Deepening Asia–Europe Connectivity through ICT

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Every day we are witness to how information and communication technology (ICT) is transforming our lives and our world. ICT increases productivity, innovation, efficiency, sociability, and strengthens relationships. Mobile phones and social media enable people to 'virtually' reunite with families and friends. ICT also facilitates the formation of communities that span nations and are based on shared interests.

In business, a recent study of businesses around the world reveal that 'firm growth and productivity are substantially higher when Internet access is greater and when firms use the Internet more intensively' (Clarke et al., 2015).[1] Furthermore, the Internet 'benefits firms of both high- and low-tech industries, firms of all sizes, and firms with and without exporting'. Even more attractive is that 'Small firms benefit more from Internet than large firms do'.

In governance, ICT has augmented information flows among citizens and stakeholders, increased transparency, opened new ways to deliver public service, and enabled greater citizen participation. Already, all United Nations member countries (in all income levels) are delivering e-services to their citizens (United Nations, 2014).

In the 10th Asia–Europe Meeting in Milan, the Leaders of the Asia–Europe Meeting (ASEM) underscored that ICT is a key element of modern society's infrastructure. They also 'expressed interest to examine ways of enhancing digital connectivity between Europe and Asia'.

This paper attempts to define the role of ICT in Asia–Europe connectivity. It will argue that in order to maximise its potential to deepen interregional connectivity, ICT should be seen not only as part of the 'physical' infrastructure but also as one that contributes significantly to 'institutional' and 'people-to-people' connectivity.

Note: The author would like to thank Dr Lorraine Salazar, Dr Faheem Hussein, and Ms Yoonee Jeong for their valuable comments.

[1] All subsequent quotes are from Clarke et al.

ICT Connectivity

For some time now, national broadband initiatives are under way throughout Asia and Europe. As a result, 'Asia has the largest total number of broadband-connected homes, with nearly as many in total as Europe and the Americas combined' (Broadband Commission, 2015). Furthermore, the rapid expansion of Asia-Pacific is squeezing other world regions in terms of their mobile broadband market share—Europe and the Americas saw declining proportional shares of mobile broadband subscriptions from the end of 2014 to the end of 2015 despite absolute increases in subscription numbers (Broadband Commission, 2015).

ASEM countries are also part of regional ICT strategies aimed at enhancing intra-regional connectivity.

The first ASEAN ICT Masterplan (AIM 2015) had six strategic thrusts: economic transformation, people empowerment and engagement, innovation, infrastructure development, human capital development, and bridging the digital divide (ASEAN, 2010). The current (second) ICT ASEAN Masterplan (AIM 2020) seeks to achieve (1) an accessible, inclusive, and affordable digital economy; (2) deployment of next-generation ICT as enablers of growth; (3) sustainable development through Smart City technologies; (4) multiple ICT opportunities across a single regional market; and (5) secure digital marketplaces, safe online communities (ASEAN, 2015).

The UN Economic and Social Commission for Asia Pacific (UNESCAP) is promoting an Asia-Pacific Information Superhighway initiative. This aims to provide seamless physical connectivity between land- and sea-based ICT infrastructure in order to increase available, reliable, and affordable broadband Internet (ESCAP Secretariat, 2015).

Europe 2020 is a strategy for smart, sustainable, and inclusive growth (European Commission, 2010a). One of its seven flagship initiatives (Digital Agenda for Europe) aims to hasten the roll-out of high-speed Internet and reap the benefits of a digital single market for households and firms. The goal 'is to deliver sustainable economic and social benefits from a Digital Single Market based on fast and ultra-fast Internet and interoperable applications'. The specific targets are (i) broadband access for all by 2013, (ii) access for all to Internet speeds of 30 Mbps or above by 2020, and (iii) at least 50 percent of European households with Internet connections above 100 Mbps by 2020.

State of Play

Europe's 68.3 terabits per second (Tbps) of used international bandwidth is the biggest in the world (Lindeman, 2013). Asia has only 13.3 Tbps. Seen from another perspective, Europe's 144,315 bits of international bandwidth per Internet user is more than six times that of Asia

and the Pacific (at 22,612 bits). It is also more than 20 times that of the user from least developed Asia-Pacific countries (at 4,113 bits) (ESCAP website).

