

Global e-Readiness—for *What?* Readiness for e-Banking

Vincent Maugis

Department of Political Science, Massachusetts Institute of Technology, Cambridge, MA 02139. E-mail: vmaugis@mit.edu

Nazli Choucri

Department of Political Science, Technology and Development Program, Massachusetts Institute of Technology, Cambridge, MA 02139. E-mail: nchoucri@mit.edu

Stuart E. Madnick

Sloan School of Management, School of Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139. E-mail: smadnick@mit.edu

Michael D. Siegel

Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA 02139. E-mail: msiegel@mit.edu

Sharon E. Gillett

Internet and Telecoms Convergence Program, Massachusetts Institute of Technology, Cambridge, MA 02139. E-mail: sharoneg@mit.edu

Farnaz Haghseta

MIT Open Course Ware, Massachusetts Institute of Technology, Cambridge, MA 02139. E-mail: farnaz@mit.edu

Hongwei Zhu

Technology and Policy Program, Massachusetts Institute of Technology, Cambridge, MA 02139. E-mail: mrzhu@mit.edu

Michael L. Best

Program in Media, Arts and Science, Massachusetts Institute of Technology, Cambridge, MA 02139. E-mail: mikeb@media.mit.edu

ABSTRACT

With the rapid diffusion of the Internet worldwide, there has been considerable interest in the e-potentials of developing countries giving rise to a *first generation of e-readiness studies*. Moreover, e-readiness means different things to different people, in different contexts, and for different purposes. Despite strong merits, this first generation of e-readiness studies assumed a fixed, one-size-fits-all set of requirements, regardless of the characteristics of individual countries, the investment context, or

Sherif Kamel was the accepting Associate Editor for this paper.

Information Technology for Development, Vol. 11 (4) 313–342 (2005)
Published online in Wiley InterScience (www.interscience.wiley.com).

© 2005 Wiley Periodicals, Inc.
DOI: 10.1002/itdj.20022

the demands of specific applications. This feature obscures critical information for investors or policy analysts seeking to reduce uncertainties and make educated decisions. But there is very little known about e-readiness for e-banking. In particular, based on lessons learned to date and their implications for emerging realities of the 21st century, the authors designed and executed a research project with theoretical as well as practical dimensions to answer the question of “e-Readiness for *What?*,” focusing specifically on e-banking, based on the very assumption that *one size can seldom, if ever, fit all*. The authors also propose and develop a conceptual framework for the “next generation” e-readiness—focusing on different e-business applications in different economic contexts with potentially different pathways—as well as a data model—to explore e-readiness for e-banking in 10 countries. © 2005 Wiley Periodicals, Inc.

Keywords: e-readiness assessment; value-creation opportunities; e-banking; banking; pathways; profiles; leapfrogging

1. INTRODUCTION: NEW CHALLENGES IN e-DOMAINS

The rapid rate of Internet penetration throughout the world, coupled with dramatic advances in uses of information technology in business and industry, has created an extensive literature on various aspects of e-business and e-commerce as well as a special interest in e-readiness (Mann et al., 2000). Most of this literature is on industrial countries with a track record of e-related performance (Crenshaw & Robinson, 1999; Gibbs, Kraemer, & Dedrick, 2003). In many of these countries, the composition, and performance of the new e-domains create new venues with economy-wide linkages that provide sources of value-added—the scale and scope of which is not yet fully understood.

These studies contributed to an accelerated interest in e-venues for growth in the developing countries (Agency for International Trade and Cooperation, 1999; Tigre & O’Connor, 2002; Goldstein & O’Connor, 2000). National and international institutions alike appear to be focusing on the e-potentials for growth in private as well as public sectors, and almost every developing country is now mounting a national information technology (IT) development plan (Humphrey, Mansell, Pare, & Schmitz, 2003; Panagariya, 1999; UNCTAD Secretariat, 2001). And the World Summit on Information Society (WSIS) 2003 and 2004 is placing IT-related issues at the center of global politics.

Underlying these trends is an implicit expectation that successful e-business and e-commerce (however redefined) can take place if, and only if, emergent initiatives are built on robust foundations of readiness (e-readiness as a tool, 2001). However, the notion of e-readiness means different things to different people, in different contexts, and for different purposes. As a result, a large gap exists between ideas and concepts, on the one hand, and practical applications and implications, on the other. Gaps also exist between new expectations and capabilities in place. Investors as well as policy makers would be well served by the availability of tools to reduce ambiguity about decision and choices in this general domain. In particular, there is little known about e-readiness for e-banking, which is the focus of this article.

Much of what we know about e-readiness—in theory and in practice—comes from a range of studies that provide a view of past performance, current assessment, and future expectations. In this article, we review these studies, identify central tendencies and selectivity features, and propose an approach that, we believe, provides the basis for the next generation of e-readiness—for research and policy, assessments as well as realities. e-Banking is used as the focal application to illustrate this new approach.

2. FIRST GENERATION e-READINESS

The track record of studies addressing e-readiness matters is as impressive as it is wanting. These studies are impressive because they reflect the views and interests (as well as the methods and approaches) of consulting firms, academic researchers, and government organizations, national as well as international. They are wanting because it is difficult to extract a coherent view of the realities at hand, or the methods upon which they are developed. As such, they provide little guidance for business and government, perhaps even obscuring the realities as well as the opportunities.

Nonetheless, when closely scrutinized, the record to date yields a baseline of current understandings, illustrates central tendencies, and provides some important insights (if not evidence) for further inquiry to help reduce uncertainties and ambiguities in both theory and practice. The Appendix presents a “census” of the key studies, in terms of characteristic features and central foci.

2.1 Critical Features

A census of this “first generation” e-readiness assessments shows that roughly 137 countries have been assessed at least by one set of tools, 55 countries have been assessed at least five times by different organizations, 10 countries have been assessed more than eight times, and many of the less-developed countries have had no assessment at all (Bridges.org, 2002). Methodologically, most assessments are based on statistical studies or questionnaires, country cases, ad hoc interviews, and summary evaluations of IT-readiness for economic growth or for business opportunities defined in the most general terms.

2.2 Assumptions and Constraints

These early e-readiness studies generally assume a fixed, “one-size-fits-all” set of requirements, regardless of the characteristics of individual countries, the investment context, or the demands of specific applications. Many of these reports provide little information on how their indices were constructed, or how they might be adjusted to analyze particular e-business opportunities. The details and methodologies of assessment are not always publicly available (if at all), and there is a general tendency to provide “single standard” views and values. Put differently, attention is given to general propensities with a degree of aggregation that then obscures potentially important differences (Bruzzese et al., 2001; Clayton & Waldron, 2002; Min Tjoa, 2002).

Ambiguities in methodology compound uncertainties of analyses and results. More to the point, the prevailing one-size-fits-all feature obscures the very differences that investors or policy analysts require to reduce uncertainties or, possibly even make more educated decisions. Finally, there is no attention to the most fundamental of questions, namely, “e-Readiness for *What?*”

3. e-READINESS FOR *WHAT?*

Drawing on the above-mentioned studies, and assessing existing reviews of such studies—and benefiting from their experiences and insights—we developed a new coherent and internally consistent conceptual framework based on the propositions that (a) one size seldom, if ever, fits all, and (b) identifying value-driven opportunities serves as a critical cornerstone for theory and for policy. The implications of these propositions are examined below.

3.1 Foundations

We began with the development of an *operational definition* of readiness for conceptual as well as measurement purposes. Closely coupled with the conceptual framework, the formulation of a data-model intended to ensure internal consistency in the implementation of our measurement strategy. The next step was to explore *alternative pathways* toward e-readiness—consistent with our rejection of the one-size-fits-all proposition. The pathways provided the basis for addressing *opportunity-driven* assessments for on-the-ground application with reference to a specific type of e-readiness opportunity in a particular domain. In this process, we sought to identify and frame the relevance-criteria for select-targeted applications to a given opportunity.

3.2 Value Creation Opportunity

The conceptual anchor for this entire initiative lies in our formal definition of *e-readiness*. We define e-readiness as the *ability to pursue value creation opportunities facilitated by the use of the Internet*. The objection might be raised that such definitions amount to nothing more than unnecessary semantics. In this case, the quest for definition has a specific purpose, namely to serve as a conceptual anchor to (a) provide systematic guidelines for specific applications, (b) facilitate comparisons and case studies, (c) enable useful matching of abilities, on the one hand, with opportunities, on the other, and later on (d) create an architecture for innovative e-readiness tools and data-model to test utility.

Moreover, the diversity of questions, the range of contingencies, and the differences in conditions at any one-time highlight the importance of undertaking *targeted* e-readiness assessments. For example, using our e-banking focus, one may ask: “What is the best investment to improve the likelihood of success of a specific e-banking opportunity in a specific country?” Or, alternatively, “Which countries show the most promise as a new market for a particular set of e-banking opportunities?” or, “What is the current state of e-readiness for a specific e-banking opportunity in a specific country?” and so forth.

Despite apparent similarities, these questions differ significantly in their intent, focus, and information requirements—even as we take into account the multiplicity of potential perspectives of relevance in any particular case. These are all practical questions; but they require the use of theoretical as well as empirical guidelines.

3.3 Multiple Perspectives

The proposition that one size seldom fits all reflects our view that *no one single question can address all the complexities of the e-readiness domain*. Indeed, the relevant questions as well as the strategies for producing answers are driven by *who* is asking that question, *why*, and for *what* purposes.

To illustrate, for businesses, with primary interest in expansion into new markets, the question might be the nature of “fit” between the business and the relevant context and contents of potential applications, or opportunities. For national governments, whose interest is in effective targeting of investments in IT, the question might be: What are the best ways of determining gaps and needs, and strategies for closing the need-gap. For governments of developing countries, as well as for international institutions, the objective might be to bring IT capabilities to bear more readily on development objectives. For nongovernmental organizations, special interests, and such groups, the question might be how to mobilize select constituencies in support of particular IT strategies. And the examples go on.

