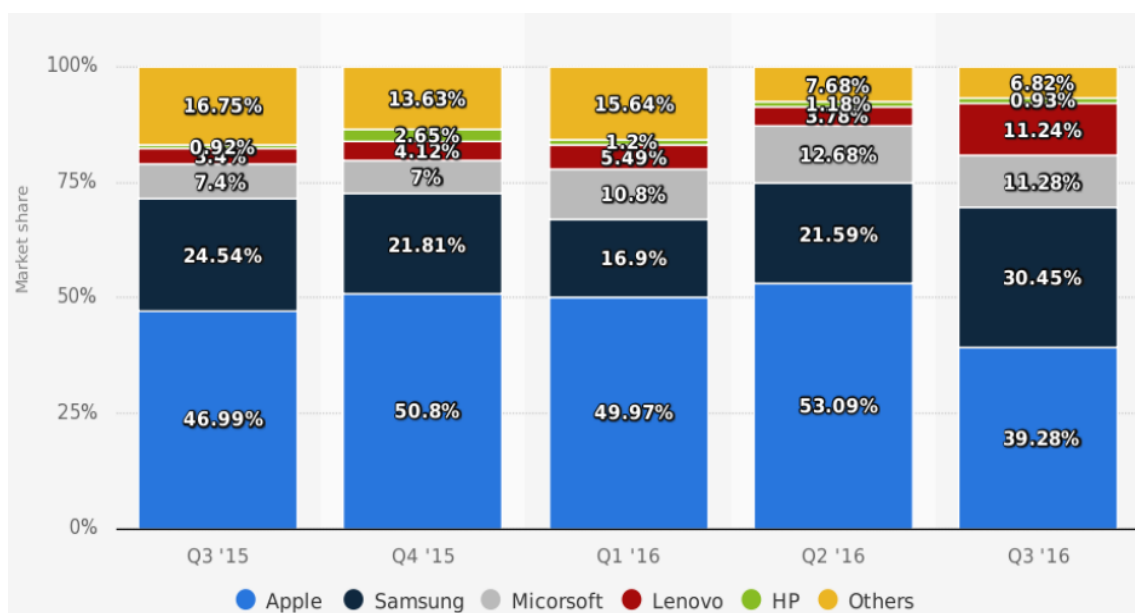
Source: Statista

⁸² Interview with a representative from an ICT company.

⁸³ This assumption comes from the inputs provided by the other case studies as well as from the fact that the main players of the ICT industry are multinational companies. It is very likely that they will use the e-label scheme where it is allowed.

⁸⁴ Interview with a representative from a trade association.

Figure 14: Market share of tablets vendors in Australia (2015-2016)



Source: Statista

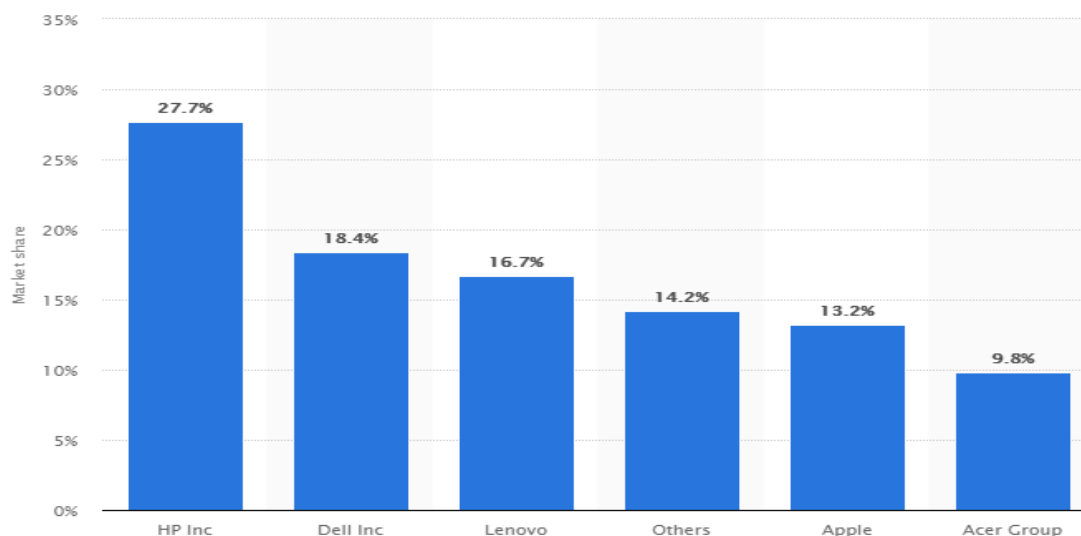
Apple devices in Australia use e-labels, as confirmed by one of the interviewee.⁸⁵ Then it can be inferred that at least 43% of the smartphones and 47.45% of tablets had an e-label in 2016. As Samsung, HTC, HP, Lenovo are multinational companies that apply e-label in Australia,⁸⁶ it can be estimated that approximately 81% of the smartphones and 78% of the tablets present on the Australian market in 2016 were using the e-label.

The same conclusions can be drawn with regards to the laptop market. Figure 15 presents the market share of PC vendors in Australia in 2017, which is concentrated among 5 main stakeholders, all international companies which make use of e-label on their products. Thus, it can be estimated that in 2017 approximately 85.8% of the PC sold in Australia were provided with an e-label.

⁸⁵ Interview with a representative from an ICT company.