However, the great majority of Europe's used international bandwidth is used to route Internet, data and voice traffic within the continent. In Asia, 38 percent of used international bandwidth goes to the US/North America, 14 percent to Europe, and 48 percent is intra-regional (Ko, 2014).

Internet traffic between Asia and Europe is growing (Mauldin, 2015). In 2004, inter-regional bandwidth between the two continents was less than 0.1 Tbps. A decade later, Asia–Europe bandwidth was at 8 Tbps. This is not too far behind the 2014 Europe–North America bandwidth of about 11 Tbps and Asia–North America bandwidth of approximately 10 Tbps.

Internet use will continue to expand in both continents. Between 2014 and 2021, the Used International Bandwidth for Asia is expected to grow by 40 percent CAGR. The growth rate for the same period for Europe is 36 percent CAGR (Williams, 2015). Despite the faster predicted growth rate for Asia, Europe will still have almost three times the bandwidth of Asia in 2021.

It is likely that the projected demand will be met. In 2014, the used capacity of Asia–Europe via the Middle East route is only about 10 percent of the potential capacity. Furthermore, there will be additional capacity to be supplied by next generation networks like the Bay of Bengal Gateway (BBG), SeaMeWe-5 (SMW-5), and Asia Africa Europe-1 (or AAE-1).

While the demand for bandwidth may be met, the problem may be with disruptions that could negatively affect Internet traffic between the two regions.

Much of Asia–Europe traffic passes through submarine cables that transit the Suez Canal (Ruddy, n.d.). These cables are vulnerable to damage caused by shipping (anchor dropping) and fishing (trawling) as well as mudslides and typhoons. It is noteworthy that 'up to 90% of international capacity purchased on submarine cables in Asia is unprotected' (Ruddy, n.d.). Furthermore, there are three undersea choke points in this route: Luzon Strait (250 km); Strait of Malacca (3 km); Egypt, the Red Sea and Bab-el-Mandeb (30 km); Strait of Sicily (145 km), and the Mediterranean. Combined with a lack of redundancy, Internet service between Asia and Europe could slow down or even be completely disrupted for weeks if there are cuts to these cables (Coffey, 2014).

The need for alternative routes that would bypass the choke points and add critical redundancy to outgoing and incoming network traffic is being addressed.

While only 10 percent of Asia–Europe traffic is currently routed terrestrially, new terrestrial options have cropped up. In addition to the current Asia–Europe terrestrial cables (i.e. Europe–Russia–Mongolia–China or ERMC, Europe–Russia–Asia or ERA, Trans-Europe Asia or TEA, and Europe–Kazakhstan–Asia or EKA) are other planned initiatives like the Trans Eurasian Information Superhighway (TASIM) and the Diverse Route for European and Asian Markets (DREAM) (Rolland, 2015).

Even railroad development efforts are contributing to the development of terrestrial networks. Since fibre can be laid along rail lines, the planned high-speed railway that would connect China and Europe could also create a new Eurasian fibre optic backbone (Rolland, 2015). Already, China's government is actively encouraging Chinese Internet-based businesses and media to actively participate in building a 'digital Silk Road'.

In the non-commercial sector is Trans-Eurasia Information Network (TEIN4), the large-scale research and education data-communications network that connects Asian and European researchers via direct links to Europe's GÉANT network (TEIN website).

To be sure, terrestrial networks will not replace submarine cable networks. High construction costs make it difficult for these to compete with submarine cables. Terrestrial networks 'complement'—and not 'compete' with—undersea networks.

Satellites will also play a back-up role to the subsea and terrestrial networks linking Asia and Europe.

ASEM's Role in ICT Connectivity

The role of ASEM governments in expanding digital connectivity between Asia and Europe is circumscribed. The decision to light up dark fibre or to lay down new submarine cables or even use terrestrial instead of submarine cables is purely commercial (ISOC and TPRC, 2015). Governments cannot directly influence these decisions. Furthermore, Asia–Europe partners have very limited influence over the middle part of the submarine cables that link them.

However, ASEM partners should intensify their initiatives that create greater demand for international bandwidth. Most of these initiatives fall under the following categories: (1) legal and regulatory policies and reform, (2) universal access policies, (3) support for private sector broadband network build-out, and (iv) policies to stimulate demand and spur adoption (World Bank Group, 'Broadband Strategies Tool Kit').

