A FRAMEWORK TO E-TRANSFORM SMES IN DEVELOPING COUNTRIES

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ABSTRACT
Research into e-commerce and eTransformation indicates viable and practical solutions from e-commerce for organizations to meet challenges of a predominantly changing economic environment. Much of this research relates to developed countries ready to pounce on new approaches. However, developing countries seem to fall far behind. The few available studies related to SMEs in developing countries reveal a delay or failure on the part of SMEs to adopt ICT and e-commerce technologies. Various factors identified as causes for this reticence can be broadly classified as Internal Barriers and External Barriers. Exploring the identified barriers further, with an exploratory pilot study and interviews, this paper answers the question how barriers for adoption of e-commence impact the SMEs at different stages of sophistication. The paper also presents a framework to determine the current stage of an SME on a roadmap, which tracks eTransformation, and assists in overcoming barriers for moving between stages. Proceeding further, it identifies barriers predominant at various levels for different SMEs on the roadmap. Accordingly, SMEs at discrete stages need to be supported differently to suit requirements pertaining to level of ICT Sophistication. The proposed framework is a pointer in this direction to assist SMEs, policy makers and other stakeholders in addressing issues impeding adoption of e-commerce technologies in SMEs in developing countries.

1. INTRODUCTION
A significant contribution to the national economy is made by the SME sector in terms of wealth created and employment generated (Raman & Yap, 1996). With the development of ICT and the shift to a knowledge-based economy eTransformation and the introduction of ICT are becoming increasingly important tools for SMEs. eTransformation facilitates SMEs to reinvigorate corporate management and promote growth of the national economy. However, SMEs appear to face significant and unique challenges in adopting new technologies (Auger & Gallaugher, 1997) thus impeding SMEs in developing countries specifically.

A review of the literature indicates that many studies have been carried out in developed countries on factors inhibiting adoption of ICT and e-commerce. These studies have looked at organizational perspectives, owner/manager perspectives and environmental perspectives (Mehrtens et al., 2001). Among these are studies that investigate the facilitators/ inhibitors affecting adoption (Chen, 2003; e-Sri Lanka, 2003; Al-Mashari, 2001; Raman & Yap, 1996). Some barriers detected are specific and are more pronounced with SMEs in developing countries.

Many constraints inherent with SMEs in developing countries, subscribe to barriers: internal and external to the organization, making it essential to examine them in depth. The impediments within the organization hindering adoption of technologies are Internal Barriers while other impediments outside the organization related to infrastructure, political, legal,

social, and cultural barriers are External Barriers. Some barriers are more significant at certain stages. The rate of progression differs depending on the various barriers predominant at each stage. For an SME to successfully adopt the technologies and eTransform, these barriers need to be addressed. It is assumed that SMEs move through increasingly mature stages with respect to the way IT is used in their internal and external processes.

There is an interesting and growing number of studies addressing e-commerce adoption within the specific context of SMEs (Budhwani, 2001). This paper contributes to the ability to understand factors that inhibit ICT and e-commerce adoption in SMEs in Sri Lanka, a developing country on its way to an e-society. Believing that research findings from Sri Lanka will prove to be useful for other developing countries it explores how the barriers could be overcome by way of support activities. This paper fills the gap with research from developing countries by first discussing the barriers and later discussing required support for SMEs to adopt e-commerce technologies towards eTransformation. Next, it investigates barriers faced by SMEs with different levels of ICT sophistication. The framework established, follows, identifying a subset of barriers along with suggestions for support towards SMEs at a particular level of sophistication. Lastly it discusses the results that lead to conclusions.

2.   THEORETICAL FRAMEWORK
2.1   Barriers to ICT and E-commerce Adoption by SMEs
Previous studies which investigate barriers that effect SMEs adoption of ICT and e-commerce have identified a variety of factors, which can be grouped into several categories. A number of authors (Chen, 2003; Mehrtens et al., 2001) group factors into three major categories; owner manager characteristics, firm characteristics and cost and return on investment.

Other factors, such as the current level of technology usage within the organization related to the characteristics of the organization, also affect adoption of e-commerce (Iacovou et al., 1995). The OECD (1998) has identified that: lack of awareness; uncertainty about the benefits of electronic commerce; concerns about lack of human resources and skills; set-up costs and pricing issues; and, concerns about security as the most significant barriers to e-commerce for SMEs in OECD countries. Low use of e-commerce by customers and suppliers, concerns about security, concerns about legal and liability aspects, high costs of development, limited knowledge of e-commerce models and studies which investigate barriers that affect SMEs adoption of ICT and e-commerce have identified a variety of factors, which can be grouped into several categories. A number of authors (Chen, 2003; Mehrtens et al., 2001), group factors into three major categories: owner/manager characteristics, firm characteristics, and costs and return on investment.

Diversity among owner/managers, the decision makers for SMEs, reflects on a number of factors towards adoption of e-commerce technologies concluding that factors affecting adoption relate to owner/manager characteristics. A significant factor here is little or no knowledge, firstly of the technologies, and secondly of the benefits from such technologies. This is a major barrier to the take up of e-commerce (Iacovou et al., 1995), while lack of knowledge on methodologies, and unconvincing benefits to the company are among other factors (Courtney and Fintz, 2002). SMEs definitely have limited resources (financial, time, personnel). This "resource poverty" has an effect on adoption, as they cannot afford to experiment with technologies and make expensive mistakes (EBPG, 2002).