⁸⁶ Ibid.

Figure 15: Market share of PC vendors in Australia (2017)



Source: Statista

Consequently, it can be considered that following its adoption, the e-label scheme has been applied to a significant share of the ICT devices in Australia.

6.4 Efficiency of the measure

While it was difficult for stakeholders to quantify costs and benefits, most had a clear opinion on the direction and the order of magnitude of the impacts of e-labelling.

According to ACMA, the e-label is a cost-saving alternative to physical labelling.⁸⁷ In fact prior to the introduction of e-labelling, all manufacturers had to print or to mould one label per device. Despite this cost reduction impact, such cost savings are not very significant in magnitude (except in very large production runs⁸⁸). The biggest cost item is the compliance work required to obtain the right to use the label rather than the costs of etching the label itself. This background work remains the same regardless of the form of the label.

Aside from the manufacturers, Market Surveillance Authorities and the customs are the main actors impacted by the change in the labelling scheme. Their role is to check the whether the compliance documentation held by the manufacturer matches the label on the device.

Overall, the introduction of e-labelling has had no effect on the market surveillance process itself. Indeed, the presence of a label on the device (electronic or otherwise)

⁸⁷ Interview with a representative from a Market Surveillance Authority.

⁸⁸ Interview with a representative from an ICT company.

does not mean the device is compliant, it is the compliance documentation (test reports, Declarations of Conformity, CB statements etc.) that demonstrates compliance. When the ACMA introduced the e-label the record keeping requirements did not change.⁸⁹ So, the time required to assess the match between the records and the label remains the same. The electronic label is just another way to display compliance information.

At the same time, the e-label has helped the Market Surveillance Authority identify the label on the device. Indeed, the location of the physical label was not consistent across devices (e.g. some were positioned on the front or on the back while others were on the package or even inside the product) and physical labels could easily be damaged which would obstruct readability. In comparison, the e-label is always located in the firmware and therefore easily located and always readable.⁹⁰

6.5 Conclusions

An e-labelling scheme was introduced in Australia in 2010 for devices with a built-in display. This makes Australia the first country to have introduced such a scheme applied to a broad base of products.

In comparison to a physical label, the adoption of e-labelling has had several positive impacts for manufacturers. Indeed, the e-label more aesthetically appealing than a physical label and there are fewer design constraints due to the limited space available on the external surface of the product. In addition, updating compliance information is easier, which can be a valuable asset for companies, especially if they operate in multiple markets.

For consumers, the e-label has increased user-friendliness and it is longer lasting than a physical label.

Finally, from the perspective of customs and market surveillance agencies, the e-label is more resistant to fraud because its modification is more complex than for a physical label. At the same time, the introduction of the e-label has had no impact on the effectiveness of the market surveillance checking process. However, for the Market Surveillance Authority the e-label is easier to find and always readable.

As for manufacturers, the results reported in terms of cost-savings are more mixed, cost savings are not very significant except in very large production volumes. Indeed, the biggest cost related to the label is not the cost of production of the label itself but the compliance work needed to be allowed to use the label. This one remains the same regardless the label scheme.

⁸⁹ Ibid.

⁹⁰ Interview with a representative from a ICT company.

7 Singapore

7.1 Background and description of the measure

In the context of Singapore's regulatory framework, telecommunication equipment includes any appliance, apparatus or accessory used or intended to be used for telecommunications. This definition as well as the overall telecommunication equipment regime is incorporated within the legal provisions of the Telecommunications Act⁹¹ and its sub-acts, such as the Telecommunications (Dealers) Regulations⁹² (below referred as the "Regulations"). In this respect, telecommunication equipment dealers⁹³ are obliged to comply with the mandatory requirements of these Regulations. To conduct their activities, dealers need to obtain licences, issued by the Infocomm and Media Development Authority of Singapore – IMDA (before October 2016 - Information Development Authority of Singapore – IDA), which is the main regulator of the telecom industry (below also referred as the "Authority"). Two different types of licences are allowed:

- Dealer's Class Licence (not requiring approval from the Authority as long as dealers cover any type-approved equipment⁹⁴, registered equipment⁹⁵ or equipment explicitly listed in the Regulations⁹⁶) or
- Dealer's Individual Licence (in all other cases under specific circumstances).

Once licenced, dealers must meet a certain set of conditions, as stipulated by the Regulations. In accordance with condition 8(a) of the Dealer's Class Licence and condition 12(a) of the Dealer's Individual Licence dealers are obliged to affix on any telecommunication equipment, labels, considered necessary by the Authority, before such equipment is displayed or offered for sale. This obligation is elaborated in further details in the Requirements for Telecommunication Equipment Labels (below referred as the "Requirements")⁹⁷, issued by the Authority. The primary purpose of the Requirements is to facilitate the easy identification of telecommunication equipment which is approved for use in Singapore. In section 4 of the Requirements it is provided

⁹¹ Telecommunications Act (Chapter 323), Original Enactment: Act 43 of 1999, Revised Edition 31.12.2000. Available at: <https://sso.agc.gov.sg/Act/TA1999>

⁹² Telecommunications Act (Chapter 323, Section 74), Telecommunications (Dealers) Regulations (Rg. 6), G.N. No. S 185/2003. Revised Edition 31.12.2004. Available: <https://sso.agc.gov.sg/SL/TA1999-RG6?DocDate=20041231>