The degree of convergence or divergence among various objectives, on the one hand, and prevailing e-readiness conditions, on the other, is clearly an empirical question. In this connection, it is useful to be able to address different types of questions, for different audiences from the same database and to consider that variables may have different meanings in different contexts, as well as for different intended applications (or investment opportunities).

Clearly, context matters and often highlights potentials for substitutability, for customization of activities, or for “leapfrogging.” For example, radio connectivity may substitute for telephone lines. Cell phones diffusion could reduce (even eliminate) the need for large-scale investments in landlines; e-communication may provide useful substitutes for physical mobility; and so forth. Leapfrogging is always a contentious issue; nonetheless, developing economies need not replicate the technology trajectory of the West nor the modalities for expanding applications of information technology.

Building upon the first generation studies, our research proposes new directions in theory and measures. Ultimately, we seek to formulate a “map of e-readiness” to help guide investment requirements and policy directions in increasingly contingent electronic opportunities and possibilities. Such efforts are essential prerequisites for building next generations of e-readiness tools.

4. TRANSCENDING THE FIRST GENERATION

The first generation literature on various aspects of e-readiness, electronic connectivity, and implications for economic development has identified a large number of variables that are considered relevant to e-readiness. But, the relevance to *what*, *how*, and *why* is often obscure.

4.1 Profiles

Our guiding propositions are that (a) different countries (or economies) are characterized by different e-readiness profiles or propensities defined by their individual access and capacity conditions; (b) given the variety and diversity of characteristics, there may well be a wide range of variables that shape propensities for both access and capacity—with respect to some opportunity; and (c) such propensities enable the pursuit of specific applications within the broad opportunity context that a country may have at any point in time.

We use the term *profile* to cover two sets of fundamental features central to enabling e-readiness: one pertains to broad conditions of *access*; the other to the *capacity* to utilize the access factors available. The conceptual framework and its eventual operationalization serve as guides for quantifying past performance to the extent possible. They also identify those variables that are most significant indicators of access and of capacity. Because these conditions are clearly not identical in form, type or nature, we regard them as *sets of clusters*.

By *clusters* we mean a set of variables within and across domains of access, capacity, and opportunity whose high intercorrelations point to an underlying set of common attributes.¹ Each cluster, in turn, consists of a set of constituent factors all of which must be in place—to one degree or another—to signal the relative degree of e-readiness in any particular situation and for any specific opportunity (or objective). These are the measurable elements of the data model. Our analysis shows that Access consists of a cluster of

¹We identified the clusters based on correlations coefficients.

variables reflecting infrastructure and reflecting services. The Capacity cluster is composed of social, economic, and political variables. Our data model integrates a total of 31 specific components (variables) within the domain of Access and 73 within the domain of Capacity. The Opportunity cluster consists of variables measuring opportunity penetration broadly defined (i.e. factors that make it possible for investors to enter into a new market), on the one hand, and those highlighting the potentials for specific applications (i.e. context-distinctive initiatives targeted to a particular product, process, or situation). Sources are listed in the references footnoted below.²

By extension, the empirical question is, which *variables* dominate which *clusters*? In the absence of theoretical directives, it would be fair to say that we proceeded empirically along lines of trial and error. Simple statistical measures of association were drawn upon, informed by displays of data properties coupled with comparisons within and among cases. This probe—the conceptual framework and the data model—owes much to the first generation of e-readiness studies.³

For example, the proposed research framework generally points to a wide range of opportunities that could be enabled by particular sets of access and capacity conditions. Moreover, by extending the general framework we can focus on specific *types of opportunities*. To illustrate, we show in Figure 1 the generalized research framework where we distinguish between access and capacity positioned as “inputs” at the center of the diagram, and list “outputs” in terms of some general types of e-opportunity penetrations in different sectors or economic activities usually dominated by physical rather than electronic modalities.

4.2 Pathways

We use the term *pathway* to mean context-dependent applications or delivery mechanisms enabled by the infrastructure and capacity in place: existence of supporting services, extent of affordability, etc. The key concept is that the same result can be attained through differing means, i.e., alternate pathways.

As an example, consider e-commerce as exemplified by online shopping services such as Amazon.com. There are many obvious enablers needed such as:

- An affluent population, willing and able to buy items.
- High availability of personal computers in the home to be used for shopping.
- High penetration of Internet usage and infrastructure to be used to provide connection to the online services.
- Wide availability and usage of credit cards to enable online payment.
- Low-cost and widely available to-the-home delivery services (such as the United Parcel Service [UPS] and Federal Express [FedEx]).

It is easy to see that e-commerce could thrive in developed countries, such as the USA, where all the conditions are met.

²Association for Progressive Communications, Bank for International Settlements, Bank for International Settlements Committee on Payment and Settlement Systems, Central Intelligence Agency, Economist.com, Euromonitor International, Europemedia, Expat Forum, The Information for Development Program, International Telecommunication Union, Organisation for Economic Co-operation and Development, Reuters Business Insights, United Nations Development Programme, World Bank. Please contact the authors for a list of specific components.

³Specifically, the conceptual framework (in terms of differentiation between *Access* and *Capacity*) is extracted from the results and inferences of first generation e-readiness studies (see Appendix). The specific variables selected for populating the data model emerged from basic and initial probes of association and correlation yielding “groups” of like-factors across a large number of countries.

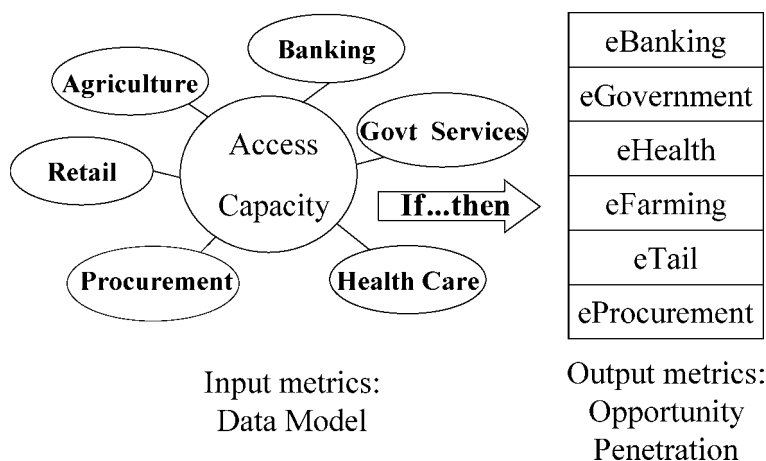


Figure 1 Research framework.

On the other hand, when one considers developing countries, such as in South America, where even electricity cannot be assumed, it might seem that e-commerce would not have a chance. But, in fact, there is significant e-commerce activity—but through a very different pathway. Although individuals cannot buy frequently because the population is not wealthy, this is exactly what makes the buying decision so important. Under these circumstances, you want to buy the ideal item for the best possible price, which is exactly what e-commerce facilitates. But what about the lack of the other enablers noted above? The answer is that “Internet Cafes” have taken on a key role: They provide the PC’s and Internet connectivity at convenient locations and low cost, so individuals do not have to incur the expense. Furthermore, they act as collection agents for the funds (so credit cards are not needed) and pick up locations for the merchandise (so that to-the-home delivery is not needed). Thus, all the conditions needed to support e-commerce can exist, but in a very different way than we find in most developed countries.

It is the creativity to find alternate pathways that makes it possible for opportunities to exist and even flourish under widely different circumstances.

5. VALUE CREATION IN e-BANKING

The emphasis on *value creation* opportunities, as being central to the entire e-readiness exercise, allows us to address a wide range of questions reflecting different stakeholder interests and objectives. Questions that can be addressed include, for example: What specific opportunity is being considered in country X? If, for instance, the opportunity considered is e-banking, what is the intended goal? Is it the goal to increase per capita income, strengthening the financial sector, or foster institutional development? What are the investment requirements for meeting this goal? Given current conditions, what are the alternative paths or possibilities for reaching the specified goal? What other value-creation opportunities exist in this situation? What factors might cause the effort to fail?

5.1 Approach

Our approach to e-banking begins with the development of an *operational* definition of readiness for conceptual as well as measurement purposes. On this basis, we formulate a

data model for the analysis of key readiness requisites. Closely coupled with the conceptual framework, the data model is intended to ensure internal consistency in our measurement strategy, then provide *alternative pathways* toward e-readiness in e-banking consistent with our rejection of the one-size-fits-all proposition.

Our framework derives from, and is the basic definition of e-readiness as a function of *the ability to pursue value-creation opportunities*. Methodologically, the core elements of the definition can then be parsed to represent the e-readiness for any community, investor, nation, business, etc. Earlier studies provided the foundations for a rough rule of thumb—a set of criteria—to help to distinguish among (a) factors essential to *access* conditions (related to enabled physical connectivity), (b) factors pertaining to *capacities* that are necessary but not sufficient (pertaining to social, economic, and related policy conditions) for e-readiness, and (c) variables that provide final proof of e-readiness mobilization, namely, capturing the convergence of necessary and sufficient bases for realizing a particular *value-creation opportunity*. The simplified diagram in Figure 2 serves as a reminder of the basic logic.

If we consider e-banking as a test case of this streamlined approach, it is likely that some e-readiness factors are more informative than others, and, it would be useful to know what factors are critical, for which profiles, why and how. At the same time, e-readiness profiles are not fixed; they are subject to investments, policy, and a host of contextual socioeconomic factors. Given this variability (and flexibility) different countries can, and do embark on different pathways toward greater e-readiness in general or toward e-readiness targeted toward a specific opportunity. It is fair to ask, “*Profiles of what, precisely? Pathways from where and to what? And for what type of opportunities?*”

In the context of e-banking, Table 1 shows e-readiness in terms of domains and clusters. This generic framework allows us to hypothesize: If *access* conditions are in place, then *capacity* considerations come into play. If both access and capacity are in place, then value creation *opportunities* can be pursued. In other words, there can be no viable *opportunity* creation in the absence of access and capacity conditions. The sequence implied in this logic serves as a point of departure for articulating the data model more fully.

