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E-health in the East Asian tigers

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Summary
Objective: The article analyzes e-health progress in East Asia's leading tiger economies: Japan, Hong Kong, Singapore, South Korea and Taiwan. It describes five main dimensions of e-health provision in the tigers: policymaking, regulation, provision, funding and physician-patient relations.
Methods: We conducted a series of fieldwork interviews and analyzed key healthcare websites.
Results and Conclusion: Our main finding is that the development of e-health in the region is less advanced than might be expected. Our explanation focuses on institutional, cultural and financial factors.

1. Introduction

The application of information technology (IT) to public sector operations sometimes captured in the notion of e-government is starting to have an impact on developed healthcare systems the world over. As time goes by, that impact is expected to become even more pronounced. ''The consensus seems to be that new information technologies will significantly affect almost every aspect of health care,'' wrote Blumenthal [1]. In this article, we examine the progress of e-health in the five leading economies of East Asia: Japan, Hong Kong, Singapore, South Korea and Taiwan. Each seeks to place itself at the forefront of the information revolution and has high levels of Internet access and usage. Each also has a sophisticated healthcare system dedicated to securing maximum healthcare benefit at minimal cost. By standard outcome indicators, these systems all have very good records. The tigers, therefore, form a cluster in which e-health might be expected to be notably advanced. However, our finding is that although some progress is being made, it remains limited. It is also variable across the five societies.

The article begins by reviewing some of the literature on e-health taking from it a series of critical dimensions and issues. It then briefly analyzes the two relevant contextual aspects of the East Asian tigers: their participation in the information age and the nature of their healthcare systems. On these bases, it examines their

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e-health progress, focusing on the major themes unearthed in the contemporary literature. Finding limitations and variations, it concludes by thinking through possible explanatory factors, focusing on institutional, cultural and financial issues.

2. The e-health literature

Much of the existing e-health literature has been developed in the context of the United States, reflecting both US leadership in the information age and the continuing search for solutions to US healthcare problems. Five main themes are prominent. Four of the five address distinct dimensions of the broad policy and management framework for healthcare, examining Internet impacts on policymaking, regulation, provision and funding. The fifth theme looks inside the healthcare sector and inside the surgery, at the implications of the Internet for physician-patient relations. Eventually, this may have policy significance, but for now, it is best treated separately.

The major argument made about healthcare policymaking is that the US government has been slow to engage with the numerous issues generated by the IT revolution [2]. The core features of that revolution, notably enhanced information flows, increased networking possibilities and novel commercial opportunities, are now well documented [3]. However, it is said that in US healthcare, most policy actors in both Congress and the executive branch continue to focus on pre-information age agendas. Although, the Bush administration has started to address these concerns, the result remains something of a lack of Internet-related policy activity and only a limited number of perspectives on the Internet's potential to transform the US healthcare system. Clearly structural features of the US system, including fragmentation both of government and of the healthcare sector, play key roles.

Looking at the narrower sphere of regulation, concerns are expressed about the failure of regulatory agencies to keep pace with Internet-related developments. Goldsmith notes that the Internet generates many potential regulatory problems, ranging from licensing e-health practitioners to monitoring information quality in a virtual world with no boundaries [4]. Fried et al. detail some of the obstacles placed in the way of e-health by existing regulations, holding that individuals and organizations must navigate a maze of rules and codes, old and new, if they wish to implement fresh ideas and approaches [5]. Kassirer's prediction is that the courts will play a role when substandard medical advice provided through web sites or e-mail yields poor medical outcomes. He believes that courts will be especially important when professional advice is given without a direct patient encounter, or when state lines are crossed [6]. Some regulatory issues are US-specific, but many have much wider relevance.

Partly building on the regulatory theme, analysts have also debated the limitations currently imposed on healthcare provision through the Internet. Kleinke argues that the Internet will not contribute to a solution to the administrative redundancies, economic inefficiencies, and quality problems that have long plagued the US healthcare system. Instead, it will exacerbate the cost and utilization problems of a system in which patients demand more, physicians are legally and economically motivated to supply more, and public and private purchasers are expected to pay the bills [7]. Goldsmith holds that the challenges of standardizing coding and formats for clinical information, and protecting patient privacy, will hinder the realization of network computing potentials in healthcare [4]. The problems to which these and other authors point are structural. Economic, organizational, legal, regulatory, and cultural conflicts rooted in the US healthcare system are all barriers to e-healthcare provision.