2.2   Barriers to E-commerce in Developing Countries
If governments believe that e-commerce can foster economic development it is necessary to identify inherent differences in developing countries with diverse economic, political, and

cultural backgrounds to understand the process of technology adoption (Mehrtens et al., 2001).

Organizations adopting ICT and e-commerce in developing countries face different issues and problems such as: the lack of telecommunications infrastructure, lack of qualified staff to develop and support e-commerce sites, lack of skills among consumers to use the Internet, lack of timely and reliable systems for the delivery of physical goods, low bank account and credit card penetration, low income, and low computer and Internet penetration (Ah-Wong, 2001; Budhwani, 2001).

SME studies of e-commerce issues in developed countries (Corbitt et al., 1997; Huff & Yoong, 2000; OECD 1998) indicate issues faced by SMEs in developed countries can be totally different. Organizations adopting ICT and e-commerce in developing countries face problems like: lack of telecommunications infrastructure, lack of qualified staff to develop and support e-commerce sites, lack of skills among consumers needed in order to use the Internet, lack of timely and reliable systems for the delivery of physical goods, low bank account and credit card penetration, low income, and low computer and Internet penetration (Anigan, 1999; Bingi et al., 2000; Marshall et al., 2000). Lack of telecommunications infrastructure includes poor Internet connectivity, lack of fixed telephone lines for end user dial-up access, and the underdeveloped state of Internet Service Providers.

Disregard for e-commerce is not surprising where shopping, a social activity in Sri Lanka, recognizes face-to-face contacts as important. Distrust of what businesses do with personal and credit card information in countries where there may be good justification for such distrust, could become a serious obstacle to e-commerce growth (Anigan, 1999; Elkin, 2001).

Absence of legal and regulatory systems inhibits development of e-commerce in developing countries. A study of SME adoption of e-commerce in South Africa found that adoption is heavily influenced by factors within the organization (Courtney and Fintz, 2002). Lack of access to computers, software/hardware, affordable telecommunications, low e-commerce use by supply chain partners; concerns with security and legal issues; low knowledge level of management and employees; and unclear benefits from e-commerce were found to be major factors that inhibit adoption. Similar study in China found that limited diffusion of computers, high cost of Internet and lack of online payment processes directly inhibit e-commerce. Inadequate transportation and delivery networks, limited availability of banking services, and uncertain taxation rules indirectly inhibit e-commerce adoption.

A study in Egypt (El-Nawawy and Ismail, 1999) found main contributory factors to non-adoption include: awareness and education, market size, e-commerce infrastructure, telecommunications infrastructure, financial infrastructure, the legal system, the government's role, pricing structures, and social and psychological factors. A comparison of two studies in Argentina and Egypt suggests key factors affecting e-commerce adoption in developing countries are: awareness, telecommunication infrastructure, and cost. The Internet and e-commerce issues of SMEs in Samoa are consistent with the studies conducted in other developing countries (Schmid et al., 2001). Studies in Sri Lanka revealed inhibiting factors as: lack of knowledge and awareness about benefits of e-commerce, current un-preparedness of SMEs to adopt e-commerce as a serious business concept, insufficient exposure to IT products and services, language barriers and lack of staff with IT capability (SLBDC, 2002). Web-based selling was not seen as practical as there is limited use of Internet banking and Web portals, as well as inadequate telecommunications infrastructure (SLBDC, 2002).

Thus, available literature reveals significant factors dealing with internal and external barriers that can be grouped to develop a framework for investigations affecting adoption of e-commerce technologies.

Internal Barriers: SMEs can control internal factors categorising them into: Individual (owner/manager), Organizational and barriers related to cost or return on investments.

External Barriers: Those that cannot be resolved by the SME organization and are compelled to work within the constraints. Inadequate telecommunication infrastructure and legal and regulatory framework are examples of external barriers. These could be further subdivided into : infrastructure related, political, social and cultural and legal. Some external barriers could be addressed by clustering sharing expenses, resources and facilities.

The summary of barriers pertaining to SMEs in Sri Lanka is shown in Table 1. By combining empirical findings from various areas in literature, it was possible to categorise the barriers into a model of several important factors as shown in the table given below. Table 2 depicts this categorisation of barriers by illustrating the factors important for SMEs in their adoption of ICT and e-commerce.

2.3   Support to Overcome Barriers

Even though there is a considerable corpus of literature on barriers to adoption of ICT and e-commerce, it cannot be denied that there is paucity of literature on the support activities required by SMEs to overcome the barriers. This section provides a review of the available literature on necessary support activities to help alleviate the barriers.

Lawson et al. (2003) suggest that the barriers could be overcome with the help of government and industry associations providing information to raise awareness, train, participate in the diffusion process and work with good consultants. This, to some extent is active in the UK, though it appears to be insufficient (Simpson, 2004). With the help of a survey carried out on 192 SMEs, along with five case studies investigating barriers at the initial Web design and development stages, the importance of support agencies in eliminating or alleviating the deterrents was revealed (Elsammami, 2001).