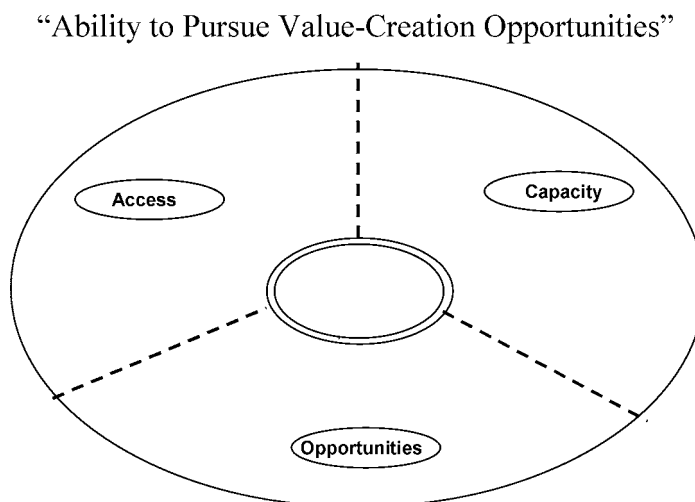


Figure 2 Domains of e-readiness.

TABLE 1. e-Readiness: Domains and Clusters

Domains	Clusters
1. Access	(a) Infrastructure (b) Services
2. Capacity	(a) Social factors (b) Economic factors (c) Policy factors
3. Opportunities	(a) Opportunity penetration (b) Specific applications <ul style="list-style-type: none"> • e-banking • B2B, B2C, B2G, C2C procurement • Marketing/information search • Comparison of alternatives (aggregation) • Payment • Delivery of goods • Logistics • Interface with public administration • Etc.

5.2 Data Model

For purposes of simplification, we show in Figure 3 a tree structure view of the data model, which displays the derivative approach we have adopted as well as some factors illustrative of each cluster within the domain set(s).

This simple view allows us to steer data collection and analysis and to generate some initial results. The key steps include (a) populating the data model quantitatively, (b) focusing on specific cases to identify key access and capacity factors in relation to

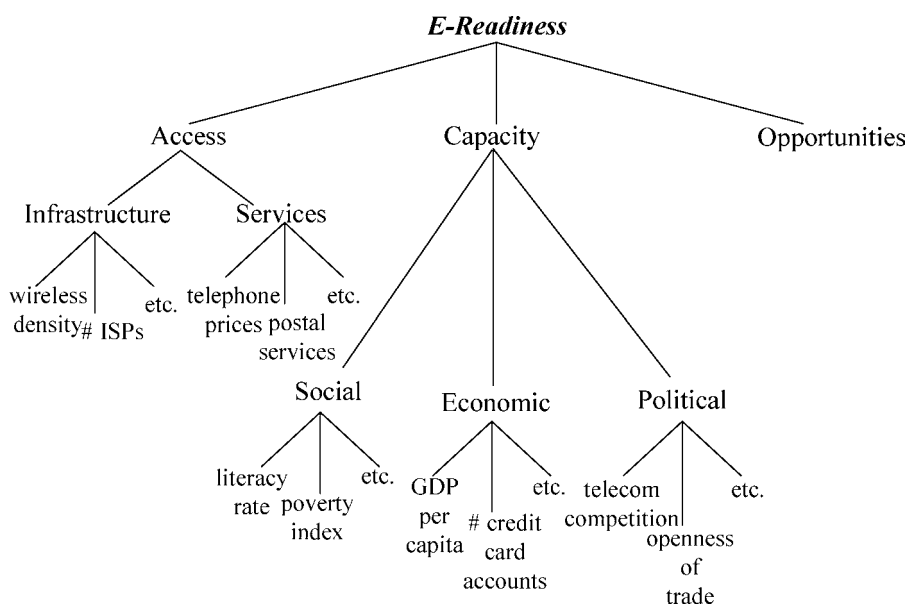


Figure 3 Data model (simplified).

an e-readiness opportunity, and (c) identifying observable pathways to e-readiness in relation to specific opportunity-driven applications. Of course, different data models could also be useful.

The tree structure shown in Figure 3 is instructive in its coverage, but somewhat misleading in terms of underrepresenting the importance of dimensionality, distributions, “nestedness,” and potentials for a wide range of applications. The tree-structure shows “what,” but not “why.” However useful as a heuristic device, for more instructive and operational inquiry, the model view is unduly limiting and may constrain our understanding of possibilities as well as opportunities.

Concurrently, we developed an alternative view of the data model and its properties designed to retain internal consistency but further expand its utility by specifying five design rules, namely, to (a) provide a system framework, (b) define domain representation, (c) incorporate distributional features, (d) enable focused applications, and (e) identify critical requisites. The alternative model adopts a system-wide view—nested and hierarchical structure with rule-driven criteria for linkages across and within levels—which enables focus on specific attributes features of actors, investors, governments, etc., as well as international or system-wide developments. The latter include, for example, the strategies of international institutions in support of economic development, investments in IT and related sectors, or businesses, as well as evolving concern with matters of sustainable development and sustainability—of economies, regions, societies, firms, or businesses.

The alternative data model consists of nested, hierarchical features, which span from general attributes to specific features designed around four key elements of e-readiness, namely *Domains* (e.g., access), *Distributions* (e.g., rural), *Applications* (e.g., rural access) and *Requisites* (e.g., rural Internet access). It also allows for coherent linkage across constituent elements (adapted and extended from the GSSD design⁴. The feature of nestedness assures some degree of conceptual coherence required at the implementation level. For example, a user interested in a specific set of *requisites*, such as rural Internet access, responds to a particular *application*, i.e., rural access; as well as *distributional* factors, in this case, the rural location. These features are all embedded within, or nested in, a particular *domain*, which in this case is, specifically, access. The alternative data model is a detailed extension of the basic model in Figure 1 to introduce multidimensionality, as shown in Figure 4.

In Figure 5, the *domain structure* pertains to the subject matter (i.e., e-banking) and, as noted earlier, we differentiate among (a) infrastructure-related factors shaping overall *access* measures, (b) performance or *capacity* related measures, in terms of (c) specific *opportunity* application. Figure 6 introduces the *dimension* or distributional level, which, in this pilot e-readiness project, is measured for a particular *application*, in a specific domain, at a targeted *location*, with respect to some specific type of *value-driven opportunity*. In the context of the nested system, this is as close to “the ground” as feasible here, pointing to the most granular view of relevance, and the most detailed (micro) level of aggregation.

Consistency in data model structure is, clearly, an essential prerequisite for consistency in data collection methods. The value of the alternative data model accrues from two sources, namely, those that are generic, and those that are relevant to specific types of applications. Compared with the basic tree model, the alternative data model generally provides greater flexibility in configuration, coupled with a more systematic integration across its features. By enabling greater consistency in measurement (across all elements of relevance), there is more system-wide coherence, the architecture is more transparent in

⁴Global System for Sustainable Development—<http://gssd.mit.edu/>

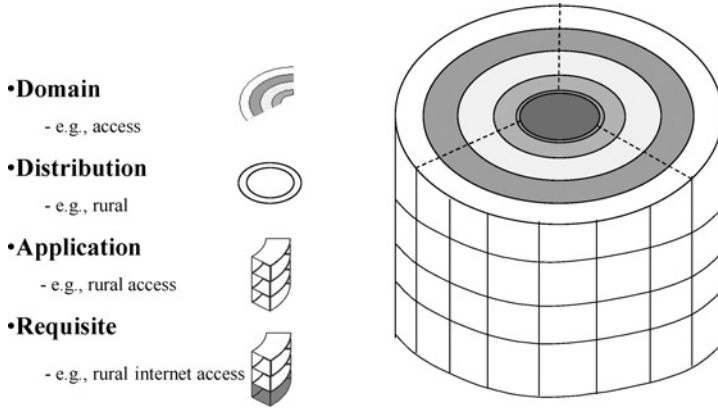


Figure 4 Alternative data model.

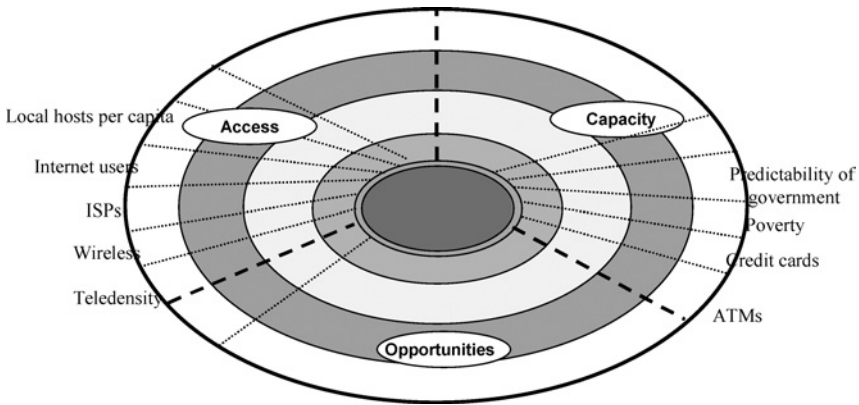
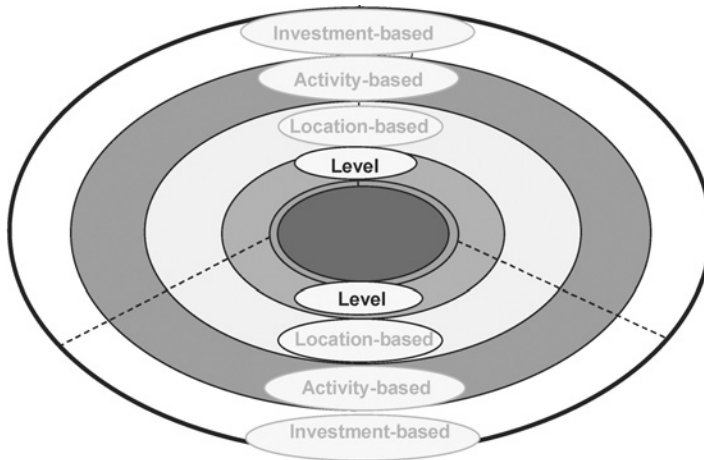


Figure 5 e-Banking domains.