Further problems are found in the sphere of healthcare funding. Shortliffe criticizes Congress for focusing on short-term benefits, arguing that research investment for e-health must be balanced between basic and applied analyses [8]. Robinson examines the effect of distinct forms of capital on the development of the healthcare Internet. In the late 1990s, venture capital flooded into the e-health sector, rising dramatically from US$3 million in early 1998 to US$335 million in late 2000. In the same period, 26 e-health firms went public, raising US$1.35 billion at their initial public offerings. However, the technology-sector crash in late 2000 hit the e-health sector especially hard, prompting an extended period of consolidation between e-health and more conventional firms [9]. US funding problems thus relate to both the public and the private sectors.

Finally, analysts have looked inside the surgery at physician-patient relations. Existing survey data show that citizens make considerable use of the Internet for healthcare information and services, mostly of a generic kind [10]. Indeed, Anderson reports that in 2002, 80% of US adults with Internet access did so [11]. As more patients go online, increasing numbers will turn up in surgeries with Internet-fueled questions and concerns. Meeting the growing expectations of these individuals will

be a significant challenge for physicians [12]. Assessing the likely impact, Kassirer argues that the Internet will change the physician–patient relationship in unpredictable ways, with some aspects of electronic communication strengthening the bond, and others undermining it [6]. Goldsmith believes patients have most to gain from the emergence of the Internet, arguing that it will rebalance the steeply asymmetrical medical knowledge held by patients and physicians [4]. Using information gained through Internet searches, patients can now open their dialogues with physicians at a much higher level than before, and thereby gain leverage in the care process. Ball and Lillis also discuss the potential challenges the Internet presents to physicians. As Internet searches often generate as many questions as answers, physicians are likely to find themselves under increased workload pressures [13]. The variable quality of healthcare information accessed through online searches [14], a matter that is being actively addressed by bodies such as the Health on the Net Foundation (www.hon.ch) and the Internet Healthcare Coalition [15], can only reinforce those pressures. Zupko and Toth hold that physicians sometimes encounter a form of cultural shock when confronted by well-informed patients [16]. It is therefore perhaps not surprising that an April 2002 survey found that physicians are much more reluctant than patients to use the Internet for healthcare interactions. While 90% of patients wanted to exchange e-mail with their doctors, only about 15% of doctors actually did so. Physician–patient confidentiality, time concerns and increased exposure to malpractice liability were cited as primary reasons for doctors' wariness [17]. In the face of this mounting speculation and evidence, Lumpkin is sanguine, however, contending that the physician–patient encounter is little changed, despite widespread Internet usage in healthcare [18].

Though focused on the US, the existing e-health literature generates key themes for an analysis of progress in other parts of the world, including the East Asian tigers. However, before exploring those themes, we first present some basic contextual information about our five societies.

3. The East Asian tigers

Two features of the East Asian tigers are particularly relevant to this analysis: their participation in the information age and the nature of the healthcare systems in which their application of IT needs to be assessed. In this section, we examine both features.

3.1. Information age participation

Looking at broad social participation, IT was exploited more rapidly in the five East Asian tigers than in any other global cluster. For many years, the Nielsen//NetRatings Global Internet Index has ranked all five societies in the top 10 worldwide for personal computer (PC) connections and Internet access and usage. The four smaller societies, Hong Kong, Singapore, South Korea and Taiwan, are particularly advanced. Furthermore, the severe acute respiratory syndrome (SARS) crisis that hit the region in spring 2003 gave a major boost both to Internet usage in general, and to e-health in particular [19]. In Hong Kong, for instance, the number of active Internet users increased by 13% from February to April 2003, before falling back by 3% from April to June 2003. The overall increase was 10%. Also at the start of 2003, the time spent online by Hong Kong people first increased by 49% and then fell back by 18%, registering an overall increase of 22% [20]. Consistent with the image of economic and social dynamism, they have projected for many years now, the East Asian tigers are among the most advanced IT societies on earth.