⁹³ "Every person who manufactures, imports for sale, lets for hire, sells, or offers or possesses for sale any equipment which is capable of being used for the purpose of telecommunication, and includes an employee of the dealer.", according to the Telecommunications (Dealers) Regulations

⁹⁴ "Any telecommunication equipment approve for sale under the Regulation 20 (1)", according to the Telecommunications (Dealers) Regulations

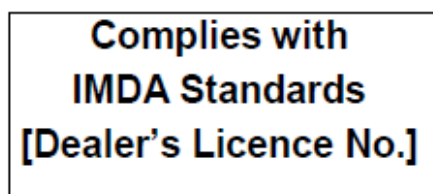
⁹⁵ "Any telecommunication equipment registered for sale under the Regulation 21 (1)", according to the Telecommunications (Dealers) Regulations

⁹⁶ "Telephone (Standard/Multi-Feature/Image/Data/Switching); Telephone Line Interface; Telephone Ancillary; Autodialler; Auto Answering/Recording Set' Caller Identification Equipment; Security Alarm System; Facsimile Transceiver; Voice Band Modem; EFTPOS/CCAT; Telex Equipment; Digital Leased Circuit Equipment; Other equipment as determined by the relevant authority", according to the Telecommunications (Dealers) Regulations

⁹⁷ Requirements for Telecommunication Equipment Labels. Version 1.10.2016. Available at: https://www.imda.gov.sg/-/media/imda/files/regulation-licensing-and-consultations/licensing/licenses/telecomequplabel_adv.pdf?la=en

that dealers must affix a **compliance label** on the equipment or on its instruction manual or packaging before such equipment is displayed or offered for sale for use in Singapore. The following mandatory dimensions of the compliance label are provided:

Figure 16: Compliance label dimensions



Label Size 17mm by 9mm
(Not to Scale)

Source: IMDA

According to the Requirements, the compliance label indicates that the equipment⁹⁸:

- complies with the standards and specifications published by the Authority;
- is compatible with the public telecommunication networks in Singapore;
- does not cause radio frequency interference to other authorised radio-communication networks.

In 2012, the Authority took the initiative and revised the Requirements, allowing licenced dealers to voluntarily use the **electronic compliance labelling**. This initiative emerged from regular briefing/dialogue sessions with telecommunication equipment dealers⁹⁹, along with consumer feedback. The Authority received several industry requests for electronic compliance labelling for registered telecommunication equipment.¹⁰⁰ As a result, the revision came into force on 4 April 2012 and provided the dealers the possibility to display the compliance label on the equipment's built-in display screen. The label may have dimensions different from the ones stipulated in the Requirements, but only after prior written approval of the Authority. In addition, when implementing the electronic compliance labelling, dealers are obliged to provide in the equipment packaging¹⁰¹:

- an instruction guide or leaflet, describing the method adopted to display the compliance label;

⁹⁸ Grandy, S. (2012). Singapore – Electronic Compliance Labels Allowed. Rheitech. Available at: <http://www.rheitech.com/singapore-e2-80-93-electronic-compliance-labels-allowed>

⁹⁹ Interviews with a representatives from ICT companies.

¹⁰⁰ Interview with a representative from a Market Surveillance Authority.

¹⁰¹ IMDA (2017). IDA revises telecom-related requirements. Available at: <https://www.imda.gov.sg/infocomm-and-media-news/buzz-central/2012/4/ida-revises-telecomrelated-requirements>

- clear information for consumers about where to locate the electronic compliance label for verification.

7.2 Relevance of the measure

Singapore has one of the most advanced ICT networks in the world with very high levels of access.¹⁰²

According to statistical data from 2017, Singapore is among the top 20 countries in the world with highest ICT development index.¹⁰³ In 2013 it was estimated that ICT goods make up almost a quarter of the value of Singapore's GDP with telecommunications being the third largest sector.¹⁰⁴

Over the years, Singapore has laid the foundations for a digital strategy aimed at making the country digitally ready to thrive in the future economy¹⁰⁵ and this is expected to be achieved through¹⁰⁶:

- upgraded manpower, equipped with the right skills and talents;
- digital literacy across the nation;
- regulatory sandboxes¹⁰⁷ to encourage innovation within a safe and confined location;
- upgraded solutions, practices and sectors to the digital age.

These key points summarise the systematic approach of the Singaporean government to follow the world digitalisation trends, which has resulted in further development of the ICT sector and the trade of telecommunication electrical equipment.

Moreover, in terms of consumer technology adoption, Singapore is one of the countries in the Asia Pacific region with highest percentage of smartphone penetration.¹⁰⁸ Statistics show that the number of smartphone users among the population of Singapore (approximately 5.6 million) is growing steadily:

¹⁰² (2018) Introduction to ICT in Singapore. Available at:

<https://wiki.nus.edu.sg/display/cs1105groupreports/Introduction+to+ICT+in+Singapore>

¹⁰³ Statista (2018). Information and communication technology (ICT) development index ranking top-20 countries in 2017. Available at: <https://www.statista.com/statistics/267083/top-20-countries-in-ict-development-index/>

¹⁰⁴ Enterprise Canada Network (2013). Information and Communication Technology (ICT) Market Profile - Singapore. Available at: <https://www.enterpriseacanadanetwork.ca/uploads/resources/Information-and-Communication-Technology-ICT-Market-Profile-Singapore.pdf>

¹⁰⁵ Kan, F. (2017). Preparing for the digital future. IMDA. Available at:

<https://www.imda.gov.sg/infocomm-and-media-news/buzz-central/2017/6/preparing-for-the-digital-future>

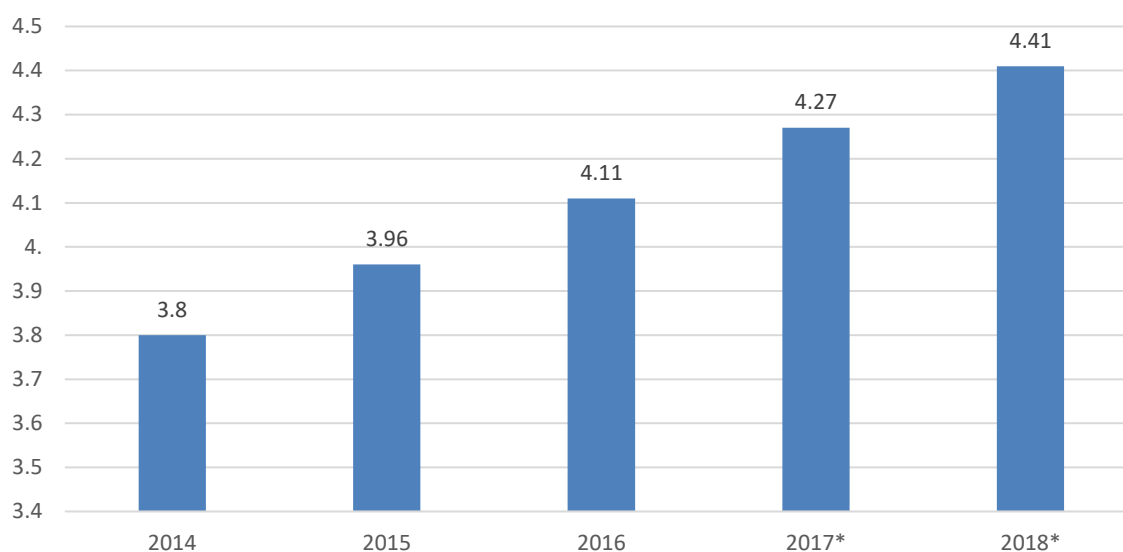
¹⁰⁶ Kan, F. (2017). Preparing for the digital future. IMDA. Available at:

<https://www.imda.gov.sg/infocomm-and-media-news/buzz-central/2017/6/preparing-for-the-digital-future>

¹⁰⁷ Conducive spaces where certain regulatory requirements are relaxed for a period of time.

¹⁰⁸ Statista (2018). Smartphone buyer penetration in Asia Pacific from 2013 to 2015, by country. Available at: <https://www.statista.com/statistics/545062/smartphone-buyer-penetration-asia-pacific-by-country/>

Figure 17: Number of smartphone users in Singapore from 2014 to 2018 (in millions)



Source: Statista DMO, 2016 Forecast

The presence of such number of devices on the market proves on one hand the progress of the Singapore ICT economy, but also raises some concerns. In this respect, one of the most pressing issues is the counterfeiting of telecommunication equipment. Combating counterfeits is as one of the top priorities for the market surveillance authority.

According to the introductory part of the Requirements, the Singaporean compliance label for telecommunication equipment is meant to:

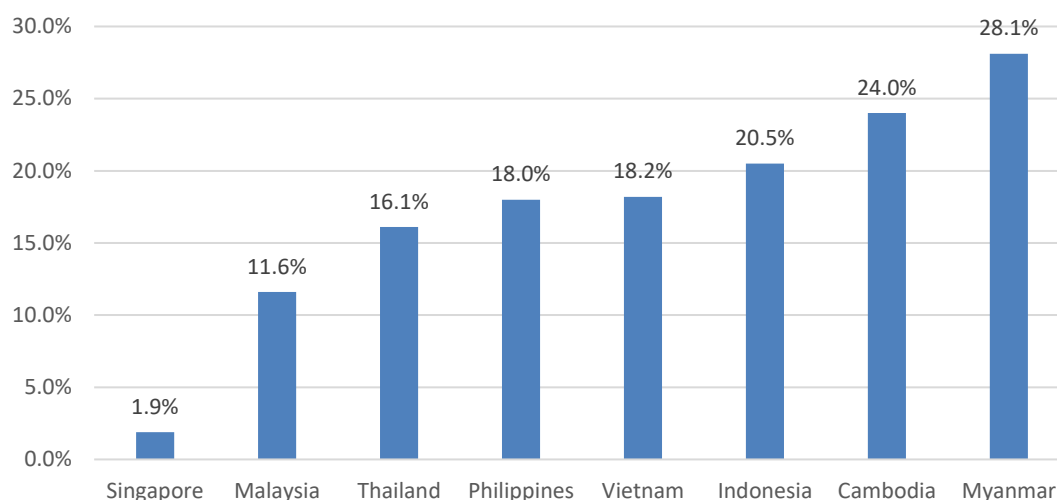
- provide greater assurance to consumers at the point of purchase that the telecommunication equipment has been approved for use in Singapore;
- identify the registered equipment suppliers.

Including the compliance option of displaying the label on the equipment's in-built screen is meant to be a next step in this direction.