The lack of technical skills amongst owner managers of SMEs, requiring external advice and support was found to be significant with yet another survey. However, it was concluded that such support and advice does not necessarily have to be from experts (Darch, 2002). The same study observed SME dependence on government and industry groups for expert specialist advice although the small number that requested such advice was disappointed with the outcome where, available personnel seemed to lack knowledge of e-commerce.

In a study carried out in Latvia, government support with regulations encouraging e-commerce was found to be welcome. Provision of well-developed infrastructure at reasonable cost, was considered another facilitator (Sukovskis, 2002).
The Electronic Commerce Infrastructure Info-Communications Development Authority of Singapore (IDA) offers support to business organisations in the form of: a legal and regulatory framework, an incentive system of investment and tax breaks, which are designed to encourage e-commerce development and investment (Staff, 2002).

In Sri Lanka, a study of SMEs found that they need support with better telecom infrastructure, a conducive legal environment, tax concessions allowing for deeper penetration of computers, national policy on e-commerce, availability of technology and services at grassroots level. Internet centres at village level were also found to be necessary (SLBDC, 2002).

A careful study of these barriers and necessary support led to the model shown in Figure 1. The adoption is dependent on the barriers the SMEs are faced with and the support provided to overcome them.

Table 1 –e Commerce Adoption Barriers in Sri Lanka

Inhibiting Factors	Source
Organisational culture	Schmid, 2001
Difficult to promote web	SLBDC, 2002; Asia Foundation, 2000
Lack fixed telephone lines	Panagariya, 2000; Bingi, 2000; Anigan, 1999; Asia Foundation, 2000
Poor Internet	Panagariya, 2000; Bingi, 2000; Anigan, 1999
Cultural barriers	Bingi, 2000; SLBDC, 2002; Straeder, 2000; Smith, 2000; Chappel, 1999,
Cost of telecommunications	Cloete, 2002; Asia Foundation, 2000; Dedrick, 2001
Lack Government support	Looi, 2005; El-Nawawy, 1999
Lack of IT expertise, skills, training, personnel	Van Akkeren, 1999a; Bingi, 2000; Anigan, 1999; Straeder, 2000; Smith, 2000; Moussi, 2000; Lewis, 2002; Jacobs, 2000; Elsammami, 2001; Panagariya, 2000; Bolongkikit, 2006; Mukti, 2000; Cloete, 2002
Fears & concerns over security	Auger, 1997; Asia Foundation, 2000; Moussi, 2000; Jacobs, 2000; El-Nawawy, 1999; Bolongkikit, 2006; Mukti, 2000; Cloete, 2002; Looi, 2005; Elkin, 2001; Anigan, 1999; Van Akkeren, 1999b; Jensen, 2004
Lack of knowledge, education and training	Auger, 1997; Kotwica, 2001; PriceWaterhouseCoopers, 2000
Lack of knowledge of technology	Jacovou, 1995; El-Nawawy, 1999; OECD, 1998; Schmid, 2001; SLBDC, 2002; Cloete, 2002; Kirby, 1993
less use of e-commerce by customers and suppliers	Cloete, 2002; Lewis, 2002; Ihlstrom, 2001; PriceWaterhouse Coopers, 1999; Sukovskis, 2002
Inadequate infrastructure telecommunication, financial, transportation	Bingi, 2000; Anigan, 1999; Asia Foundation, 2000; Straeder, 2000; Smith, 2000; Chappel, 1999; Dedrick, 2001; El-Nawawy, 1999; Panagariya, 2000; Looi, 2005; Schmid, 2001; OECD, 1997; Zhuang, 2003
Lack of skills among consumers in Internet use	Panagariya, 2000; Bingi, 2000; Anigan, 1999
low bank account and credit card penetration	Panagariya, 2000; Bingi, 2000; Anigan, 1999; SLBDC, 2002; Dedrick, 2001
Poor product match or 'not suited to my type of businesses.	Ihlstrom, 2001; Smith, 2000; Moussi, 2000; Lewis, 2002; Jacobs, 2000; Bolongkikit, 2006; OECD, 1997; Poon & Storm, 1997; Yellow Pages, 2002
the owner's lack of awareness of perceived benefits	Cloete, 2002; Jacovou, 1995; OECD, 1998
Lack of financial resource &	Van Akkeren, 1999a; Smith, 2000; Chappel, 1999; Dedrick, 2001; Moussi, 2000; Lewis, 2002; Jacobs,

high cost	2000; Elsammami, 2001; Kotwica, 2001; Lawson, 2001; Cloete, 2002; OECD, 1998; El-Nawawy, 1999; Auger,1997
Return on investment	Looi, 2005; Cloete, 2002; Dedrick, 2001; Van Akkeren, 1999b
Insufficient information into benefits, how to implement	Van Akkeren, 1999b; Smith, 2000; Moussi, 2000; Elsammami, 2001
Lack of awareness of the potential of e-commerce for their business	Kotwica, 2001; PriceWaterhouse Coopers, 1999; Lawrence, 1997; Quayle, 2002; Walczuch, 2000,
low computer and Internet penetration	Panagariya, 2000; Bingi, 2000; Anigan, 1999; SLBDC, 2002; Dedrick, 2001; Jacovou, 1995
Insufficient time and the amount of work required to maintain e-commerce	Van Akkeren, 1999; Straeder, 2000; Smith, 2000; Moussi, 2000; Lewis, 2002; Jacobs, 2000; Elsammami, 2001