To some extent, this strong IT orientation is the product of developmental state strategies. With the partial exception of Hong Kong, the East Asian tigers have long placed considerable faith in state-led growth strategies. Furthermore, for many years they have frequently focused those strategies on IT and IT-related sectors. In Japan, in the 1980s, the fabled Ministry of International Trade and Industry targeted supercomputers and the Fifth Generation as a major development project [21]. Despite a long period of economic stagnation in the 1990s, the Japanese IT industry remains a significant global force. In Singapore in the 1980s, the state took the lead in nurturing wafer fabrication, the most sophisticated ''front end'' of the semiconductor industry. Chartered Semiconductor Manufacturing, established by the government in 1988, is now the third largest silicon foundry in the world. In South Korea, in the early 1980s, the state reorganized the public-sector telecommunications system by closing inefficient firms and allocating profitable segments to major chaebol like Samsung and Goldstar, enabling them to establish specialized chip businesses. By the early 1990s, Samsung had become the world's number one producer of dynamic random access memories for PCs and workstations. In Taiwan since the 1970s, the Ministry of Economic Affairs and the state-controlled Electronics Research Service Organization have played crucial roles in developing the semiconductor industry. Today, it is the fourth largest in the world, and

firms within it have entered into strategic alliances with leading industry players in the West [22]. Even in Hong Kong, where a developmental state took longer to emerge, the government is currently overseeing the construction of a flagship Cyberport, intended to host a strategic cluster of companies and professional talents, specializing in IT applications, information services and multimedia content creation, and designed to project a hi-tech international digital city image.

The East Asian tigers are also leading players in the development of e-government. The 2001 UN/ASPA benchmarking survey of all 190 UN member states placed Singapore at number 4 (a long way behind the US, but only fractionally behind Australia and New Zealand), South Korea at number 15 and Japan at number 26. All three states featured in the top category of high e-government capacity. The survey did not assess Hong Kong and Taiwan, neither of which is a UN member state. The report noted that Singapore ''demonstrated a balanced and citizen-centric e-government program, while possessing the benefits of a high technological infrastructure and human capital measures''. It held that South Korea ''made perhaps the most dramatic advances in its e-government program by successfully implementing several new online transaction features''. It was more critical of Japan, arguing that it had ''yet to live up to its rather significant potential''. ''Japan's e-government program has not yet reached a comparable level of sophistication as that of the regional leaders due primarily to achieving only a limited interactive presence among national government websites'' [23]. A January 2002 analysis of e-government in East and Southeast Asia reached similar conclusions, identifying the five tigers as regional leaders [24]. Accenture's 2004 survey looked at only two of the five East Asian jurisdictions analyzed here. It ranked Singapore number 2 in the world after Canada, and Japan number 13 [25].

Looked at from many different perspectives, then, the East Asian tigers are leading participants in the emergent information age.

3.2. Healthcare systems

Healthcare systems in the tigers share a basic orientation, but are otherwise quite varied. The orientation is best termed productivist, in that in each society social policy has usually been subordinate to economic objectives. While the governments of all five tigers certainly get involved in social policy, they usually do so either for economic reasons or after they have made provision for their various economic goals. The main stimuli to this strong focus on economic development were, in all cases, the devastation brought by the Second World War, and the uncertainties of the international order constructed thereafter [26]. This shared orientation has fed into healthcare policy in three main ways [27].

In Japan and its two former colonies, South Korea and Taiwan, healthcare was initially left chiefly to the market. Only once economic policy was on track and a measure of growth had already been attained, did these societies turn their attention to planning their healthcare systems. In doing so, they concerned themselves chiefly with healthcare finance, creating social insurance systems by gradualist means. Now, in all of these societies, the health insurance scheme is universal in aspiration and near universal in fact. Across all three societies, healthcare provision remains private-sector-driven, with the state performing a chiefly regulatory role. Traditional medicines are significant in all three societies and covered by national health insurance schemes [28]. However, they are not consistently brought within the planning frame.

In Hong Kong, until the early 1990s, the colonial government took a strictly reactive and incremental approach to healthcare. Its major interventions focused on subventing charitable organizations in the healthcare business, though in time, it also built hospitals and delivered care directly through them. Throughout, government activity was funded out of general government revenue. The major and to date, only step change came in 1991, with the formation of the Hong Kong Hospital Authority (HKHA). This imposed state control and state funding on the secondary sector and gave Hong Kong a miniature version of the British National Health Service. However, there has never been any attempt to bring primary care within the planned healthcare system. Only in 1999, was traditional Chinese medicine subjected to anything more than minimal government regulation [29].