Although there is no explicit statistical data reflecting whether or not the electronic compliance labelling has affected counterfeit goods presence on the national telecom market, in 2015 Singapore stood out in the world ranking with lowest volume of lost sales due to counterfeiting of smartphones - less than 2%¹⁰⁹. This sets Singapore apart from other countries in ASEAN region (see Figure 18).

¹⁰⁹ EUIPO, The economic cost of IPR infringement in the smartphones sector, 2017, p. 6. Available at: https://www.indprop.gov.sk/swift_data/source/images/novinky/2017/03/smartphone_sector_en.pdf

Figure 18: Lost sales due to counterfeiting of smartphones by ASEAN countries in 2015 (%)



Source: VVA calculations based on EUIPO, 2017¹¹⁰

Generally low levels of non-compliance were also confirmed by IMDA and industry representatives.¹¹¹ If any, the anti-counterfeiting effect of e-labelling is considered positive, since on one hand such labels cannot be pasted over or worn out and on the other, e-labelling certification software is fully controlled by the respective manufacturer, which makes it more difficult to falsify.¹¹²

However, when introducing the e-labelling, the regulator did not focus on counterfeiting goods, but it gave priority to two other main objectives¹¹³:

- to streamline the existing licencing and equipment registration processes and
- to reduce business cost for telecommunication service providers and equipment dealers.

And such actions are consistent with the market surveillance authority's general approach, as IMDA's main goal is to promote a competitive market, while encouraging innovation that brings benefits to industry and consumers.¹¹⁴

¹¹⁰ EUIPO, The economic cost of IPR infringement in the smartphones sector, 2017, p. 6. Available at: https://www.indprop.gov.sk/swift_data/source/images/novinky/2017/03/smartphone_sector_en.pdf

¹¹¹ Interview with a representative from a Market Surveillance Authority and representatives of ICT companies.

¹¹² Interview with a representative from an ICT company.

¹¹³ IMDA (2017). IDA Revises Telecom-Related Requirements to Help Businesses Streamline Processes and Reduce Costs. Available at: <https://www.imda.gov.sg/about/newsroom/archived/ida/media-releases/2012/ida-revises-telecom-related-requirements-to-help-businesses-streamline-processes-and-reduce-costs>

¹¹⁴ IMDA (2018). What We Do. Available at: <https://www.imda.gov.sg/about/what-we-do>

After introducing the electronic compliance labelling scheme, IMDA also enhanced the online Telecoms Licencing portal¹¹⁵ to facilitate faster renewal of equipment registration.¹¹⁶ In this way, it provided to dealers more flexibility in complying with the equipment labelling requirements in a cost-effective matter.¹¹⁷

7.3 Effectiveness of the measure

In Singapore, introducing the electronic compliance label aimed on one hand to facilitate the current registration and licencing processes, managed by the Authority, and on the other to reduce costs for the telecom businesses. However, the initiative not only fulfilled its objectives but brought additional societal benefits to industry (manufacturers), and users (consumers and market surveillance authority). Examples are provided in the box below:

Table 5: Overview of e-labelling benefits

<p>Reduction of costs for the industry (ITIF, 2017):</p> <ol style="list-style-type: none">1. Time-consuming design and expensive equipment costs Due to changing aesthetics, manufacturers often struggle to catch up with the rapid technological developments of ICT products. Some devices that are on the market are with small size, which does not allow affixing physical label, especially if multiple logos have to be shown.¹¹⁸ Such size constraints issues could be easily resolved by displaying the certification information on the screen of the telecommunication equipment¹¹⁹;2. Manufacturing costs Electronic compliance label drastically reduces the expenses for creation, control, maintenance, and production of markings, packaging, and instruction sheets that have traditionally been used to convey required certification or conditions-of-use information. These costs could be even higher in case of label modification, re-working of products and in-country retrofits;3. Compliance costs for producers and exporters operating across multiple countries Usually, the purpose of these costs are country-to-country differences in technical regulation and standards and conformity assessment procedures. The latter are particularly daunting for SMEs. Additionally, different regulations and standards reduce the ability of companies to increase productivity through economies of scale. Such compliance costs may be:<ul style="list-style-type: none">• Direct - hiring of technical consultants to interpret foreign regulations, increased investment in production facilities, and undertaking of additional certification procedures;

¹¹⁵ Available at: <https://eservice.imda.gov.sg/tls>

¹¹⁶ IMDA (2017). IDA revises telecom-related requirements. Available at: <https://www.imda.gov.sg/infocomm-and-media-news/buzz-central/2012/4/ida-revises-telecomrelated-requirements>

¹¹⁷ Interview with a representative from a Market Surveillance Authority.

¹¹⁸ Interview with a representative from an ICT company.

¹¹⁹ Interview with a representative from an ICT company.

- Indirect - higher inventory and procurement expenses, and loss of sales due to delays in product launches.

These costs are faced by companies that often prepare global labels in order to ship telecommunication equipment around the world. In this respect, e-labelling has proven to be effective when meeting the requirements of different regulatory regimes¹²⁰.

Waste reduction and environmental protection

When physical labels are recalled or replaced, companies have to dispose of the outdated materials, which could be a process detrimental for the environment (ITIF, 2017). Being paperless, e-labelling excludes the waste problem and is considered environmental friendly.¹²¹

Better and more secure access to information

When the label is displayed on a screen, the information could be easily accessed and verified by the market surveillance authority and consumers.¹²² Moreover, electronic compliance label is secure and not directly user accessible, which reduces the risk that consumer is uninformed due to impaired certification information. While physical labels could get easily tampered with, e-label cannot be scratched, damaged or lost.¹²³

¹²⁰ Interview with a representative from an ICT company.