Table 2 Categorisation of Barriers to Adoption in Sri Lanka

|	Factors	Author
Internal Barriers	Owner/manager Characteristics	Jacovou et al., 1995; Kirby et al., 1993; Looi, 2005; Molla et al., 2005a; Lawrence, 1997
	Firm Characteristics	Thong et al., 1996; Looi, 2005; Chong, 2006; Mehrtens et al., 2001
	Return on Investment	Van Akkeren et al., 1999a; Cloete et al., 2002; Looi, 2005; Lawrence, 1997
External Barriers	Infrastructure	Auger et al., 1997; Chappel et al., 1999; El-Nawawy et al.,1999; Looi, 2005, Panagariya,2000
	Social & cultural	Chong, 2001; Farhoomand et al., 2000; Takada et al., 1991; Farhoomand et al., 2000; Jennex et al., 2004; Molla et al., 2005b
	Political	Farhoomand et al., 2000; Dedrick et al., 1995
	Legal & Regulatory	Eang, 2005; Bingi et al., 2000; Farhoomand et al., 2000; Panagariya, 2000; Schmid et al., 2001
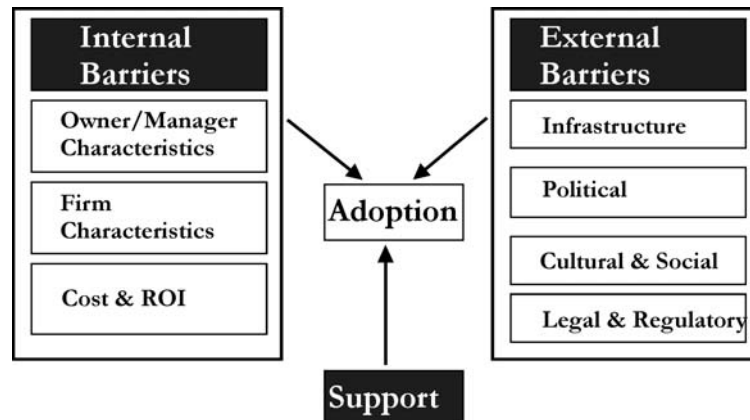
Figure 1 - Model for Adoption

2.4   Stages of Growth Models

The adoption of e-commerce technologies by SMEs can be illustrated as an ordered sequence of stages. A model which illustrates various different stages an organization can progress through, is an effective tool to describe and evaluate an enterprise's sophistication in its use of ICT (Prananto et al., 2001). It would facilitate the understanding and explanation of the process and act as a guide towards implementation and policy formation. Stages of growth models presume a progression of levels over time (Prananto et al., 2003; Ginige et al., 2001). Progression means the accumulation of knowledge, experience, qualifications and expertise within the company (Prananto et al., 2001). It is imperative that a model should look at both internal functions of the organization as well as the external functions.

A model which takes into consideration of this holistic picture is the eTransformation Roadmap by Ginige et al. (2001). Illustrating a step-by-step approach that assesses current status of companies involved it gives direction viewing IT sophistication from both internal and external perspectives. It looks at external process development (progressive development of the website); as well as employee involvement as individuals, task teams as groups, and the entire company as a single entity. The final goal of the eTransformation Roadmap is a convergence of the external and internal processes involved in the business practice. These stages of growth models could be used for descriptive purposes in terms of evaluating an organization's use of ICT, and prescriptive in terms of planning for outlining a potential direction of growth (Prananto et al., 2001). Despite the importance there have been limited investigations of the evolutionary process of SMEs into their use of ICT (Cooper & Burgess, 2000), , and none in the case of SMEs in Sri Lanka.

This original eTransformation model is modified with evolution to a eSME Roadmap to suit the SMEs in developing countries, specifically Sri Lanka (Kapurubandara & Lawson, 2007). The arms and building blocks of the eTransformation Roadmap illustrate how an organization normally increases its sophistication of both internal and external processes. Each stage on the eSME Roadmap has certain characteristics which distinguishes it from other stages (Kapurubandara, 2008).

3.   RESEARCH METHODOLOGY

Empirical research in this area being limited, an exploratory investigation utilizing qualitative and quantitative evidence was considered most suitable. The empirical research selected the Colombo District with the highest density of companies using ICT. The World Bank defines enterprise size in Sri Lanka based on the number of employees. This research considers enterprises with 10-250 employees as SMEs (Cooray, 2003).

The study was conducted in two stages: preliminary pilot interviews and a survey. According to Mingers (2001), the use of such multiple methods is widely accepted as providing increased richness and validity to research results, and better reflects the multidimensional nature of complex real-world problems. Besides, a multi-method approach allows for the combination of benefits of both qualitative and quantitative methods, and permits empirical observations to guide and improve the survey stage of the research (Mingers, 2001).