In Singapore, the early post-war experience was similar to that of Hong Kong. Here, however, separate initiatives were taken in the spheres of provision and funding. In 1985, much provision was integrated at the secondary care level through creation of the state-run Hospital Corporation of Singapore. This body subsequently sought to drive private-sector disciplines into state provision through ''corporatization''. In 2000, in an attempt to generate integrated pathways of care, it was broken into two territorial clusters focused on the secondary sector but also having primary and tertiary elements. However, as most of the primary sector remained outside the state sector, the extent of integration was limited; in Singapore, the

state provides 80% of secondary care but only 20% of primary care. On the funding side, Singapore in 1984 created a compulsory savings system, Medisave, within the wider Central Provident Fund scheme. It added the insurance schemes MediShield and MediShield Plus in 1990 and 1994 and created a basic social safety net, Medifund, in 1993. These various schemes partially fund secondary care provision. There is also some direct state subsidy. Funding of primary care takes place mainly through out-of-pocket expenses. The traditional sector stands outside all state planning and, as in Hong Kong, has only recently been brought within the regulatory framework.

These healthcare systems have enviable records. Not only did they make a rapid post-war transition from the contagious disease characteristic of third-world countries to the chronic disease characteristic of first-world societies, but also they register very favorable health outcomes as measured by standard input and outcome indicators (Table 1).

Healthcare systems in the East Asian tigers thus share a productivist orientation and strong performance. They exhibit varied state roles, with much healthcare activity lying outside the public sector and some of it falling beyond the planning horizon. In Japan, South Korea and Taiwan, state involvement is extensive in finance but limited in provision. In Hong Kong, the government both funds and directly provides care in the secondary sector, but not elsewhere. In Singapore, the state provides a large amount of secondary and some primary care. The funding regime is complex, comprising direct state subsidy, forced individual saving, state-run and private-sector insurance, and out-of-pocket expense. In all five tigers, both the public and private sectors play important roles and face clear incentives to take an interest in harnessing the Internet for healthcare gain.

4. E-health in the East Asian tigers

Against the dual backdrop of sophisticated IT societies that make extensive use of the Internet and cost-effective healthcare systems driven in variable ways by actors from the public and private sectors, we now turn to a survey of e-health in the East Asian tigers. To frame the survey, we begin by providing a brief descriptive overview of the major state-run healthcare websites in the region. We then structure our analysis using the five main analytical spheres that dominate the existing e-health literature: policymaking, regulation, provision, funding and physician—patient relations.

4.1. Overview

All ministries or departments of health in the East Asian tigers have their own website. Throughout the region, the major quasi-autonomous state agencies, such as the national health insurance agencies in Japan, South Korea and Taiwan, the HKHA in Hong Kong and the two big healthcare clusters in Singapore, also have sites. Here, we look only at the main government healthcare sites (Table 2). The overall quality is high. All have clickable links to organizational objectives and tasks. Most also offer detailed information about subsidiary divisions. All contain links to the government homepage and related healthcare sites so that visitors can conduct further searches and collect additional information. All provide feedback channels. In Singapore, the Ministry of Health (MOH) offers online feedback opportunities. In Taiwan, citizens can make online appointments with the Director of the Department of Health (DoH). In Japan, the Ministry of Health, Labour and Welfare (MHLW) uses e-mail to solicit

Table 1 Healthcare inputs and outcomes in the East Asian tigers, 1990s

Jurisdiction	Health expenditure per capita (1990—1998, US$)	Health expenditure as a percentage of GDP (1990—1998)	Physicians per 1000 people (1990—1998)	Life expectancy at birth (1999, years)	Infant mortality rate per 1000 live births (1999)	Under-five mortality rate per 1000 (1999)
Japan	2284	7.6	1.9	81	4	4
Hong Kong	1134	5.0	1.3	80	3	5
Singapore	841	3.2	1.4	78	3	4
S. Korea	349	5.1	1.3	73	8	9
Taiwan	N/A	5.5	0.7	75	6	N/A
High-income countries	2702	9.7	2.8	78	6	6

Note: Taiwan data are from 1999. *Sources*: [34].