Each domain is also characterized by specific dimensions, i.e. a distributional levels. For example, we might want to look at **credit card usage** on a **national level** (the entire country or countries).

Figure 6 e-Banking dimensions.

its features, individually and collectively, and the methodology and rules of operation are more explicit. These factors are all important in the e-banking context given the diversity of cases and conditions, and of alternative pathways and possibilities.

6. EMPIRICAL ANALYSIS OF e-BANKING

Focusing on a set of 10 countries—five more industrial and five less so—the goal is to identify (a) commonalities and variability in *e-readiness requisites* across countries, (b) pathways to *penetration* for a particular activity, e-banking, as a specific opportunity within the banking sector; and (c) pathways to specific *opportunities* of e-banking applications. The 10 countries (Lafferty Business Research, 2002) are quite diverse in context, culture, size, wealth, etc. They include Brazil (Tigre, 2003; Tigre & O’Conner, 2002), Dominican Republic, Ghana (International Institute for Communication and Development, 2003a, 2003b, 2003c), India (Goodman et al., 1998; Wolcott, 1999), Japan (Goodman et al., 1998), Russia, Singapore (Goodman et al., 1998; Wong & Fitzgerald, 2000; Wong, 2003), Spain (Kraemer & Dedrick, 2000), Sweden (Nyberg, 2002; Suominen, 2001), and the United States (Kraemer et al., 2002).

6.1 Profiles—Variability and Commonality

A comparison of the industrial countries cases enabled us to identify different ways in which they have met their access requirements and realized their socioeconomic capacities. It also allowed us to explore differences and similarities in access and capacity among a set of countries generally considered as e-readiness successes. In other words: What is distinctive about success cases?

Taken as a group, the 10 countries together showed the expected bimodal profiles of access—i.e., industrial versus developing—with respect to infrastructure and services requirements (Figure 7 shows numbers of Internet users against GDP per capita); the same

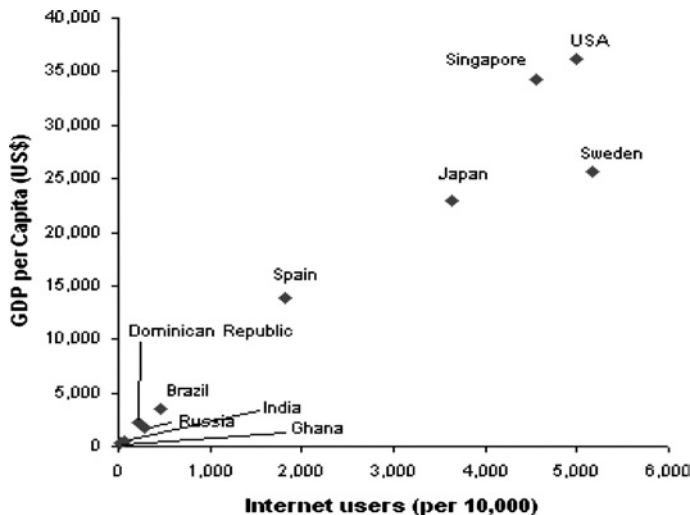


Figure 7 Internet users and GDP. The Internet users’ observations are for 2001; for GDP they are for 2000.

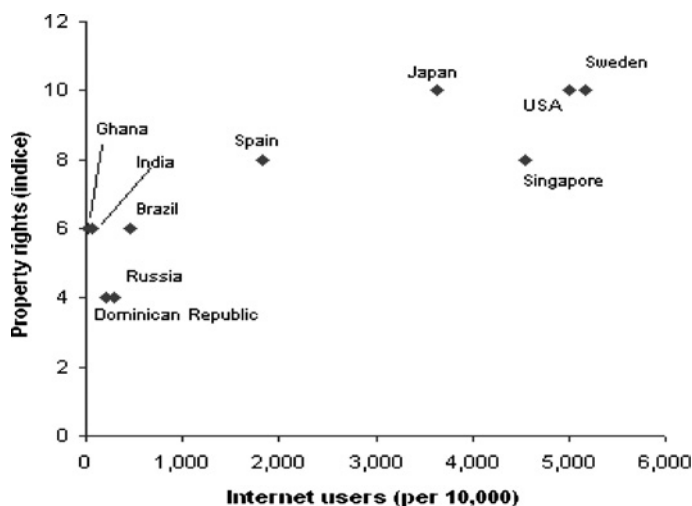


Figure 8 Internet users and property rights. The Internet users' observations are for 2001; for property rights they are for 2000.

bimodality holds for the capacity conditions (Figure 8 shows the number of Internet users against our index of Property rights).

A closer look at the five industrial countries, however, shows that the variability within the access domain is explainable by contextual factors. With respect to capacity, namely, social, economic, and political variables—what appears significant in terms of capacities-in-place is less the usual variables pertaining to level of development than variables related specifically to political conditions, namely, political stability, government performance, and regulatory frameworks, etc. In this connection, at least, politics matters and matters a lot.

Despite the general congruence with underlying socioeconomic indicators (as GNP per capita), it is the policy-related variables (as property rights) that provide added insights into the e-performance of industrial countries rather than the usual socioeconomic developmental variables per se. The comparisons made in this section highlight in a simple way both variability and commonality across the 10 cases.

Straightforward as these profiles and figures might be, they do provide some guides for next steps by pointing out the relative salience of key variables. The surrounding set of *enablers* (i.e., supportive factors) provides the basis for our e-readiness framework, as shown in Figure 9. This framework integrates the variables pertaining to the sector where a particular e-opportunity is considered. For example, for the banking sector, variables related to traditional banking practices will be located in the access and capacity clusters, while those pertaining to e-banking will be in the opportunity clusters.

6.2 Pathways to e-Banking Opportunity

The next step is to address matters of pathways—in terms of pathways to penetration, on the one hand, and pathways to specific opportunity target, on the other. Based on this logic so far, we explored pathways to e-banking for five industrial-country cases and the requisites in place that allowed for overall e-banking penetration as a precursor to specific e-banking applications. In other words, there must be a degree of penetration before it is possible to engage in specific forms of e-banking.

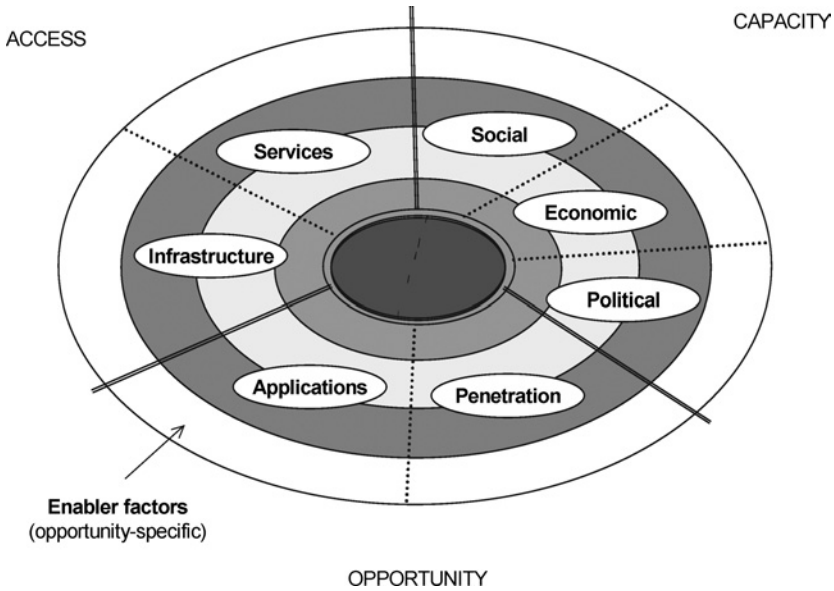


Figure 9 e-Readiness framework.

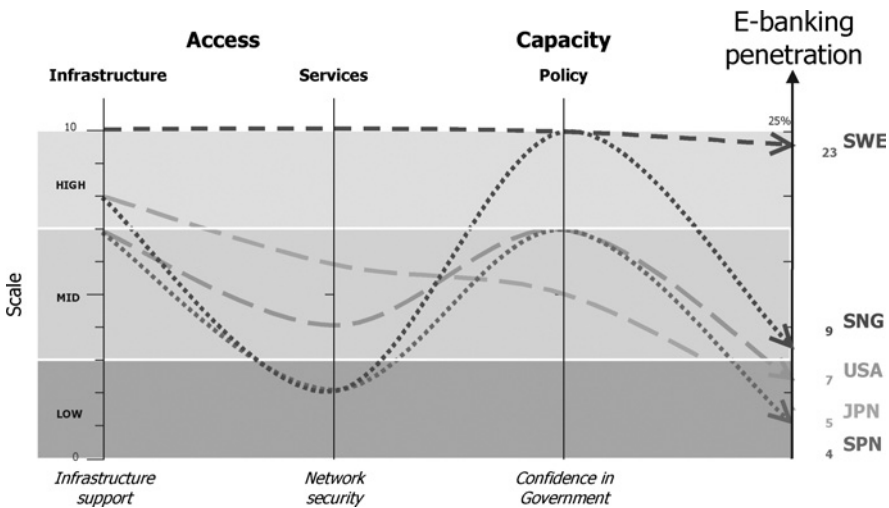


Figure 10 Pathways to e-banking. Figures for infrastructure supports are for 2001, network security for 2000, confidence in government for 2000, and e-banking penetration for 2000.