Focusing on perceptions of the drivers and inhibitors of adoption of e-commerce technologies face-to-face semi-structured interviews with 17 SME owner/managers were conducted. Inhibiting factors, supporting activities and the general experience the organization faced during or prior to the adoption were discussed. Respondents, while providing descriptions of their ICT and e-commerce activities, contributed opinions regarding reasons for current usage levels along with perceptions of issues or factors acting as barriers to extend use.

A random sample from an Export Development Board (EDB) list, representing SMEs of varying size, type and market segments in various industry sectors was chosen. All respondents received the same set of open-ended questions a week before the interview for maximum autonomy in expressing views and to prepare for the interview. One hour long interviews were audio recorded and transcribed for analysis. Cross-case analysis was undertaken by organizing the data in a spreadsheet, with rows representing each SME and columns containing the data. Arranging the data into categories within a matrix-like structure is accepted as a useful technique for facilitating pattern matching of qualitative data (Yin, 1994).

The preliminary pilot interviews brought in barriers imperative to SMEs and the survey instrument, forming outcome from interviews and observations supported by an extensive literature review. A survey instrument with questions using a 5 point likert scale was developed, pilot tested by 3 SME owner /managers in Sri Lanka and our research group which helped in refining the instrument. It covered: information about barriers internal to the organization (related to owner/manager, firm, return on investment) for not using or extending the use of ICT and e-commerce; barriers external to the organization (related to infrastructure, cultural, political, legal and regulatory) for not adopting or extending the use of ICT and e-commerce; internal and external support required by the organizations; usage of ICT and company demographics.

The questionnaire was administered in Colombo. Overall, 625 questionnaires were personally addressed to the owner/managing director. The Department of Census and Statistics in Sri Lanka helped select recipients using a random sampling technique from a database of 3000 SME organizations in the Colombo District and from the list of SMEs from Tradenet. Follow-up efforts to non-respondents were made through phone calls and post, three weeks after the mail-out. Out of 169 total responses received, 13 were incomplete, resulting in 156 usable responses. This provided a response rate of 23.8%, considered adequate for the analysis and comparable to response rates in IS literature (Pinsonneault et.al, 1993). Comparison of the analysis between the first and second round of respondents did not show any statistically significant difference. Therefore it can be safely assumed that non response error is not present and the data obtained from the respondents are representative of the sample chosen.

4.   RESULTS DISCUSSION
4.1   Analysis of Survey Data

More than 75% of the respondents (96% males and 4% females) were either professionally qualified or graduates. T-test analysis showed no significant difference based on gender and level of education. There was consensus for support in various forms and directions to address the barriers faced in adopting ICT and e-commerce technologies.

A vast majority, 98.5% of the respondents have adopted ICT, but at various different levels in the adoption ladder. Some respondent organisations are quite advanced while some are at the entry level. Respondents generally agreed that ICT is important and is advantageous. Moreover, it has become an essential and important status symbol, which enhances the image of the company and hence become an indispensable commodity.

All organisations used desktop applications mostly word-processing and Excel, with 86.8% of SMEs having an Internet connections.

It was revealed that there is a slow but steady trend towards the usage of e-mail for communications; internally within the organisation as well as externally with the customers and suppliers. The slow but the definite upward trend of e-mail use for communications in the organisations is noteworthy.

4.2   Barriers and Support for SMEs

Of the Tables below, Table 3 identifies the top 5 internal barriers of 9 listed. Table 4 shows external barriers, divided into Cultural, Infrastructure, Political, Social, and Legal and Regulatory. Tables 5 and 6 illustrate internal and external support needed.

Table 3 - Internal Barriers for Not Using/Extending the Use of E-commerce

Barriers	Frequency	Valid %	Mean	Std
Employees lack the required skills	136	66.2	3.87	1.36
Security concerns with payments over the	134	63.4	3.6	1.26
Cannot give any financial gains	14	61.3	3.67	1.4
Not suited for the products	132	38.4	3.29	1.37
Not suited to the way we do business	135	38.5	3.12	1.32

Table 4 - External Barriers-Cultural

Barrier	Frequency	Valid	Mean	Std
Cultural Barriers				
Lack of popularity for online marketing & sales	137	62.0	3.59	1.13
Infrastructure Barriers				
Low Internet penetration in the country	142	71.2	3.77	1.08
Poor speed & quality of telecommunications	147	72.1	3.7	1.07
Inadequate infrastructure in the country	142	66.5	3.64	1.21
Relatively high cost of internet access	146	49.3	3.26	1.21
Unreliable power supply	148	42.5	3.16	1.23
Political Barriers				
Unstable economic climate in the country.	151	76.9	3.74	1.06
Constant change of government rules and regulations	151	70.9	3.72	1.15
Social Barriers				
The lack of available information on e-commerce	150	69.3	3.63	1.05
No one shop facility for services	144	56.3	3.53	1.17
Snr. Management in other sectors lacking in ICT knowledge	139	49.6	3.34	1.14
Lack of reliable expert help at a reasonable cost	146	49.3	3.30	1.23
Legal & Regulatory Barriers				
Little support from government/ with policies	142	65.4	3.77	0.98
Inadequate legal framework for e-commerce	135	64.4	3.70	0.98
No simple procedures and guidelines	143	65.1	3.69	1.12
Lack of suitable software standards	144	55.5	3.56	1.09