Table 2 Major government healthcare websites in the East Asian tigers, 2004

	MHLW Japan	HWFB Hong Kong	MOH Singapore	MOHW South Korea	DoH Taiwan
URL	mhlw.go.jp	hwfb.gov.hk	moh.gov.sg	mohw.go.kr	doh.gov.tw
Language	Japanese English	Chinese English	English	Korean English	Chinese English
Own search engine?	Yes	Yes	Yes	Yes	Yes
Clickable link to information about the unit?	Yes	Yes	Yes	Yes	Yes
Electronic facilities for healthcare professionals?	No	No	Yes	Yes	Yes
Contact details for named officials?	No	Yes	Yes	Yes	Yes
Feedback opportunities?	Yes	Yes	Yes	Yes	Yes
Clickable link to the government homepage?	Yes	Yes	Yes	Yes	Yes
Clickable links to related sites outside the unit?	Yes	Yes	Yes	Yes	Yes

feedback. In South Korea, the Ministry of Health and Welfare (MOHW) and in Hong Kong, the Health, Welfare and Food Bureau (HWFB) have similar practices.

However, within this generally strong showing, there are also significant differences, with Japan's MHLW and to a lesser extent, Hong Kong's HWFB lagging behind their regional counterparts in key respects. Firstly, the MHLW fails to provide contact details for named officials on its website. This is standard practice in the other four tigers. Singapore's MOH, for example, gives address, telephone number and e-mail details for key officials. Secondly, while healthcare professionals and officials in Singapore, South Korea and Taiwan can communicate with each other through the Internet, their counterparts in Japan and Hong Kong cannot. Thirdly, the range of options available to users is more restricted in Japan and Hong Kong than in the other three tigers. In South Korea, for instance, IT has played a role in the surveillance system for communicable disease since 1999. Through electronic data interchange and regional database management systems, notifying and reporting systems have been computerized, and an electronic record of all notified and reported cases is kept. Using the Super-Highway Communication Network, physicians and public health centers can access the notifying and reporting system, DisWeb, anywhere and anytime through the Internet (http://dis.mohw.go.kr). In Singapore, the MOH site within the government's eCitizen portal enables healthcare professionals to download application forms for license renewal, approval to perform a pregnancy termination, and so on.

4.2. Policymaking

The policymaking strand of the e-health literature castigates US policymakers for being slow to grasp the potential of the Internet. Such a charge is less easy to sustain in the East Asian tigers, though again experience is variable. Singapore and Taiwan are the regional leaders. Singapore's eCitizen portal addresses many aspects of citizen interaction with government, with healthcare being a prominent theme. The Internet is used to reinforce the public health messages that have been disseminated by the Singaporean government through other media for many years. Behind the scenes, e-mail links pervade the healthcare system and enhance the cohesiveness of policy networks. In a controlled city state, those networks are in any case very tight. In Taiwan, the DoH in 2002 launched an ambitious e-health project, with a timeline stretching to 2006. The Health Information Network that is central to this initiative has a backbone funded by central government and permits local users in both the public and private sectors to participate on a self-paying basis. Drawing on US experience, it seeks to promote electronic medical records, based on a smart card system, so that information can flow to all parts of the healthcare sector. A Healthcare Certification Authority, created in 2002, oversees promotion of this initiative. In the other three tigers, progress is less impressive. Japan launched an e-Japan strategy in January 2001, designed to make it ''the world's most advanced IT nation within 5 years'' [30]. The strategy had an explicit e-government strand. In September 2001, the MHLW followed up by issuing a ''grand design'' for

promotion of IT in the healthcare sector. The aim was to computerize the entire sector by 2004 and to introduce an electronic medical record system covering 60% of clinics and 60% of hospitals with 400-plus beds by 2006. Progress towards targets appears to be on track. However, Japanese performance in the e-health domain is poor by regional standards. Hong Kong is also quite slow to place healthcare online. The HWFB site contains standard bureaucratic information, such as current policy initiatives and recent speeches, plus public health information that has been developed particularly since the 2003 SARS crisis. Here, the major networking initiative is being taken by the dominant public-sector delivery agency, the HKHA. While its primary focus is provision, the networking links being created among hospitals are likely to have policy consequences. As in Singapore, e-mail links also bolster ties within policy networks that are already quite cohesive. South Korea is making an aggressive attempt to exploit the Internet across all areas of government, but in the healthcare sphere, currently remains an average performer.