Figure 10 illustrates how overall e-banking penetration is reached given levels of access and capacity.⁵ The variables used for building profiles and pathways are normalized on a scale of zero to 10 (lowest zero and highest 10), while the opportunity outcomes are

⁵We used a simple normalization approach consisting of scaled indicators rankings 1–10 for each variable for the five countries to emphasize variation of key indicators within and across the selected cases. The opportunity penetration (right axis) is shown as a percentage of the respective population.

shown as percentage of the respective population.⁶ This approach provided the basis for identifying relative influences of key factors and deriving pathways for purposes of comparisons.⁷ The figure clearly shows the dominance of Sweden (SWE) in e-Banking penetration relative to the other cases considered, gained through high levels in the respective areas of infrastructure, services, and policy.

In Sweden, we observe an interesting interplay between *access* and *capacity* factors. Deregulation in telecommunications has allowed the country to build and maintain superb telecommunication networks. This competitive policy environment was naturally extended over Internet services and led to the fast growth in this sector. In addition to this conducive policy environment, the government also used a tax benefits instrument to induce employer-sponsored computer purchases. This interplay helped Sweden arrive at a high level of ratings in infrastructure and institutional capacity that are essential enablers for e-banking. In addition, network security and application usability are particular to e-banking, without which customers cannot quickly adapt their banking behaviors to accept e-banking services. Swedish banks were well aware of these factors and developed secure and user-friendly e-banking solutions to win trust from customers.

Examples of alternative pathways can also be seen in Figure 10 by comparing Singapore (SNG) and the United States (USA). Although their e-banking penetration is similar, they reached that point through different routes. The USA had a higher rating for network security, but Singapore's higher rating for "confidence in government" enabled it to attain a higher level of e-banking penetration.

These cases validate our framework in a number of aspects. First, access infrastructure and institutional capacity are interrelated requisites for effective deployment of any Internet enabled services. Second, opportunity-specific factors have to be considered in evaluating the readiness of pursuing the opportunity. Here e-banking is the opportunity and security is one of the most important factors specific to e-banking. As a contrast, online information dissemination services such as Web portal generally do not require the level of security needed for e-banking services. And last, adding other factors that are not closely related to e-banking will obscure and can even mislead the e-readiness evaluation for e-banking. For example, if a rural population is very small and banking services are concentrated in urban areas, adding a rural accessibility parameter into the evaluation metrics will underestimate the readiness. Our opportunity-driven framework helps eliminate this bias and allows for more precise analysis.

Another way of deriving inferences from the above is to consider data representation in radar form, a display method commonly used by international institutions in policy contexts. This form provides a simple visual perspective on the relative positioning of cases along *multiple* dimensions concurrently. These can be considered as illustrative profiles. Together with the pathways graphs, they help to identify country-specific challenges as well as problems and opportunities, thus clarifying where it might need to develop policy strategies and concentrate future investments.

The display in Figure 11 shows more precisely the relative positioning of each of the five countries along each of the axes of interest. This profile represents the access and capacity

⁶Figures for infrastructure supports are for 2001, network security for 2000, confidence in government for 2000, e-banking penetration (overall and specific applications) for 2000, household consumption for 1998, ATMs for 1999, and credit cards for 1999.

⁷These comparisons are among the five countries only; the intent is to highlight differences and similarities among them.

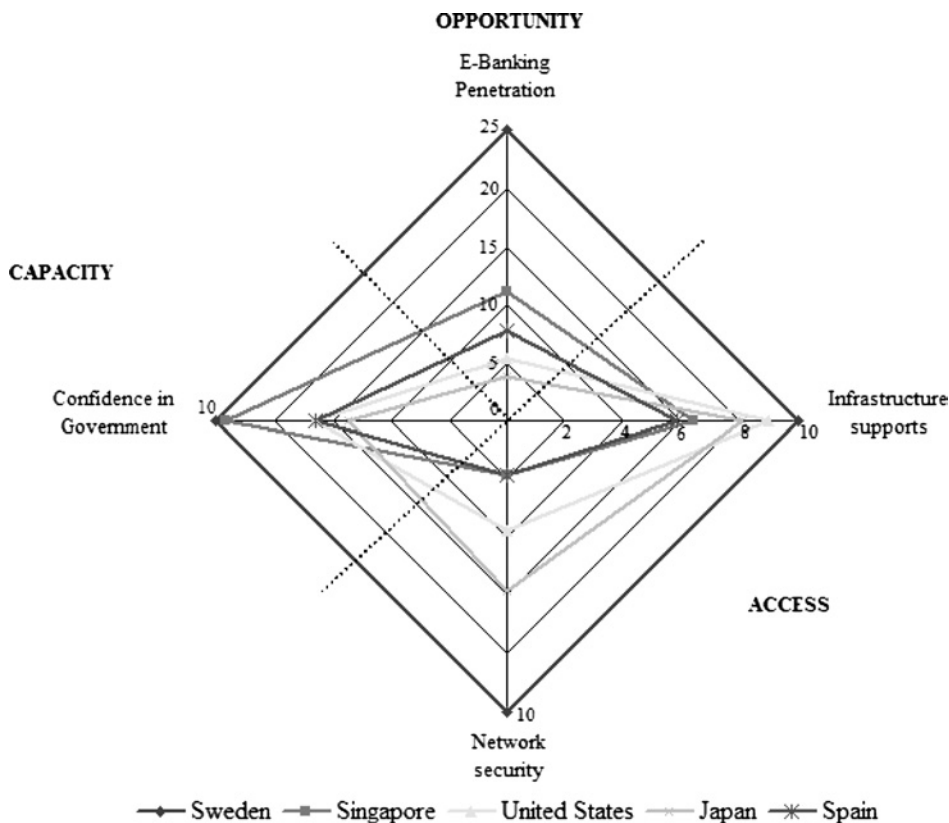


Figure 11 e-Banking profiles.

clusters of the e-readiness framework and the opportunity overall penetration. It attempts to capture the essence of countries' performance in (or preparedness for) the particular opportunity considered.

For example, we now note that not only does Sweden display relatively greater scale and scope in its e-banking performance than do the other countries, but it appears more balanced as well, in the sense that it has achieved a greater presence in along each of the pathway axes than any of the others, including the United States.⁸

6.3 e-Readiness for the Developing World

The notion that countries might leapfrog into the information age, by moving aggressively to the newest generation of technologies and rapidly developing capacity, immediately suggests there must be multiple pathways to various types of e-readiness. Clearly, these pathways will often differ from the approaches we have seen in industrialized countries. We examined pathways to e-banking penetration for five OECD countries and we saw that

⁸Because Sweden rates highest across all the dimensions, it is, in fact, the outer line connecting the end points of the four coordinates of Access, Capacity, and Opportunity shown.

various pathways can lead to different levels of e-banking penetration. We will now briefly consider factors for Ghana, one of the less-developed states in our sample group, to deliver e-banking applications.

Ghana is a West African nation of 20 million people. When we consider its access factors, such as telecommunications infrastructure, it falls well below the levels of our five “test” industrialized countries. The same can be said of certain enablers, such as ATM penetration, and capacity factors such as effective public policies. Through a simple survey of banks in a country, we have found e-banking penetration in Ghana to be nearly zero. While some banks have been advertising Internet banking services for commercial or large customers, our research has not revealed any such services to be currently operational. However, some banks do offer some minimal telephone banking services. Given these levels of penetration, access, and capacity if we were to place Ghana on our pathway graphs it would appear as a line hugging the bottom of the figure.

With a current total of 80 ATM’s countrywide and essentially no e-banking applications one might ask how our pathways model could be of any use to understanding and developing Ghana’s e-readiness. While it is true that this particular example might seem deflating, we believe that the pathways approach should allow Ghana to explore various approaches towards increased e-banking penetration—without having to blindly follow other countries pathways nor naïvely racing to “top-up” some assessment’s set of indicators.

Clearly, in our earlier section we showed that Sweden had undertaken a pathway towards significant e-banking penetration without relying on a large ATM network. Whether Ghana should travel a similar path towards this opportunity or not is just the sort of question one would wish to study within an e-readiness assessment. With a set of relevant probes, that describe relevant access and capacity factors as well as critical enablers, multiple pathways to e-banking opportunities can be contemplated.

6.4 Pathways to Specific e-Banking Activity

Extending comparisons further, we also examine application-specific pathways *within* e-banking for each of the five industrial countries. Here we explore a somewhat different proposition, namely that, *if* access conditions *and* the necessary enablers (or requirements) are in place, *then* capacity factors make possible the pursuit of specific e-banking applications. The logic here is that if access and capacity shape penetration of the *overall* opportunity across countries, then enabler (i.e., supportive) factors in individual countries shape the penetration of *particular* applications.

Figure 12 shows the respective levels of enabler factors integrated in the original pathway diagram. Some interesting observations can now be made. For example, although Sweden, as noted earlier, is the highest in overall e-banking penetration, the usage of ATMs and credit cards is low in Sweden. In fact, the high level of e-banking activities may be substituting for many of the traditional banking activities.

In Figure 13 five specific e-Banking activities are considered: balance checking, funds transfer, bills payment, shares trading, and financial services purchase. This figure tends to confirm our assumption above. Since e-banking is used extensively for “paying bills” (far higher than in any of the other countries examined), it should not be surprising that there is much less need to use ATMs or credit cards. This figure also reveals other differences as well as commonalities among the countries in the particular uses of e-banking.