One of these demand-side initiatives is growing the digital economy.

Growing the Digital Economy

A digital economy is one where 'the use of the Internet and IP-enabled networks is pervasive across *all* (economic sectors), irrespective of what they produce sell or trade' (World Bank Group, 'Broadband Strategies Tool Kit'.[2] In this definition, an Internet economy—comprised of businesses based on the Internet and the World Wide Web—is just the first stage of the digital economy.

ASEM members have their respective national level strategies and have achieved varying levels of success in creating their digital economies. A 2015 study by the Fletcher School at Tufts University measured the readiness of 50 countries for the digital economy (Chakravorti et al., 2015). These countries were then distributed into four digital economy trajectory zones. The trajectory zones and some ASEM partners who are in each zone are given below:

- *Stand Out* (countries with high levels of digital development and continue to remain on an upward trajectory): Korea, Ireland, Singapore, and Switzerland.
- *Stall Out* (countries that have achieved a high level of evolution in the past but are losing momentum and risk falling behind): Australia, Denmark, Finland, Japan, and Netherlands.
- *Break Out* (countries moving upward and are poised to become Stand Out countries in the future): China, India, Malaysia, Thailand, the Philippines, and Viet Nam.
- *Watch Out* (countries that face significant opportunities as well as challenges): Indonesia, Portugal, Russia, and Slovenia.

Aside from national efforts, ASEM partners also participate in regional digital economy initiatives.

'An Accessible, Inclusive and Affordable Digital Economy' is a key outcome of the ASEAN ICT Masterplan (AIM) 2020 (ASEAN, 2015, p. 12). Four out of AIM 2020's eight strategic directions directly address the digital economy (ASEAN, 2015, pp. 15–16). These are (1) economic development and transformation, (2) innovation, (3) human capital development, and (4) ICT in the ASEAN Single Market.

Europe's Digital Single Market strategy 'aims to open up digital opportunities for people and business and enhance its position as a world leader in the digital economy' (European Commission, 'Digital Single Market'). In 2015, the EC announced specific initiatives in each of the main areas on which the Digital Single Market strategy will focus: (1) better access for

[2] Underscoring in the original.

consumers and businesses to digital goods and services, (2) shaping the environment for digital networks and services to flourish, (3) creating a European Digital Economy and Society with long-term growth potential (Fullbright, 2015).

At the interregional level, these national and regional digital economy initiatives could be complemented by a focused ASEM initiative on cross-border e-commerce.

E-Commerce

Globally, e-commerce transactions reached $1,938 billion in 2014 (E-commerce Foundation, 2015). Asia-Pacific's share was $770 billion while Europe's was $562 billion. In the same year, 8 ASEM countries (China, United Kingdom, Japan, Germany, France, Russia, Spain, and Australia) occupy the top 10 countries in e-commerce turnovers.

The growing importance of e-commerce to economic growth can be seen through its share in the gross domestic product (or eGDP). Globally, e-commerce share of GDP increased from 2% in 2011 to 2.64% in 2014 (E-commerce Foundation, 2015, pp. 13–14). Asia-Pacific's eGDP of 3.3 percent is above the global average of 2.6 percent, while Europe's eGDP of 2.5 percent is slightly below it. Among countries, the United Kingdom and China are the leaders with an eGDP of 5.7 percent and 5.2 percent, respectively.

An important development in e-commerce is the rise of Mobile Commerce (m-commerce or the use of digital mobile devices in buying and selling goods and services). M-commerce already accounts for 34 percent of all e-commerce transactions globally.

Global mobile retail revenues is expected to grow from $133 billion in 2013 to $516 billion in 2017 (Statistica, 'Global mobile retail commerce revenue from 2012 to 2018"). An industry study reports that between 2013 and 2016 'the multi-country average compound annual growth rate for mobile commerce is projected to be 42 percent, toppling e-commerce's same growth rate at 13 percent' (PYMNYT, 2015).

The growth in m-commerce is driven by smartphones (Criteo, 2015).[3] In the developing world, smartphones are the primary way to access the Internet. In Asia, close to 50 percent of e-commerce transactions are over smartphones. In terms of countries, Japan, South Korea, and the United Kingdom are the most advanced markets for mobile shopping. Mobile share of e-commerce is now over 50 percent in Japan and South Korea, and more than 40 percent in the United Kingdom.