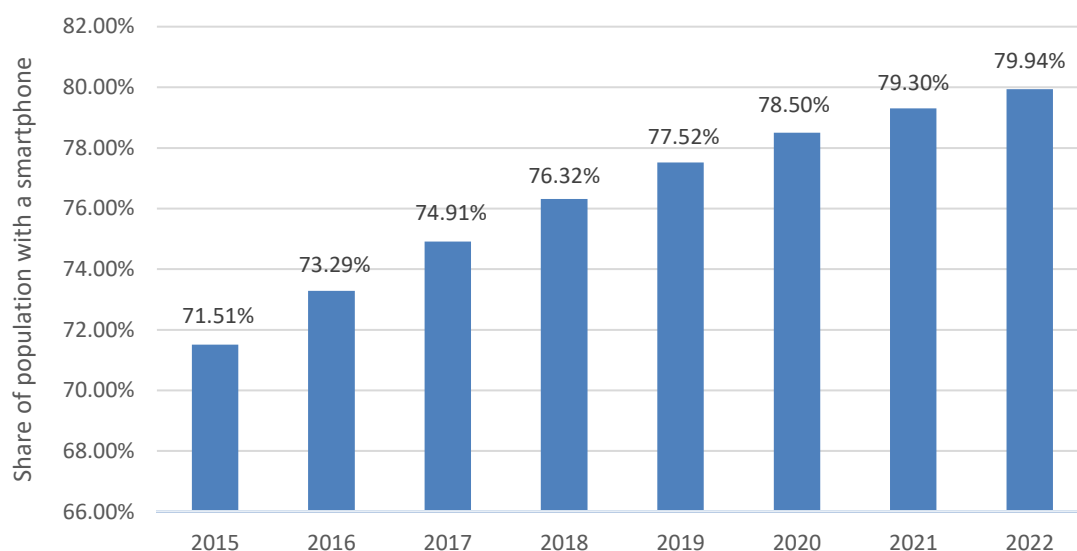
¹²¹ Interview with a representative from an ICT company.

¹²² Interview with a representative from an ICT company.

¹²³ Interview with a representative from an ICT company.

When assessing e-labelling effectiveness in terms of **user uptake**, we should take into account the smartphone penetration that has been in steady growth during the last few years and is expected to raise further in near future (see Figure 19):

Figure 19: Smartphone penetration as share of population in Singapore 2015-2022



Source: Statista DMO, 2016

In terms of **industry uptake**, businesses have generally welcomed the e-labelling scheme.¹²⁴ Companies consider it cost-effective and with a number of intangible benefits, generally making products easier to launch and market.¹²⁵

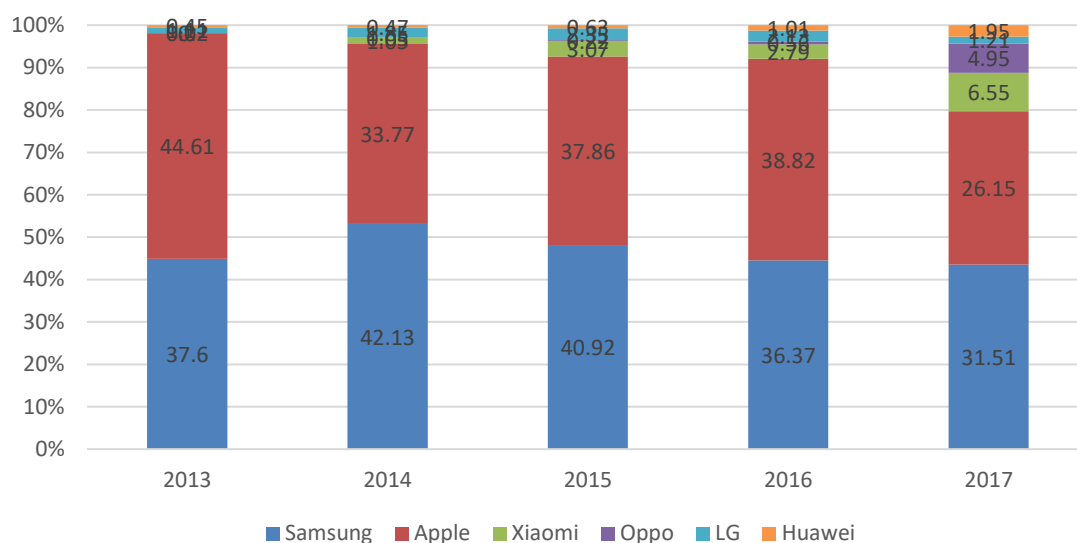
At the moment, Singaporean telecom market is characterised with uneven distribution of shares in favour of well-known mobile vendors, world leaders in the field, who not only trade but also manufacture smartphones¹²⁶.

¹²⁴ Interview with a representative from a Market Surveillance Authority.

¹²⁵ Interview with a representative from an ICT company.

¹²⁶ Hio, L. (2017). One in five smartphones sold in Singapore in 2017 is from a Chinese vendor. The Straits Times. Available at: <http://www.straitstimes.com/tech/smartphones/one-in-five-smartphones-sold-in-singapore-in-2017-is-from-a-chinese-vendor>

Figure 20: Main mobile vendors market share in Singapore 2013-2017



Source: StatCounter, 2017

According to our desk research and conducted interviews, these companies have adopted the electronic compliance labelling scheme.¹²⁷ Therefore, we may conclude that around 80-90% of the smartphones in Singapore implemented electronic compliance label in the period 2013-2017 period. This take-up is not surprising considering e-labelling's benefits and low costs for the different groups of stakeholders.