For a multidimensional perspective, we turn once more to the radar representation. Figure 14 allows us to get a better sense of performance concentrations across each of

the e-banking activities by each of the five individual countries. In this diagram presenting relative shares of own-applications (as percentage of the population—not scaled), each country appears distinctive. Clearly, the lead country in all e-banking applications is Sweden; and the dominant application across countries is balance checking. Looking at Sweden, for example, if we compare the profile display for overall e-readiness (Figure 11), with the display focusing on e-banking (Figure 14), we do see the dominance of Sweden,

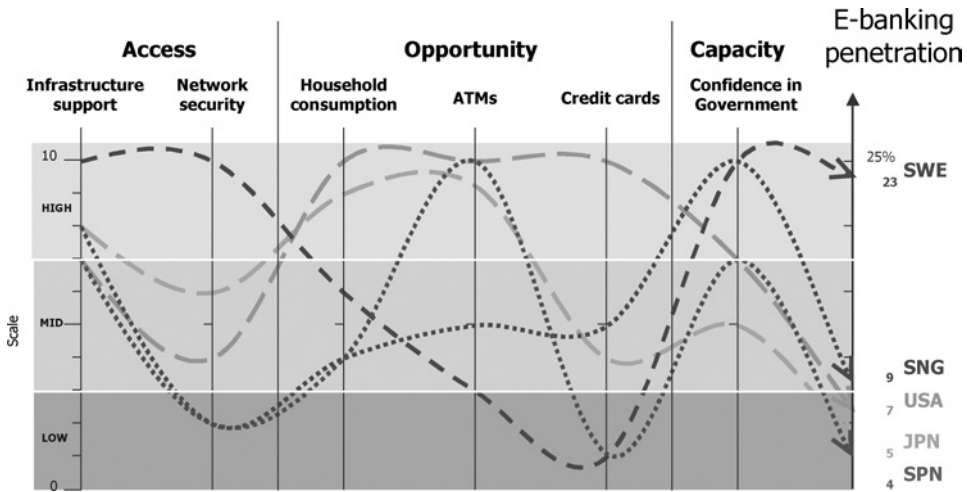
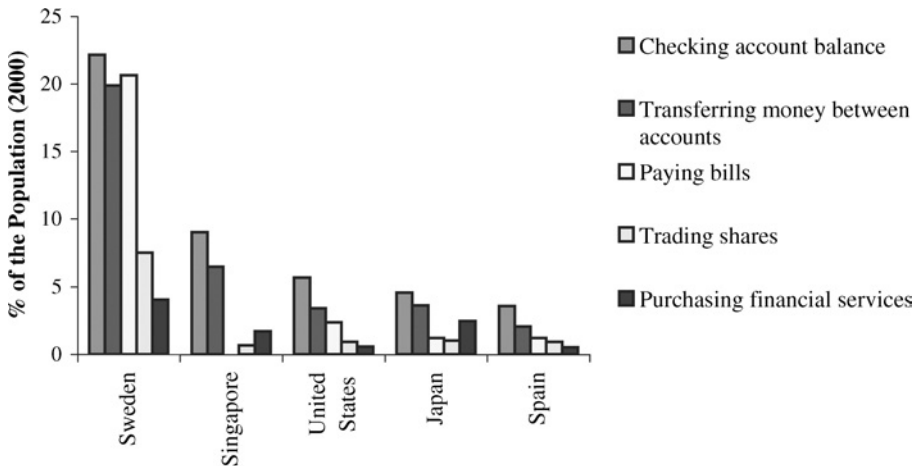


Figure 12 Pathways to e-banking. Figures for infrastructure supports are for 2001, network security for 2000, confidence in government for 2000, e-banking penetration for 2000, household consumption for 1998, ATMs for 1999, and credit cards for 1999.



[Note: data missing for Singapore - Paying bills]

Figure 13 Penetration of e-banking activities per country. (Note: Data missing for Singapore—Paying bills.)

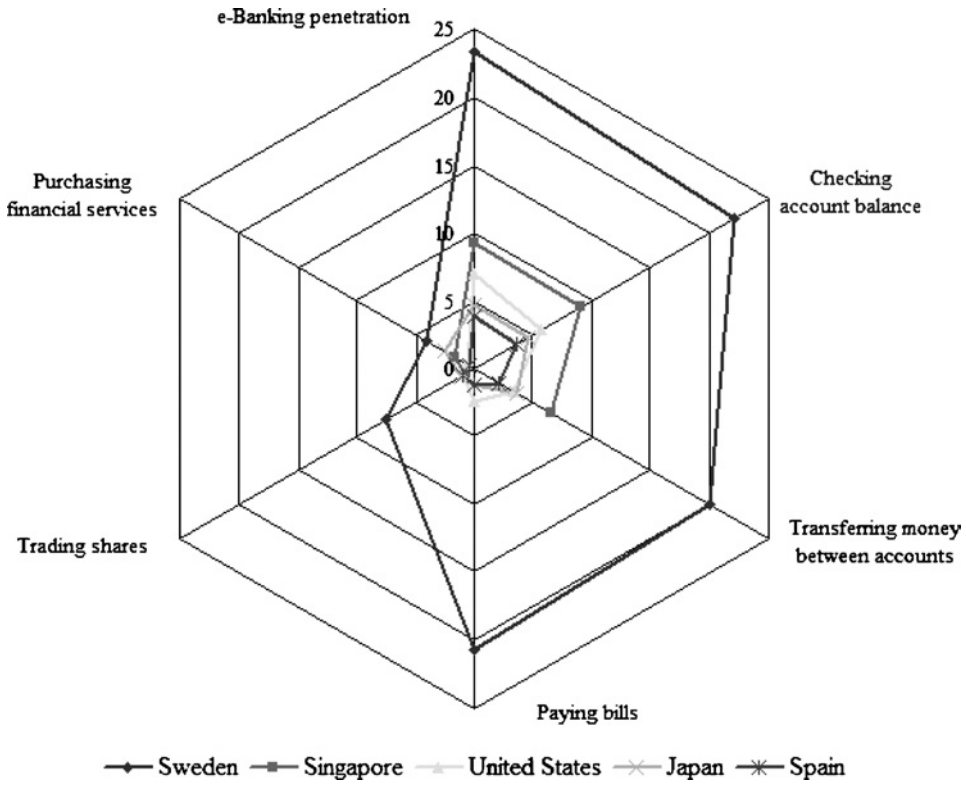


Figure 14 e-Banking profiles (2).

but we can also infer something of a behavioral model in e-banking activities. For instance, working clockwise, we see an example of focused sequential activities for the high-success case of e-banking, but we also see the activities which are relatively limited, and these might be considered as new opportunities for the next set of specific e-banking activities.

Clearly, there is scope for Sweden’s expansion of e-banking supporting the purchase of financial services. By contrast, we also note that for Sweden the use of e-banking for billing purposes exceed uses for transfer of funds.

7. CONCLUSION

7.1 Toward Next Generation e-Readiness

Much of the first generation literature on e-readiness has been sweeping in nature and aggregated in its inference-base. We do have information about general indices or general results from evaluation and assessment studies, but this practice makes it more difficult to move from generalities to specifics, or from broad trends to case-specific inferences or hypotheses. This practice also reinforces the usual difficulties or impediments associated

with cross-case or cross-country learning. In sum, systematic measures are necessary for effective comparisons; and comparisons are essential for improved understanding of e-readiness conditions.

Mapping out the chosen paths for a set of case studies will allow us to examine *why* certain paths were chosen over other alternatives in different cases, and to apply our findings to a pathway model that can be applied to *new e-readiness assessments*. For example: What e-readiness path has Japan followed to support e-banking opportunities? What *alternative* paths could have been pursued to reach the same ends? What does this tell us about e-banking requirements for *other* countries?

Shaped by the quest for value-driven opportunities, commensurate with performance potentials, our theoretical approach is responsive to the realities of a specific situation. At the same time, the conjunction of an operational definition with a data model greatly enhances prospects for replicability, scalability, and validity. This approach would enable the analyst to engage in fairly customized inquiries, given that customization can be made at the level of the economy, the industry, the firm, the opportunity, the investor, etc. These features, together, provide robust foundations for next generation e-readiness studies.

7.2 Next Steps

Jointly, the value-opportunity seeking framework and design are only first steps. We have built upon the first generation studies by transcending the earlier practices by explicitly discarding the one-size-fits all premise of earlier assessments. We developed conceptual, methodological, and empirical foundations for an alternative approach that could help frame the next generation of e-readiness. Clearly, we need to test our approach in a wide range of issue-areas and different situations.

All of this is in the early stages of research. The full measure of the research strategy can be shown only when the tasks are expanded to include greater country coverage, extended data analysis, and a detailed application of the required data model (i.e., fully populated database for any case in point, covering all the key variables). An improved specification of our approach to a “best” data model will involve greater conceptual consistency as well as more desegregation of units, levels, opportunities, etc. So, too, it is essential to extend further coverage of the elements within each of the domain conditions and then to introduce additional principles of differentiation. This means addressing matters of *distributions* (referring to the specific population or market segments in question, such as rural vs. urban, etc.), and types of *users* (referring to the relevant domain parameter within the distribution, for example, rural access), as well as specific *enablers* (such as rural Internet access—for particular applications).

Still missing, however, is a more robust set of rules and tools for coupling conditions, content, and context than we have done to date. At the operational level, we need to explore how different types of organizations can focus their investments and expenditures to best reach penetration goals—choose among pathways, consider multiple e-business opportunities—and determine which is most likely to succeed given available pathways as well as existing access, capacity, and opportunity-specific requirements. Such capabilities will allow us to answer questions such as, “What are the best investments for reaching a certain level of e-opportunity? What are the alternate requirements for reaching a certain level of an opportunity?” And so forth.

New tools are needed for improving measurement and tracking, for enhancing the overall coherence of e-Readiness systems and structures, and for providing some degree of “predictive” utility in this domain. The pilot case of e-banking is only a first step, but clearly, the foundations are now in place as we look to the development and specification of the next generation of e-readiness assessments.

ACKNOWLEDGMENTS

This research was supported by funds from the Center of e-Business at MIT, Sloan School of Management, Massachusetts Institute of Technology.

The assistance of T. Yuge, R. Perez, and R. Cavazos in providing data and preparing this document is greatly acknowledged.

APPENDIX

First Generation Studies—Comparison Tables

This Appendix compares key first generation e-readiness studies in terms of characteristic features and central foci: reports on assessment studies and tools; statistical-or questionnaire-based ready-to-use tools, and third-party reports; country case study models; Interview and survey-based reports.