[3] Data used in this paragraph is from this report.

Cross-border e-commerce is also on the rise. According to a 2016 Nielsen study, 57 percent of online respondents who made an online purchase in the second half of 2015 bought from an overseas retailer (Nielsen Global Connected Commerce, 2016). The same study revealed that close to two-thirds of respondents in Western Europe say they purchased from an overseas retailer, including 79 percent in Italy—the highest percentage in the online study—and 73 percent in Germany.

Annual global cross-border e-commerce revenues could swell to between $250 billion and $350 billion by 2025 (van Heel et al., 2014). Asia will account for some 40 percent of those cross-border revenues while Europe will account for about 25 percent of revenues.

Given its increasing importance, **ASEM partners could adopt measures to promote cross-border e-commerce**. Specifically, they could adopt the following UNCTAD (2015) recommendations:

1. Align e-transaction laws.
2. Streamline/harmonise consumer protection policies.
3. Streamline/harmonise data protection and cybercrime policies.
4. Strengthen the capacity of lawmakers and judiciary in cyberlaws.
5. Enhance awareness of consumers and companies.

Driving Institutional Connectivity

ICT can be a valuable tool to deepen Asia–Europe institutional connectivity—strategies, agreements, as well as legal and institutional mechanisms to facilitate international transactions of goods and services, investment policies, and the movement of people across borders (ASEAN Institutional Connectivity).

Trade Facilitation and Regulatory Connectivity

The role of ICT in improving trade and in enhancing trade and trade facilitation is well recognised.

Studies show that ICT enhances trade because (i) it reduces the fixed entry cost into a market; (ii) it reduces delays in acquiring and transmitting relevant information needed for international transactions; and (iii) it facilitates international trade in services, particularly information-intensive services. Research also specifically confirms that policies that facilitate and encourage adoption and use of ICT will help boost trade in developing countries (Liu and Nath, 2012).

ICT is also transforming international trade. In the past, international trade was carried mostly at the product level. Today, international trade is also at the product component level because ICT has enabled granular specialisation in the production process (Basco and Mestieri, 2013).

ICT is arguably indispensable in trade facilitation. According to an ESCAP (n.d.) paper: 'Automated business processes, digitalization of procedures, simpler interaction and transmission of data, and faster decision-making abilities deliver advantages in many trade and transport facilitation areas'.

In customs, ICT is recognised as 'a critical strategic measure … to manage the complexities implicit in today's global trading environment' (Gareth n.d.). Using ICT also has the advantage of improving customs governance and minimising corruption (by reducing direct interaction between customs officers and traders in customs clearance).

Europe has an electronic customs project that aims to replace paper-based customs procedure with European Union–wide electronic ones (Taxation and Customs Union website). While in Asia, the ASEAN Single Window initiative connects and integrates national Single Windows that aim to expedite cargo clearance within the context of increased economic integration in ASEAN (ASEAN Single Window website).

ICT can also enhance regulatory connectivity and coherence and transparency through digitising and sharing information; connecting agencies, citizens, and enterprises; deploying social media; and transforming business processes. Specifically, eCollaboration systems support a wide range of inter-personal interactions, such as communication via a range of different media, the coordination of joint activities (e.g. tasks and processes), as well as the collaboration on joint objects (e.g. documents) (Riemer et al., 2009). ASEM could consider using eCollaboration tools to coordinate and align the various connectivity initiatives (Benchmarking Partners, 2000).

Aside from using common tools, it is also important for ASEM to have a common interoperability framework.

Interoperability ensures that different ICT systems and devices of partner countries can exchange data and interpret the shared data. An interoperability framework includes the technical specifications that will allow different national agencies to electronically work together.

A number of ASEM partners have adopted their respective interoperability frameworks to enable various national government agencies using disparate ICT systems and standards to share data and information. At the regional level, the European Interoperability Framework was adopted

- to promote and support the delivery of European public services by fostering cross-border and cross-sectoral interoperability;
- to guide public administrations in their work to provide European public services to businesses and citizens;
- to complement and tie together the various National Interoperability Frameworks (NIFs) at European level (European Commission, 2010b).

An ASEM Interoperability Framework would enhance electronic data exchange and information sharing among different national agencies. This would not only boost trade facilitation but also deepen regulatory connectivity, coherence, and transparency.