Table 5 - Internal Support

Internal Support	Frequency	Valid	Mean	Std
Advice & direction with regard to ICT & e-commerce	152	69.8	3.94	0.93
Guidance to overcome risks associated with implementing	146	78.7	3.94	0.93
Awareness building/educating in ICT & e-commerce	149	77.2	3.88	0.89
Assist SMEs with guidelines for appropriate hardware and software	151	73.5	3.80	0.88

Table 6 - External Support

| External Support	Frequency	Valid	Mean	Std
Improving national infrastructure (telecom, road, etc)	147	85.7	4.08	0.75
Provide form of financial assistance to help SMEs	152	77.6	4.00	0.83
Government to take leadership & promotion	150	76.0	3.97	0.93
Provision of tax incentives	148	79.7	3.97	0.91
Improve low computer and Internet penetration	147	79.6	3.97	0.84
Improve low bank account & credit card penetration	140	72.2	3.86	0.81
Enforce suitable software standards	149	73.8	3.83	0.91
Improve collaboration among the SMEs	149	69.1	3.81	1.02

Analysis of survey results reveal that lack of skills, lack of awareness of benefits and return on investments prevent SMEs from adopting ICT and e-commerce technologies, reinforced by "awareness and education" ranking top for support by nearly 95% of the respondents, not surprising for a developing country like Sri Lanka trying to implement technologies. It reflects on other internal barriers too and awareness and education can, to a great extent, counter this barrier. Since use of ICT in Sri Lanka is low, e-commerce faces inhibition and does not suit business transactions.

"Lack of popularity in online marketing" and "low Internet penetration" rate high in the list of external barriers. Improving ICT diffusion in Sri Lanka can address this problem. 'Inadequate infrastructure' impedes SMEs as reinforced by their request for "improvement of national infrastructure" raking very high on the support needed. SMEs in Sri Lanka are adversely affected by the high cost and unreliable service of infrastructure services such as electricity and telecommunications. The steps taken by the government to improve telecommunication facilities breaking telecom monopoly is noteworthy. Policy inertia and the lack of legal and regulatory framework also rank high and enforce constraints on SMEs. Policy reforms introduced by governments support the large export-oriented foreign direct investments leaving SMEs with ad-hoc policy prescriptions and weak institutional support (White paper, 2002). The government's role in an overly bureaucratic regulatory system results in delays in its deliberations and is extremely costly (White paper, 2002). Appropriate legal and regulatory framework would ensure that SMES operate on a level playing field.

Social barriers come next. A one-stop shop facility helps SMEs access information, technology, markets and the much needed credit facilities. This concept, implemented for export-oriented foreign direct investments (EOFDI) by the Board of Investments (BOI) found it to be successful. Being policy makers working towards progress of SMEs, senior management lacking in ICT knowledge is identified as an important constraint directly impacting operational efficiency of SMEs. Awareness building and education with regard to ICT and technologies would help alleviate this problem. Government, academia and industry sectors can take leadership roles in promotion of ICT conducting awareness and training programmes, technical and non-technical catering to the needs of SMEs at grass-roots level. SMEs place a very heavy reliance on external advice and support. Such support and advice seem unavailable.

4.3   SMEs Level of Sophistication

IT sophistication is defined as how a piece of information technology is used with appropriate process in an organization by looking at how people, processes and technology interact (Ginige et al., 2001). Taking a cue, data was analysed to recognize level of IT sophistication with internal and external business processes of SMEs and determine their position on the e-transformation road map.
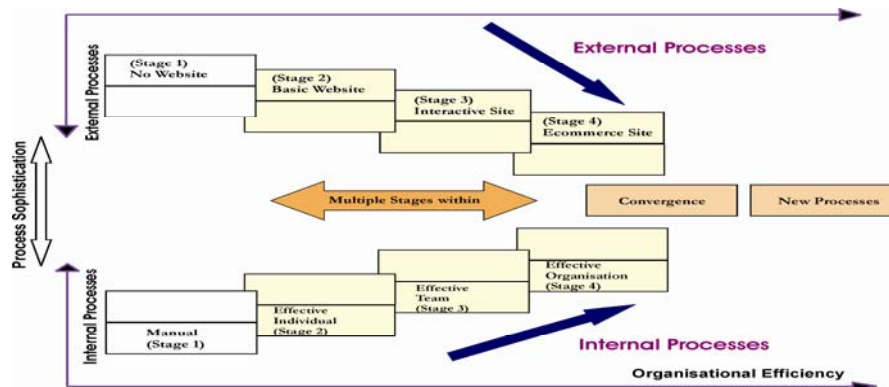
Figure 2- Initial eSME Roadmap for SMEs in Developing Country, Sri Lanka (Adapted from Ginige et al., 2001)

Two distinct new stages "No Computer" on external processes and "Manual" on internal processes resulted from the analysis. Extending the road map accommodated new stages. In Sri Lanka many organizations are yet to adopt computers in their business and small organizations fear hiring computer literate employees on high wages or losing trusted old hands to computers.