4.3. Regulation

Turning to regulation, three main issues are raised in the literature. The first is that e-health generates a number of regulatory problems. The second is that excessive regulation may impede e-health progress. The third is that the courts are likely to have to step in when administrative regulation fails. In the East Asian tigers, regulation is clearly a major concern and an evident constraint on e-health development, often for good reason. One instance is limitations placed on consultations, which in all five tigers quite properly mandate face-to-face physician—patient contact before any specific healthcare information or advice can be given. For the foreseeable future, online consultation, though technically feasible, is likely to be restricted by professional concerns. Another instance is limitations placed on information sharing and exchange, which in all the tigers are again very properly restricted by privacy considerations. However, there is some variation in regional regulatory practice. In Singapore, patients requiring repeat prescriptions can place an order online and have the medications delivered to their homes. Only after 6 months, do they have to return to the healthcare system to consult a physician. Elsewhere, this practice is illegal. In Japan, physicians are prohibited from answering specific questions about healthcare or disease by e-mail or telephone.

4.4. Provision

Regarding provision, assessments in the US literature are mainly negative. On the one hand, the argument is made that IT cannot be expected to solve structural problems in healthcare systems. On the other, barriers even to less ambitious networking initiatives are held to be substantial. These are fair points, but they should not be allowed to obscure the real progress being made by healthcare systems around the world, and in our case in East Asia. Among the five tigers, Taiwan's healthcare websites, both public and private, provide the most comprehensive services to patients. Singapore ranks second, and Hong Kong third. Japan and South Korea are somewhat behind the regional pace. An overview is given in Table 3.

In Taiwan, the DoH operates a Taiwan e-Hospital site to provide free online medical advice to patients (http://taiwanedoctor.doh.gov.tw/). Currently, 237 medical practitioners and 11 nutritionists from 31 public hospitals form a consulting team to answer questions about 29 specialties. Patients seeking general medical advice can send questions to a particular practitioner and receive feedback online or by e-mail. In the private sector, a number of hospitals, such as the Chang Gung Memorial Hospital, have online question-and-answer services for patients. The KingNet Second Opinion WebHospital (www.webhospital.org.tw) and the Taiwan Physician's Net (www.doctor.com.tw) are two prominent sites providing free online medical advice to patients. Established by KingNet Entertainment

Table 3 Availability of online medical services in the East Asian tigers, 2004

	Japan	Hong Kong	Singapore	South Korea	Taiwan
Provision of online medical advice to patients by ministries/departments of health?	No	No	No	No	Yes
Patients can make appointment online?	No	No	Yes	No	Yes
Patients can access their medical records online?	No	No	Yes	No	No
E-pharmacy service?	No	No	Yes	No	No
Online information sharing among health care professionals?	No	Yes	Yes	No	Planned

(www.kingnet.com.tw) in 1998, the WebHospital has some 200 voluntary physicians answering questions from the public. The Taiwan Physician's Net brings together about 1500 physicians, whose information and advice are posted on the web. Apart from getting online medical advice, patients can search for a particular physician and visit his or her office for treatment. In Taiwan, patients can also make medical appointments online with many public and private hospitals. Looking to the future, the DoH is planning to develop a Medical Information Exchange Center to promote information sharing and enhance treatment quality.

In Singapore, health is one of a number of cluster points within the eCitizen site. To date, the Internet is mainly used to provide general healthcare information, with the healthcare portal containing comprehensive information about healthcare providers, the healthcare establishment, healthy lifestyles and public health issues such as SARS. Many searches are possible. The site also allows individuals to submit complaints and feedback. Only a few transactions can be undertaken online. As in Taiwan, appointments can be made and altered online. Through Singapore's e-pharmacy services, recurrent prescription items can be ordered online and delivered throughout the island. In one of its two main healthcare clusters, patients can register online and access summary medical records. Inside the healthcare system, information flows are starting to change as polyclinics and GPs gain access to hospital records online. The likelihood is that enhanced integration of the public and private sectors will result.