TABLE A1. Reports on Assessment Studies and Tools

Report	Author	Date	Description	Content	Quantity assessed tools
Comparison of E-Readiness Assessment Models	Bridges.org	2001	Describes existing e-readiness assessment models in three categories (ready-to-use tools and questionnaires, third-party surveys and reports, digital divide reports and position papers). Draws comparison, carries analysis, and provides recommendations.	Comparison: Topics covered and level of detail, category focus, assessment methodology, result of assessment, analysis and recommendations, definition of e-readiness, user's/tool's goal, focus for assessment, measurement issues, towards a more comprehensive tool.	10+
Who is Doing What and Where	Bridges.org	2002	Looks at where e-readiness assessments have been carried out, and by whom. Emphasizes that significant duplication of effort has occurred in some countries, while others are devoid of useful data. Tables.	The 137 assessed countries are organized on a seven-region basis. The models are separated into in-depth case studies and those that are based on a questionnaire or statistical assessment.	19

TABLE A2. Statistical- or Questionnaire-Based Ready-to-Use Tools and Third Party Reports

Model	Author	Date	Description	Focus	Quantity assessed countries
E-Commerce Readiness Assessment Guide	Asian Pacific Economic Cooperation (APEC) Electronic Commerce Steering Group	2000	Gauges a country's readiness for e-commerce through a six categories, 100 multiple-choice questions detailed questionnaire. No overall scoring. Countries are recommended to work on areas with "less than optimal answers."	Basic infrastructure and technology, access to necessary services, level and type of use of the Internet, promotion and facilitation activities, skills and human resources, positioning for the digital economy.	n/a
Readiness for the Networked World	Center for International Development (CID) at Harvard University and IBM		Rates communities along four progressive stages of development in 19 indices. Based on communities self-estimation. No prescription for improvement.	Access, learning, society, economy, policy.	19
Cross National Analysis of Internet Development	Crenshaw, E. M. and K. K. Robinson. Ohio State University Department of Sociology.	1999	Statistical metrics and hypothesized model of technology development state the probable relationships between 10 variables. Provides narrative explanation of how the factors are likely to shape technology development.	Level of technological development, political openness/democracy, mass education, presence of a sizable service sector, tele-density, foreign investments, ethnic homogeneity, sectoral inequality, population density, quantity of exports.	n/a
Readiness Guide for Living in the Networked World	Computer Systems Policy Project (CSPP)	1998	Rates communities along four progressive stages of development in five categories. Based on a 23; question questionnaire.	Infrastructure, access, applications and services, economy, enablers.	n/a

continued

TABLE A2. Statistical- or Questionnaire-Based Ready-to-Use Tools and Third Party Reports (*Continued*)

Model	Author	Date	Description	Focus	Quantity assessed countries
E-Readiness Rankings	The Economist Intelligence Unit and Pyramid Research	2002	Tallies scores across six categories, five of which include a total of 29 indicators. Combines business environment rankings (70 separate indicators) with connectivity scores. Brief explanation of the results and the changes since last ranking.	Connectivity and technology infrastructure (25%), business environment (20%), consumer and business adoption (20%), social and cultural infrastructure (15%), legal and policy environment (15%), supporting e-services (5%)	60
E-Readiness Rankings	The Economist Intelligence Unit and Pyramid Research	2001	Tallies scores across six categories, five of which include a total of 29 indicators. Combines business environment rankings (70 separate indicators) with connectivity scores. Provides brief account of the results and changes since last ranking.	Connectivity (30%), business environment (20%), e-commerce consumer and business adoption (20%), legal and regulatory environment (15%), supporting e-services (10%), social and cultural infrastructure (5%).	60
Global Diffusion of the Internet: Questionnaire	The Mosaic Group	1998	Indicates stages of Internet growth and usage through combination of statistics, narrative description and comparison. Focuses on six Internet statistics.	Pervasiveness, geographic dispersion, sectoral absorption, connectivity infrastructure, organizational infrastructure, sophistication of use.	n/a
Global Technology Index	Howard A. Rubin and MetricNet	2002	Qualitative and quantitative statistics on country's technological sophistication and strength using 25 indicators in five categories. Ranking graphs.	Knowledge jobs, globalization, economic dynamism and competition, transformation to a digital economy, technological innovation capacity.	49

continued

TABLE A2. (Continued)

Model	Author	Date	Description	Focus	Quantity assessed countries
Information Society Index	World Times / IDC	2003	Statistical ranking based on 23 indicators in five categories. Only the list of rankings.	Computer infrastructure, Internet infrastructure, information infrastructure, social infrastructure.	53
Information Society Index	World Times / IDC	2002	Statistical ranking based on 23 indicators in five categories. Only the list of rankings.	Computer infrastructure, Internet infrastructure, information infrastructure, social infrastructure.	55
Information Society Index	World Times / IDC	2001	Statistical ranking based on 23 indicators in five categories. Only the list of rankings.	Computer infrastructure, Internet infrastructure, information infrastructure, social infrastructure.	55
Knowledge Assessment Matrix	World Bank	2002	Online statistical assessment using 61 indicators in five categories. Default scorecards and optional measurements. Only values and graphs.	Performance, economic incentive and institutional regime, education and human resources, innovation system, information infrastructure.	100
Risk E-Business: Seizing the Opportunity of Global E-Readiness	McConnell International and World Information Technology and Services Alliance (WITSA)	2000	Rates countries in five categories on a scale of 1–3. Provides extensive analysis and recommendations.	Connectivity, e-leadership, information security, human capital, e-business climate, public-private partnership.	53
Ready? Net. Go! Partnerships Leading the Global Economy	McConnell International and World Information Technology and Services Alliance (WITSA)	2001	Rates countries in five categories on a scale of 1–3. Provides extensive analysis and recommendations.	Connectivity, e-leadership, information security, human capital, e-business climate, public-private partnership.	53

TABLE A3. Country Case Study Models

Model	Author	Date	Description	Focus	Quantity assessed countries
E-Readiness and E-Needs Assessment	Country Development Gateway Projects, World Bank Development Gateway	n/a	Basic country assessments with a modified version of CID's methodology. Carried by CDG local teams.	19 categories focusing on technology infrastructure, pervasiveness of technology, regulatory policy, and business environment.	30+
Global Diffusion of the Internet: Case Studies	The Mosaic Group	1998	Indicates stages of Internet growth and usage through combination of statistics, narrative description and comparison. Focuses on six Internet statistics.	Pervasiveness, geographic dispersion, sectoral absorption, connectivity infrastructure, organizational infrastructure, sophistication of use.	25
Internet Country Case Studies	International Telecommunications Union (ITU)	n/a	Detailed case studies of ICT in the target country. Includes statistical ranking based on Mosaic's methodology, and recommendations.	Background, telecommunications, internet, applications	16
Country ICT Surveys	Swedish International Development Coordination Agency (SIDA)	2001	Detailed case studies focusing on the ICT sector through five main categories. Provides recommendations to improve ICT usage.	ICT policy process, connectivity and access, human resources, structure of ICT sector and major users, major areas for development opportunities.	4
Information Communications Technology Country Assessment	United States Agency for International Development (USAID)	n/a	Detailed case studies of countries using a five categories framework. Provides detailed action plans for countries to pursue in the future.	Pipes (access), public sector (government policies, e-government), private sector (usage), people (training), existing development programs.	4+

TABLE A4. Interview and Survey-Based Reports

Model	Author	Date	Description	Focus	Quantity assessed countries
Negotiating the Net Model	Center for International Development and Conflict Management (CIDCM) at the University of Maryland	2001	Based on interviews with key actors in a set of institutions. Describes the processes and outcomes of negotiations between key players over the phases of development, identifying major contentious issues likely to remain problematic in the future.	Background and history, Key players in Internet development, Internet development and ICT policy over time, Negotiation between players in developing the country's Internet.	n/a
International Survey of E-Commerce	World Information Technology and Services Alliance (WITSA)	2000	Report based on a survey to technology companies on their experience with e-barriers and asking for recommendations. Provides charts and narrative accounts of the answers. Only general conclusions, no country-by-country assessment.	How ready are world markets for electronic commerce? Economic factors, Regulatory environments.	n/a