Some stages consisted of multiple stages within. The majority fell into two middle stages, a few into the least and most sophisticated stages. Figure 2 shows the modified road map for a Sri Lankan SME. Table 7 shows details of each stage on the Initial eSME Roadmap.

Table 7 - Stages on the Initial eSME Roadmap (adapted from Ginige et al., 2001)

Process	Stage #	Stage	Description
Internal	Stage 1	Manual	Computers are not used in the organisation. All the processes are conducted manually.
	Stage 2	Effective Individual	Individuals using computers and stand alone productivity software such as accounting packages, spread sheets, etc. May use e-mail.
	Stage 3	Effective Team	Computer network being used in functional units such as accounting, production. People work in teams using a network.
	Stage 4	Effective Organisation	All computers in the organisation are networked, and the databases and information systems are interlinked. Enterprise wide applications are used for purchasing, manufacturing, sales, accounting, etc. Information is shared across the enterprise.
External	Stage 1	No Website	The organisation does not have a website
	Stage 2	Basic Website	The organisation has its own domain name and brochure-ware type of website hosted. Has an ISP for marketing purposes.
	Stage 3	Interactive Website	Existence of a website providing two –way flow of information. Answers to structured queries online ordering, order tracking etc.
	Stage 4	E-commerce Website	The organisation should have a secure Web server to facilitate financial transactions or a link to a payment gateway to process online payments.
Process Integration	Stage 5	Convergence	The organisation has achieved integration of all information it needs to support all business processes and to interact with its business partners.
	Stage 6	New processes	Such organisations can handle new processes such as SCM CRM KM etc.

4.4   Detailed Roadmap

Further analysis of the survey data revealed that some of the SMEs do not exactly fit into the descriptions provided above. They do not possess all the characteristics pertaining to a stage, but are equipped with subsets of the features. This was more evident with stages 2, 3 and 4 of the internal and external processes of the Initial eSME Roadmap. It was the author's view to differentiate these partial or sub stages within a stage as they were found to be important. SMEs are taking small steps towards eTransformation. This led to the identification of sub stages within the main stages of the Initial eSME Roadmap. Depending on whether the SME has access to e-mail and Internet, depending on the availability of IT infrastructure (technology and applications) and also on the extent of features adopted, two sub stages within each stage on the internal processes were classified. In Sri Lanka, e-mail and Internet are considered costly affairs (SLBDC, 2002). Where the SMEs are saddled with many other pressing concerns, adoption of e-commerce is given a lower priority which is not surprising given the expenditure involved (Lawson et al., 2003; Van Akkeren & Cavaye, 1999b). Moreover, SMEs do not believe that e-mail and Internet are important or essential for their businesses. Furthermore, in an atmosphere that shows serious limitations regarding awareness and perceptions of the benefits of e-commerce, SMEs see no motivation towards embracing Internet and e-mail.

Depending on the availability of IT infrastructure (technology and applications) and extent of features the SMEs have adopted in each stage, two distinct sub stages within each of the stages on the external process arm were identified. It can be concluded that the SMEs' lack of awareness of e-commerce and the costs associated with of hardware/software led to the partial adoption. Previous studies have identified lack of awareness as a significant factor impeding the SMEs adoption (Bode & Burn, 2001; Cragg & King, 1993). It could also be attributed to cost, lack of finances (Van Akkeren et al., 1999a) and lack of readiness of the SME for e-commerce. It could also be argued that these sub stages are just the beginning towards a process, which had either to be postponed or abandoned due to many barriers impeding SMEs. Whatever the cause, it was heartening to note some effort had been made, however, small. Figure 3 shows the detailed e-SME Roadmap with the sub stages.
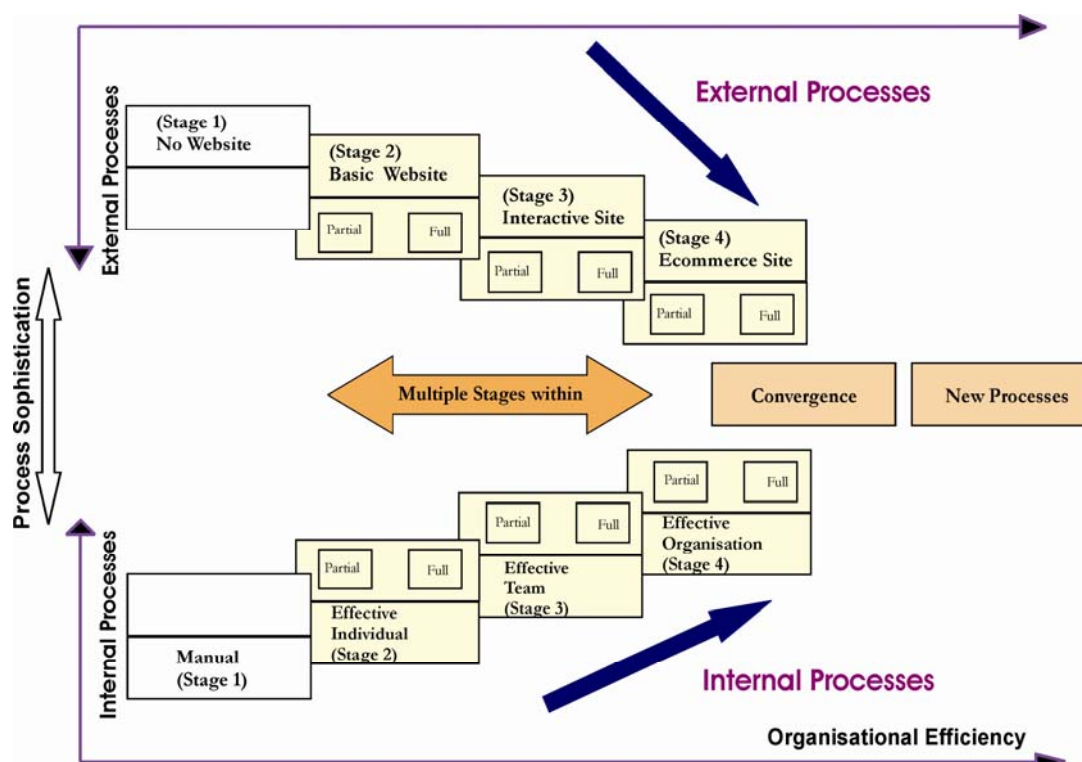