In Hong Kong, the HKHA, which oversees almost the entire secondary sector, is currently introducing online networking in hospitals. Its Clinical Management System is an integrated clinical workstation giving clinicians access to departmental information and patient records. It will soon develop into a longitudinal electronic patient record within the public hospital system, enabling records to be accessed by many parties simultaneously anywhere, anytime. The system will also actively support clinical decisions by offering alerts, reminders, links to medical knowledge and other aids. It is expected to play an important role in reducing medical errors and improving the quality of patient care. Over the next 5 years, the HKHA is planning to create a Hong Kong Health Information Infrastructure, with the aim of networking all healthcare providers in the public, private and social welfare sectors. It also intends to build an electronic medical record for every Hong Kong resident and provide citizens with an electronic gateway to healthcare information and evidence-based medicine [31]. These initiatives are likely to enhance information flows within the public healthcare system. Compared with Taiwan and Singapore, however, Hong Kong lags behind in developing Internet services for patients. Individuals cannot register and access summary medical records online. Lacking an e-pharmacy service, the Hong Kong system does not allow recurrent prescription items to be ordered online.

Japan and South Korea are falling behind their regional counterparts in providing online health services to patients. Their official health websites do not deliver any electronic service to individual patients. With the exception of initiatives taken by a small number of private hospitals in South Korea, like the Yonsei Eye and ENT Hospital, neither public nor private hospitals in these two tigers allow patients to register online. However, in 2001, Japan's MHLW established telemedicine networks to provide specialized care to people in remote areas. The government will provide US$4 million a year to form networks consisting of one large hospital and three clinics working together to supervise patients. Each patient will be equipped at home with a computer that can monitor heart rate, blood pressure and other indicators, as well as a phone capable of transmitting video. They will be linked to physicians through an ISDN digital phone connection, thus enabling physicians to diagnose illness by electronically transmitted data. From June 2001, the MHLW started to establish 10 such networks a year, so that all 47 districts will have at least one by 2006 [32]. In 2000, South Korea's semi-public Seoul National University Hospital founded ezhospital, which is business-oriented instead of patient-oriented. With three main business elements, education (content services), e-trading and system integration, ezhospital is starting to alter purchasing arrangements for both medical and non-medical supplies. As the South Korean system is highly fragmented, the purchasing consortia that can be built through the Internet could one day become significant. At present, however, e-purchasing is at an early stage of development.

4.5. Funding

Analyses of e-health funding focus on one main issue, the short-termism of US initiatives. In this domain, it is difficult to reach an overall assessment of the tigers' performance. On the one hand, their developmental state orientations make the general climate for IT industrial emergence very different from the climate found in the US. In this regard, the tigers look to the long term in a systematic fashion that has no US equivalent. On the other hand, it is hard to find evidence that the tigers are investing

heavily in e-health applications. Moreover, because the private sector plays such a large regional role in healthcare, as it does in the US, many of the relevant initiatives fall outside the state sector and are hard to capture. There are undoubtedly many small commercial initiatives in East Asia as, again, there are in the US. Furthermore, like other commercial websites, private healthcare sites throughout the region rely heavily on advertising and sale of products for income. To take just two Taiwanese instances, the KingNet WebHospital and the Taiwan Physician's Net offer online sales not only of health-related products, but also of cinema tickets. The very fragmented nature of private-sector healthcare operations throughout the tigers means that few summary assessments can be made.