Deepening Institutional Connectivity

It would be too slow and expensive to try to achieve institutional connectivity through face-to-face meetings. ASEM could consider the following initiatives to hasten and deepen Asia–Europe institutional connectivity:

1. use eCollaboration tools to facilitate, coordinate, and align institutional connectivity initiatives; and
2. adopt an ASEM Interoperability Framework.

Facilitating People-to-People Connectivity

ICT can be the technology that will allow those living in ASEM countries to imagine an ASEM community.

Already, ICT is seen as helping preserve cultural heritage and promoting a regional identity. The Digital Single Market initiative includes digitising Europe's cultural heritage to make it accessible online, preserving it for future generations. AIM 2020 recognises that ASEAN citizens can form meaningful connections, work together to bridge digital divides, and build a common ASEAN identity using ICT.

Given the wide area where ICT can help facilitate people-to-people connectivity, we will limit our discussion on how ICT can help improve connectivity through tourism, museums, education, and health.

Tourism and Museums

Tourism—the traditional means of people-to-people contact—is on the rise. International tourist arrivals reached a total of 1,184 million in 2015 (UNWTO, 2016). Europe and the Asia-Pacific recorded 5 percent growth in international tourist arrivals. Europe is not only the most visited region in the world but was also the fastest-growing (in absolute terms) tourism region. Asia and the Pacific received 278 million international tourists, an increase of 13 million from the previous year.

The important role of ICT in tourism is already recognised; 'Increasingly ICTs will provide the 'info-structure' for the entire industry and will overtake all mechanistic aspects of tourism transactions' (Buhalis and Law, 2008). Beyond this, ICT can also allow those without means to travel to become 'virtual tourists'.

A good example of virtual tourism site is Google's World's Wonders Project. Through this site 'virtual tourists' can 'visit' world heritage sites like the archaeological areas of Pompeii and the Hiroshima Memorial Dome (Google Arts and Culture website). The site also enables virtual tourists to read about the heritage sites, watch videos on YouTube, browse the photo gallery, or explore 3D-models. Seeing its value in education, Google has made available guides and lesson plans for free to teachers who want to use the World's Wonder Project in their classes.

Virtual tourists could also visit various online museums at the price of an Internet connection. Admittedly, a virtual museum tour is not similar to the experience of going to a 'bricks and mortar' museum. But with virtual museum visits, more citizens from least developed countries can learn from museums in developed countries.

The digitisation of museum collections has also opened new ways for how museum collections are understood, collated, aggregated, and ultimately curated. The high cost of lending artefacts has made curation using material from different museums prohibitive. ICT has opened a wider space for collaboration and participation among museum professionals. It is now possible to curate exhibits using digital artefacts from various museum collections. It is also possible for Asian and European curators to co-curate exhibits using materials from their respective collections without being in the same place.

ASEM could hasten this new development by **supporting collaborative museum curation projects** through the Asia–Europe Museum Network.

Education and Health

ICT and Education and Health Care are areas where ASEM could also work collaboratively.

ICT in Education is attractive to developing countries for its ability to address the following: (1) the shortage of teachers, especially science and other specialty teachers; (2) the shortage of learning material such as textbooks for students; (3) providing improved informational content and learning approaches; and (4) developing students' ICT skills (Olson et al., 2011).

A 2013 study of eight ASEAN members show 'variances in the priority areas and development levels of ICT in Education among the countries... mainly due to their unique national contexts' (UNESCO Bangkok, ICT in Education website). ASEAN ICT in Education initiatives range from well-established models on ICT integration in teaching and learning to entry-level endeavours that provide access to education via ICT. The study also acknowledged the wide differences of ICT-related human capacity building, school programmes, and support across the region.

In Europe, ICT use in school is improving but several obstacles remain (EU Digital Single market website). Among these are lack of ICT equipment in schools in some countries; infrequent use of ICT for learning; teacher training is not compulsory (some teachers learn on their own time); lack of school policies on integrating ICT in teaching and learning. The same study noted that European 'teachers generally believe that there is a need for radical change to take place for ICT to be fully exploited in teaching and learning' (EU Digital Single market website).

These national initiatives are complemented at the Asia-Europe level.