7.4 Efficiency of the measure

With the revision of the Requirements from 4 April 2012, the Authority (IMDA) aimed to remove administrative burden from the licencing and registration procedures, and to reduce the costs for telecommunication equipment dealers. In reality, adopting electronic compliance labelling has impacted the telecom market in much greater depth. In its regulatory framework, the Authority mandated a minimum set of compliance information to be displayed, but also established a regime with requirements and particularities that are not very specific and detailed.

This framework creates a number of benefits and costs for all categories of stakeholders involved.

The **Authority** and **customs officials** benefit from the electronic compliance labelling mainly through facilitated enforcement of the existing regulations. When consulted, the Authority specified that in terms of quick identification of the

¹²⁷ Assumption made on the basis of desk research and conducted interviews with representatives from ICT companies and a Market Surveillance Authority.

compliance label, the traditional physical labelling has already proven effective and delivered positive results.¹²⁸

In fact, the e-label contains the same amount of mandatory information than the physical one, but as compliance information is kept electronically, the possibility for dealers to regularly and remotely update this information offers real-time status of conformity with the Requirements. Therefore, the government officials can easily check whether a manufacturer has made any changes by simply verifying the e-label on devices' built-in screen.

In terms of drawbacks, the Authority has considered potential risks that enforcement officers may not be able to identify approved/registered telecommunication equipment with e-labels if devices could not be turned on for whatever reason (e.g., broken or lost power). However, it was concluded that these risks are not substantial since dealers have to ensure that the equipment packaging contains information where to locate the electronic compliance label for verification.¹²⁹

The Authority did not prescribe any particular solution for resolving this potential issue, leaving the responsibility to the dealers to guarantee compliance with the possible technical drawbacks.

Moreover, officers can use the Telecoms Licencing portal, where they can check online whether or not the telecommunication equipment is registered.¹³⁰

In general, with the introduction of the e-labelling scheme, the IMDA believe to have made better use of technology advances while meeting the existing regulatory needs.¹³¹

As confirmed by the market authority, the transition from physical labelling system to electronic one has not brought any significant costs. Indeed, no substantial recurring costs were identified in terms of parallel use and maintenance of any "legacy" system, due to prompt update of all relevant documents on equipment labelling requirements.¹³² The regulator also elaborated on the technical costs, related to providing enforcement officers online or offline access to the Telecoms Licencing portal, maintaining the system and training the staff on how to use it. The Authority was clear that none of the above was a significant cost in adopting the e-labelling scheme.¹³³

For the **industry**, there are evidences of the benefits of e-labelling, especially when it comes to cost-saving. Some of the main types of costs that are significantly reduced by the use of electronic compliance label have already been listed in Table 5. Additionally, when consulted, stakeholders place emphasis on the reduction of

¹²⁸ Interview with a representative from a Market Surveillance Authority.

¹²⁹ Interview with a representative from a Market Surveillance Authority.

¹³⁰ Interview with a representative from a Market Surveillance Authority.

¹³¹ Interview with a representative from a Market Surveillance Authority.

¹³² Interview with a representative from a Market Surveillance Authority.

¹³³ Interview with a representative from a Market Surveillance Authority.

printing and labour costs incurred during manufacturing¹³⁴, as well as supply chain inventory management costs¹³⁵ (for example, see Table 6).

Moreover, thanks to electronic labels, companies eliminate any costs related to re-printing and re-affixing labels following updates in compliance requirements.¹³⁶

Table 6: Examples of cost reduction for the industry¹³⁷

<ul style="list-style-type: none">• Saving on lead time: Normal supply chain lead time is estimated to 10 days shipment and 10 days production. Additionally, artwork preparation, vendor printing and delivery takes around 10 working days. E-labelling reduces the total lead time of 30 days with approx. 50%, i.e. 15 days.• Saving on labour costs (e.g. number of hours needed for artwork preparation, approval process etc.) If 40 working hours per week are allocated to each product, it is estimated that one off 10% saving (about 4 hours) is achieved through the use of e-labelling.• Saving on label procurement costs For a new product launch, normally, it is needed around 1 million physical labels at the cost of USD \$0.002 per label. It is estimated that if e-labelling is applied, around USD \$2,000 per new product launch are saved. Same is the cost saving in terms of production of already existing product.
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If, however, information written on the labels of devices already placed on the market has to be changed or adapted, e-labelling provides a more flexible way to do so. Industry considers less burdensome to update the certification software of the electronic labels than to amend physical certification or labelling marks.¹³⁸

By making the system voluntary the regulator aimed at minimizing any adaptation cost for the industry. The IMDA has also informed dealers about e-labelling through a media release and letters in order to avoid any possible disruption of the existing business operations.¹³⁹

The IMDA also offers flexibility in terms of displaying the information, in fact, upon written approval from the Authority, dealers have the option to change label's dimension.

Regarding **consumers'** use of electronic labelling, it may be summarized that e-labels offer a more accessible and understandable mechanism to find the mark that

¹³⁴ Interview with a representative from a Market Surveillance Authority.

¹³⁵ Interview with a representative from an ICT company.