REFERENCES⁹

- Agency for International Trade and Cooperation. (1999). *Electronic commerce within the framework of the WTO: Implications for the less advantaged countries*. Geneva: Author.
- Asia Pacific Economic Cooperation. (2000). *E-commerce readiness assessment guide*. Retrieved from http://www.apec.org/apec/publications/all_publications/telecommunications.html
- Association for Progressive Communications.* (n.d.). [African Internet infrastructure information.] Retrieved from <http://www3.wn.apc.org/africa/>
- Bank for International Settlements.* (n.d.). [Central bank payment system information.] Retrieved from <http://www.bis.org/cpss/paysysinfo.htm>
- Bank for International Settlements Committee on Payment and Settlement Systems.* (n.d.). Retrieved from <http://www.bis.org/cpss/cpsspubl.htm>
- Bridges.org. (2001a). *E-Readiness as a Tool for ICT Development*. Retrieved from <http://www.bridges.org/ereadiness/comparison.html>
- Bridges.org. (2001b). *Comparison of e-readiness assessment models*. Retrieved from <http://www.bridges.org/ereadiness/comparison.html>
- Bridges.org. (2002). *E-readiness assessment: Who is doing what and where*. Retrieved from <http://www.bridges.org/ereadiness/comparison.html>
- Bruzzese, D., & Farmakis, G.E. (2001). *Survey of e-commerce statistical indicators*. Unpublished manuscript, University of Naples, Naples, Italy, and Laison Systems, University of Athens, ERMIS Project.
- Central Intelligence Agency.* (n.d.). *CIA world factbook*. Retrieved from <http://www.cia.gov/cia/publications/factbook/index.html>
- Clayton, T., & Waldron, K. (2002). *Towards a measurement framework for international e-commerce benchmarking*. London, UK: New Economy Branch, Office for National Statistics.
- Computer Systems Policy Project. (1998). *Readiness guide for living in the networked world*. Retrieved from <http://www.cspp.org/projects/readiness/>
- Country Development Gateway Projects. (2002). *E-readiness and e-needs assessment*. Geneva: World Bank Development Gateway.
- Crenshaw, E.M., & Robinson, K.K. (1999). *Cyber-Space and post-industrial transformations: A cross-national analysis of internet development*. Unpublished manuscript, Department of Sociology, Ohio State University.
- Economist.com.* (n.d.). *Country briefings*. Retrieved from <http://www.economist.com/countries/?CFID=5005804&CFTOKEN=2f2876a-e21f0ba7-8bd8-42b6-bb33-8e2879ccd1ee>
- Economist Intelligence Unit and Pyramid Research. (2001/2002). *E-readiness rankings*. Retrieved from http://www.ebusinessforum.com/index.asp?layout=rich_story&doc_id=5956&categoryid=&channelid=&search=e%2Dreadiness
- Euromonitor International.* (n.d.). [Euromonitor world consumer lifestyles.] Retrieved from <http://www.euromonitor.com/reference.asp?rcode=consumer-lifestyles&docid=i3274>
- Europemedia.* (n.d.). [Europemedia factfiles.] Retrieved from <http://www.europemedia.net/countryfactfiles.asp>
- Expat Forum.* (n.d.). [Expat Forum international cost of living indices.] Retrieved from <http://www.expatforum.com/Resources/icol.htm>
- Gibbs, J., Kraemer, K., & Dedrick, J. (2003). *Environment and policy factors shaping global e-commerce diffusion: A cross-country comparison*. *The Information Society*, 19(1), 5–18.
- Goldstein, A., & O'Connor, D. (2000). *E-commerce for development: Prospects and policy issues*. Paris: Organisation for Economic Cooperation and Development (OECD).
- Goodman, S.E., Burkhart, G.E., Foster, W.A., Press, L.I., Tan, Z., Woodard, J. (1998). *Asian giants on-line. The Mosaic Group: The Global Diffusion of the Internet Project*, The Global Technology Information Group.
- Harvard University Center for International Development. (2002). *Readiness for the networked world: A guide for developing countries*. Unpublished manuscript, Harvard University, Cambridge, MA.
- Humphrey, J., Mansell, R., Pare, D., & Schmitz, H. (2003). *The reality of e-commerce in developing countries*. Unpublished manuscript, Institute of Development Studies, Brighton, UK.
- IDC and World Times. (2001/2002, 2003). *Information society index*. Retrieved from <http://www.idc.com/groups/isi/main.html>

⁹Entries followed by an asterisk (*) correspond to data sources.

- The Information for Development Program.* (n.d.). [InfoDev information infrastructure indicators.] Retrieved from <http://www.infodev.org/projects/internet/375pyramid/>
- International Institute for Communication and Development (IICD) and Bridges.org. (2003a). Environmental information network (EIN) boosts internal knowledge management system by using ICT (Ghana), environmental management. The Hague, The Netherlands: Author.
- International Institute for Communication and Development (IICD) and Bridges.org. (2003b). Geekcorps pairs skilled volunteers with small businesses in emerging nations. The Hague, The Netherlands: Author.
- International Institute for Communication and Development (IICD) and Bridges.org. (2003c). SATELLIFE pilot tests the viability of handheld computers for healthcare in Africa. The Hague, The Netherlands: Author.
- International Telecommunication Union.* (n.d.). [Statistics.] Retrieved from <http://www.itu.int/ITU-D/ict/statistics>
- Kraemer, K.L., & Dedrick, J. (2000). European e-commerce report: Globalization of E-Commerce Project. Unpublished manuscript, Center for Research on Information Technology and Organizations at University of California Irvine.
- Kraemer, K.L., Dedrick, J., & Dunkle, D. (2002). E-commerce in the United States: Leader or one of the pack?: Globalization of E-Commerce Project. Unpublished manuscript, Center for Research on Information Technology and Organizations at University of California Irvine.
- Lafferty Business Research. (2002). E-banking: A global & statistical analysis of online banking. [Research report. Company URL: <http://www.cpeurope.com>.]
- Mann, L.M., Eckert, S.E., & Knight, S.C. (2000). Global electronic commerce: A policy primer. Washington, DC: Institute for International Economics.
- McConnell International. (2001a). Ready? Net go! Partnerships leading the global economy. Washington, DC: Author.
- McConnell International. (2001b). Risk E-business: Seizing the opportunity of global e-readiness. Washington, DC: Author.
- Min Tjoa, A. (2002). Indicators for internet diffusion and e-readiness. Geneva: CSTD Panel on Indicators of Technology Development, United Nations Commission on Science and Technology for Development (UNCSTD).
- Mosaic Group. (1998). The global diffusion of the Internet. Princeton, NJ: Author.
- Nyberg, H. (2002). E-banking value creation. Swedbank, Sweden: Quasar Publications.
- Panagariya, A. (1999). E-commerce, WTO and developing countries. Geneva: United Nations Conference on Trade and Development (UNCTAD).
- Reuters Business Insights.* (n.d.). [Reuters Business Insights European econsumer profile and US econsumer profile.] Retrieved from <http://www.reutersbusinessinsight.com/subscriber.asp>
- Suominen, M. (2001). E-banking in the Nordic countries: Its emergence and perspectives. Fontainebleau, France: INSEAD.
- Swedish International Development Cooperation Agency. (2001). Country ICT surveys. [Agency URL: <http://www.sida.se>.]
- Tigre, P.B., (2003). Brazil in the age of electronic commerce. *The Information Society*, 19(1), 33–43.
- Tigre, P.B., & O'Connor, D. (2002). Policies and institutions for e-commerce readiness: What can developing countries learn from OECD experience? Paris: Organisation for Economic Cooperation and Development (OECD).
- UNCTAD Secretariat. (2001). E-commerce and development report 2001. Geneva: United Nations Conference on Trade and Development (UNCTAD).
- United Nations Development Programme.* (n.d.). [UNDP human development indicators.] Retrieved from <http://hdr.undp.org/reports/global/2002/en/indicator/indicator.cfm?File=index.html>
- University of Maryland Center for International Development and Conflict Management. (2003). Negotiating the net. Retrieved from <http://www.cidcm.umd.edu/papers.asp>
- USAID. (n.d.). Information communications technology country assessment. Retrieved from http://www.usaid.gov/our_work/economic_growth_and_trade/info_technology/index.html
- Wickboldt, A-K. (2001). The effect of property rights protection on economic growth and environmental pollution: A cross-sectional time-series analysis. Unpublished working paper, Political Science Department, Massachusetts Institute of Technology.
- Wolcott, P. (1999). The diffusion of the internet in the republic of India: An update. Unpublished manuscript, University of Nebraska at Omaha.

- Wong, K.K., & Fitzgerald, P. (2000). *Internet banking—Key legal considerations—Regional overview—Singapore*. Singapore: Baker & McKenzie.
- Wong, P.-K. (2003). Global and national factors affecting e-commerce diffusion in Singapore. *The Information Society*, 19(1), 19–32.
- Wong, P.-K. (n.d.). *Globalization and e-commerce: Growth and impacts in Singapore*. Unpublished manuscript, Center for Research on Information Technology and Organizations, University of California, Irvine.
- World Bank.* (n.d., a). [ICT at a glance & country at a glance tables.] Retrieved from <http://www.worldbank.org/data/countrydata/countrydata.html>
- World Bank.* (n.d., b). [World Bank competitive indicators.] Retrieved from <http://wbln0018.worldbank.org/psd/compete.nsf/d3fe1ba1940f13908525650d0053554f/c2b07f0ad3cc44d68525650d00536564?OpenDocument>
- World Bank.* (n.d., c). [World Bank financial structure and economic development databases.] Retrieved from <http://www.worldbank.org/research/projects/finstructure/database.htm>
- World Bank.* (n.d., d). [World Bank global development network growth database.] Retrieved from <http://www.worldbank.org/research/growth/GDNdata.htm>
- World Bank.* (n.d., e). [World Bank knowledge assessment matrix.] Retrieved from http://www1.worldbank.org/gdln-scripts/programs/kam2002/kamscrip.exe/show_page
- World Bank Institute. (2002). *Knowledge assessment methodology: World Bank Institute Knowledge for Development Program*. Geneva: Author.
- World Information Technology and Services Alliance. (2000). *International survey of e-commerce*. London: Author.

Vincent Maugis was a visiting student at MIT's Department of Political Science when this study was performed; his home institution was Institut des Sciences et Techniques de l'Ingénieur d'Angers (ISTIA), France. He is currently at UNESCO, Paris.

Nazli Choucri is Professor of Political Science, and Director of the Global System for Sustainable Development (GSSD) at MIT (<http://gssd.mit.edu>). She serves as Associate Director of MIT's Technology and Development Program. An expert in international relations, she has published nine books and over 120 articles on conflict, cooperation, and sustainable development.

Stuart E. Madnick is John Norris Maguire Professor of Information Technology and Professor of Engineering Systems at MIT. His current research interests include connectivity among disparate distributed information systems, database technology, software project management, and the strategic use of information technology.

Michael D. Siegel is a Principle Research Scientist at Sloan School of Management. He is currently the Director of the Financial Services Special Interest Group at the MIT Center for eBusiness. His research interests include the use of information technology in financial risk management and global financial systems, global ebusiness opportunities, financial account aggregation, and intelligent database systems.

Sharon E. Gillett is a Research Associate and Executive Director of the MIT Program on Internet & Telecoms Convergence (ITC). Her research lies at the intersection of Internet infrastructure technology and policy and has resulted in numerous publications.

Farnaz Haghseta is with the MIT OpenCourseWare initiative. She was a graduate student in the Technology and Policy Program at MIT when this study was performed.

Hongwei Zhu is a Ph.D. candidate in the Technology, Management and Policy program. He develops technologies to enable meaningful information integration. He also develops theories to address policy issues related to information reuse.

Michael L. Best is a Research Scientist at the MIT Media Laboratory where he heads the eDevelopment group. His research focuses on the role of information and communication technologies (ICTs), primarily the Internet and Internet enabled services, in international development.

Copyright of Information Technology for Development is the property of John Wiley & Sons, Inc. / Engineering. The copyright in an individual article may be maintained by the author in certain cases. Content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.