4.6. Physicia—patient relations

Looking finally at physician—patient relations, the existing literature contains variable forecasts of unpredictable change, little change, and so on. However, there is a clear belief that patients have most to gain from e-health and physicians correspondingly have most to lose. In general, physicians in the tigers have tended to be wary of exploiting the Internet for patient interactions. This partly reflects the tight regulatory climate in which many find themselves, with many modes of physician—patient contact outlawed. It may also reflect a certain reluctance on the part of both physicians and patients to engage in the informalities of online contact. Until recently, then, the emergence of virtual physician—patient relations was highly limited. Since the spring 2003 SARS crisis, however, the pattern may have started to change. Although it is too early to register the long-term impact of the crisis, it is clear that during the SARS outbreak, many individuals sought to shift to online interactions with healthcare professionals. The fear of visiting surgeries and, in particular, hospitals that gripped the region in 2003 has certainly not disappeared and seems likely to provide a lasting stimulus to virtual delivery of healthcare. Furthermore, the generic healthcare information found in great abundance on English-language websites is paralleled on regional websites operating in Chinese, Japanese and Korean. There is also some official encouragement for patients to migrate to e-health. In May 2004, Hong-Jen Chang, CEO and President of Taiwan's Bureau of National Health Insurance, argued at an OECD forum that e-health could make a major contribution in informing patients. As evidence, he cited Taiwanese experience in confronting HIV/AIDS and the role of the Internet in educating patients about the disease. In the long run, he contended, patients equipped with information gained from online searches ''will translate into quality improvement and efficiency gains for the system'' [33]. Overall, East Asian societies retain many traditional features, which generate some resistance to change in established modes of physician—patient contact. Nevertheless, there are also factors operating in the opposite direction. One long-term impact of the SARS crisis seems likely to be heightened caution about visiting healthcare facilities, for fear of contracting infectious disease, and a consequent boost for e-health.

5. Analysis and conclusion

The East Asian tigers form the most wired cluster of societies found anywhere in the world. Moreover, they have long had a developmentalist orientation that has seen their states become involved in many aspects of economic and social development. In the sphere of e-health, however, their performance is strong at the level of basic web provision, but otherwise not particularly advanced. On the whole, their health ministries or departments have good sites covering all the fundamentals of online provision. Outside central government agencies, they often have a wealth of additional sites in the public and private sectors. Beyond that, they do not make pioneering use of the Internet in healthcare.

There are many possible reasons for this slightly disappointing performance, some of which apply to all of the tigers and others which are specific to a particular society. In Japan, the structural problems that mired the economy in stagnation for more than a decade from the early 1990s also form part of the explanation for its sluggish e-health performance. A notable feature of the Japanese healthcare system is the considerable power of the Japan Medical Association and its extensive links to the Liberal Democratic Party that has governed the country for almost all of the post-war period. In Hong Kong, the 1997 sovereignty transfer was quite disruptive, and only several years on is the political system taking a settled shape on the developmental state model. Looking beyond the specific circumstances of individual tigers, however, the major explanatory factors appear to be institutional, cultural and financial.

Institutionally, East Asian healthcare systems tend to be highly fragmented, notably in Japan, South Korea and Taiwan. In consequence, policy-makers in healthcare ministries and departments have rather few levers that they can use to direct change. In the e-health sphere, they can quite

easily construct official government websites, but generating reform in the wider healthcare system is more difficult and depends on their success in building consortia of interest among many private-sector actors. In part, they seek to do this by offering ring-fenced seed money for specified development projects. In part, they resort to exhortation, calling on all members of society to engage in the project of securing and maintaining regional and/or global leadership in the information age. In these many respects, the East Asian tigers have a great deal in common with the US.

In the additional domain of culture, they differ from the US. While capitalism is certainly a dynamic force in East Asia as in North America, it also co-exists with still vibrant cultural underpinnings. The Confucian heritage that characterizes all five East Asian tigers has many complex strands. Among them is considerable respect for authority, hierarchy, status and so on. In the medical sphere, one consequence is that doctors tend still to be accorded considerable professional status. This may make it difficult for full commercialization to take place and for the market drive that characterizes e-health in the US to work its way through the system.

Finally, the financial dimensions of healthcare in the East Asian tigers should not be overlooked. These are healthcare systems that deliver the excellent outcomes already mentioned at a fraction of the cost registered in the US and, indeed, in most developed societies. As a proportion of GDP, East Asian tigers spend between 3 and 7% on healthcare, with most coming in at around 5%. This is far below the US figure of 13—14%, and also below the high-income country standard of almost 10%. One result of the tigers' success in holding down healthcare costs is that the incentive to experiment with new initiatives is reduced. Clearly, there still are some incentives, but they are not as strong as in the US.

E-health in the East Asian tigers remains at an early stage of development. All have attained a good basic standard, but few are engaged in path-breaking initiatives. Alongside institutional factors that are similar to those found in the US, cultural and financial factors help to explain this rather unsatisfactory level of performance.

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