¹³⁶ Interview with a representative from a Market Surveillance Authority.

¹³⁷ The examples were provided in the context of simulation during interview with a representative from an ICT company.

¹³⁸ Interview with a representative from an ICT company.

¹³⁹ Interview with a representative from a Market Surveillance Authority.

is relevant and any further details the dealer is allowed to include (ITIF, 2017). Furthermore, because there are fewer size constraints when it comes to the electronic display of information, e-labels can be considered more accessible, comprehensive, and readable for the consumers (ITIF, 2017). Also, consumers could benefit by receiving additional useful information, for instance, how to environmentally dispose of the product (ITIF, 2017). Such aspects not only add value for consumers but they are also coherent with other labelling initiatives that have existed already for decades in Singapore and are embedded in its regulatory system and society¹⁴⁰.

No substantial drawbacks for consumers were identified by stakeholders. The only potential risk highlighted is related to the general possibility that consumers may not be able to identify the approved/registered equipment marked with electronic compliance label.¹⁴¹ This concern has been mitigated by making dealers responsible to ensure that the equipment packaging contains information on where to locate the label for verification. Additionally, consumers also have access to the Telecoms Licencing portal, where they can verify online through the 'Equipment Search' function if the telecommunication equipment is registered.¹⁴²

When assessing the overall efficiency of the scheme, it may be concluded that e-labelling reduces or eliminates the costs without sacrificing a user's access to relevant regulatory information (ITIF, 2017). The electronic compliance labelling has proven to be a balanced regulatory measure, that demonstrates cost-effectiveness and efficiency for all the categories of stakeholders.

7.5 Conclusions

Singapore has adopted e-labelling as an optional approach of fulfilling the requirement for affixing compliance label to telecommunication equipment. Subject to this obligation are dealers licenced under Dealer's Class Licence and Dealer's Individual Licence, as stipulated by the Telecommunications (Dealers) Regulations and, most notably, the Requirements for Telecommunication Equipment Labels. The electronic labelling scheme was introduced in the form of revision of these Requirements. As a result, dealers are allowed to display the compliance label on the built-in display screen of the telecommunication equipment. In addition, they have the obligation to inform the users that electronic labelling is preferred method for compliance and to provide clear information on how to access this information.

Bearing in mind the development of the telecom market in Singapore and its role on the world ICT scene, e-labelling may be considered a logical and relevant regulatory step, following the trends observed on the territory of other countries-frontrunners in the field of technological development and telecommunication. When revising the existing regulatory framework, the Authority has set a dual objective - to modernise

¹⁴⁰ For example, the Singapore Green Labelling Scheme (<https://sgls.sec.org.sg>) was launched in 1992 to endorse industrial and consumer products (among which many electronics) that have less undesirable effects on the environment.

¹⁴¹ Interview with a representative from a Market Surveillance Authority.

¹⁴² Interview with a representative from a Market Surveillance Authority.

the existing licencing and registration processes and to reduce existing costs for the telecom industry. Although being a voluntary option for the dealers of telecommunication equipment, the electronic compliance labelling influenced the telecom market and affected the main industry players. On the other side, IMDA has shown resilience by establishing a regime providing flexibility to the industry to find the right tools for tackling potential issues and barriers.

However, this is not an ending point for the e-labelling initiative. Currently, IMDA is assessing options for further development of the scheme. For example, possible next step is to allow telecommunication equipment dealers to affix QR code that provides link either to manufacturer's website or to an online database, created by the Authority, where the electronic compliance label is displayed.¹⁴³

Overall, since it was introduced in 2012, e-labelling is estimated to have rather positive societal effect, without evidence of causing unnecessary administrative burden or compliance costs. Indeed, by reducing the costs and ensuring better accessibility and verification mechanisms, the electronic label provides benefits for market surveillance and customs authorities, industry and consumers. At the same time, the identified drawbacks are considered minor, since there are various opportunities for compensating the costs, both in terms of policy and technology.

The cost-effectiveness and efficiency of e-labelling in Singapore can be a lesson for initiatives to replace paper-based product labels with electronic ones. Industry is putting efforts to push e-labelling in a number of countries, because businesses believe that the scheme better responds to regulators' concerns and ensures that the consumer is well-informed.¹⁴⁴ Although, for the moment, e-labelling is not widespread enough to create global impact, Singapore's example reaffirms that e-labelling can provide easier accessibility, more interactivity and better enforcement, at a lower cost, which in the end results in higher levels of product safety and consumer trust.

¹⁴³ Interview with a representative from an ICT company.

¹⁴⁴ Interview with a representative from an ICT company.

8 ANNEX 1: Stakeholder list

Table 7: List of stakeholders interviewed

Affiliation	Country
ACMA	Australia
Apple	Australia
IBM	Australia
Standards Australia	Australia
IMDA	Singapore
Dell	Singapore
Apple	Singapore
Dell	USA
Dell	USA
FCC	USA
HPE	USA
ITI	USA
ITIF	USA
Intel	USA
Intel	USA
NEMA	USA
NEMA	USA
TIA	USA
TIA	USA

The interviewees' details have been anonymised.

9 ANNEX 2: List of literature

Table 8: List of literature

- ACMA (Australian Communications and Media Authority) (2010a), *Electromagnetic compatibility compliance and labelling. Information for suppliers of electrical and electronic devices, vehicles and devices with internal combustion engines in Australia.*
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