The Asia-Europe Classroom Network (AEC-NET) is a platform for collaborative learning and intercultural exchanges among high school students in Asia and Europe (ASEF Asia–Europe Classroom Network website). It is a 'cyber-classroom shared by students and teachers to build stronger bi-regional networks and partnerships in the course of implementing common online projects' (ASEF Asia–Europe Classroom Network website). It started in 1998 as a programme under the Asia–Europe Foundation (ASEF).

There is also the Asia–Europe e-Learning Network which conducts collaborative research projects and practical activities among the ASEM partners (Asia–Europe e-Learning website). Its research area is ICT skills, e-learning, and the culture of e-learning in lifelong learning. The network is used for sharing recent research outputs and trends in ICT skills and e-learning. It is also an online community for sharing information, knowledge, and human resource development

ASEM could consider supporting the development of more Asia–Europe e-Learning networks.

Another area for people-to-people connectivity is eHealth, 'a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology' (Eysenbach, 2001).

According to the World Health Organization (WHO), 'every day, eHealth is saving the lives of women, their babies and infants in some of the most vulnerable populations around the world, in a wide variety of innovative ways' (WHO and ITU, 2014).

A 2012 study of national eHealth initiatives in Europe documented 'a shift from a constricting ICT-orientation to development of the entire health system where eHealth strategies, organizational change, and appropriate technological infrastructure are singled out as important aspects' (Moen et al., 2013). A more recent EC-commissioned report observed that 'integrating ICT in health in practice has proven challenging, for a variety of reasons, which include the financial and organizational structure for healthcare providers... and a lack of governance and leadership in the implementation of ICT (for health initiatives)' (van Welsum et al., 2013).

In Asia, the main eHealth challenges are (1) lack of eHealth policy, strategy and legal framework to support the national health system; (2) uncoordinated investment in ICT in health due to absence of an overarching plan for eHealth; (3) a low degree of cooperation, collaboration, and sharing across sectors; (4) limited capacity within the public sector to implement eHealth programmes; (5) widely differing levels of eHealth maturity across and within countries; (6) poor quality and disparities in data because health information systems exist in silos, segmented by disease specific control, health programmes, or donor-driven initiatives with little interoperability and communication; and (7) poor communication infrastructure—lack of broadband connectivity and Internet access prevents use of ICT in health (Chikersal, 2013).

At the regional level, both Europe and Asia have established eHealth networks for information exchange and collaboration. Europe's eHealth Network supports and facilitates 'cooperation and the exchange of information among EU Member States working within a voluntary network connecting national authorities responsible for eHealth' (European Commission, 2011). The Asian eHealth Information Network (AeHIN) 'promotes better use of information communication technology (ICT) to achieve better health through peer-to-peer assistance and knowledge sharing and learning through a regional approach for greater country-level impacts across South and Southeast Asia' (Asia eHealth Information Network).

ASEM initiatives on eHealth could be at two levels—at the national and interregional levels.

At the national level, **ASEM partners could intensify eHealth activities by designing national eHealth programmes that would overcome the following barriers**:

- lack of suitably qualified or experienced professionals to develop and implement eHealth projects;
- inadequate infrastructure to support programmes;

- lack of adequate business models to support broad and sustainable eHealth delivery; and
- lack of political commitment (WHO and ITU, 2014).

At the interregional level, **ASEM could support the development of a network of Asian and European eHealth networks**. This inter-network of AeHIN and E-Health Network could initially focus on sharing experiences, lessons learnt, and best practices.

Summary of Recommendations

A key argument of this paper is that ICT is a key enabler for regional connectivity. ICT is not just a part of physical infrastructure but also makes possible institutional and people-to-people connectivity. The following recommendations were proposed to maximise the role of ICT in deepening regional connectivity:

Infrastructure Connectivity

- Create the conditions that produce the demand for more international bandwidth.

Digital Economy

- Adopt measures to promote cross-border e-commerce.

Institutional Connectivity

- Use eCollaboration tools to facilitate, coordinate, and align the various institutional connectivity efforts.
- Adopt an ASEM Interoperability Framework.

People-to-People Connectivity

- Support collaborative museum curation projects.
- Support the creation of more Asia–Europe eLearning Networks.
- Intensify eHealth initiatives by
  - ☐ designing national eHealth programmes that would overcome existing barriers, and
  - ☐ supporting the development of a network of Asian and European eHealth networks.

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