Figure 3 - Detailed eSME Roadmap (Adapted from Ginige et al., 2001)

Table 8 describes the sub stages within each stage and their characteristics. It illustrates the commonalities and differences between the sub stages.

Table 8 Sub Stages of the Detailed eSME Roadmap

Stage	Sub Stage	Description
Basic Website	Partial	The organisation has its own domain name. Website has basic details of the company.
	Full	The organisation has its own domain name and "brochure ware" type of website hosted with an Internet service provider (ISP).
Interactive site	Partial	The website provides an e-mail link for communication. May have a form to provide one-way flow of information. May still have dial-up connection
	Full	The organisation has a website that provides two-way flow of information. From such a website, users should be able to get immediate responses to structured queries, such as price quotations. Another feature would be to provide personalised information to frequent visitor. These types of websites can be hosted with an ISP but it is better to host them on site. This requires a web server and a high speed, dedicated connection to the internet.
Ecommerce site	Partial	Does not facilitate payments. Provide facilities such as online ordering and order tracking.
	Full	At this stage, the organisation has secure web servers to facilitate financial transactions or a link to a payment gateway to process online payments.
Effective Individual	Partial	Individuals using computers and stand alone productivity software.
	Full	Individuals are provided with standalone computer and productivity software, such as accounting packages, spreadsheets, and word processes. They may also be connected to the internet for accessing e-mail.
Effective Team	Partial	Computer network being used in functional units such as accounting, production. People work in teams using networked applications.
	Full	Computers in a functional unit, such s sales, accounting, or design are networked. People in that unit can work in teams using networked applications, e-mail, and intranet capabilities to enhance the teams' productivity.
Effective Organisation	Partial	All computers in the organisation are networked, and the databases and information systems are interlinked. Enterprise wide applications are used in some areas. Partial information sharing across the enterprise
	Full	All the computers in an organisation are networked and the databases and information systems are interlinked. The organisation now uses enterprise-wide applications to support different sections of the organisation, such a purchasing, sales, accounting, and manufacturing, thus enabling information integration and sharing across enterprise.

The survey data was analysed to determine the number of SMEs that fell into each of the sub stages. Table10 below shows the number of SMEs within each of these sub stages. The majority of the SMEs fell into the initial stages. None of the SME organizations fell into the advanced stages of the initial eSME Roadmap.

Table 10 – Number of SMEs in Sub Stages

External Processes	No Website	Basic Website	Interactive site	e-commerce site
	65 (41%)	80 (51%)	11 (7%)	0
Internal Processes	Manual	Effective Individual	Effective Team	Effective Organization
	7 (5%)	32 (21%)	117 (75%)	0

4.5   Barriers at Different Stages

Further analysis of survey data referred to in the Results section above, shows that SMEs can be at different stages on the eSME Roadmap. It is possible for an SME to be in an advanced stage on the external processes but at a rudimentary stage on the internal processes of the Roadmap. This observation led to further analysis of data to investigate the barriers that hold back the SMEs moving from the current stage to the next desired stage on the Roadmap. Chi Square tests determined the dependence or independence between internal barriers and adoption, external barriers and adoption and support activities and adoption. Tests on barriers to external and internal processes on the eSME Roadmap were also done.

Barriers on External Processes: (Moving from No website to e-commerce site)

The objective of this test was to identify a dependency between the internal barriers and the level of adoption of the external processes.

Internal Barriers to e-commerce

The Chi Square results revealed a dependency between internal barriers and the adoption of ICT.

Table 11-Contingency Table

Internal Barriers to ICT (No Web to e-commerce site)	Stage 1-2	Stage 2-3	stage 3-4
Staff lack required skills	**39, 25.7** 66.1%	13, 18.7 30.2%	9, 16.6 23.7%
Lack of time to investigate	**35,24.6** 59.3%	16,17.9 37.2	7, 15.4 18.9
Lack of financial resources	**29, 19.9** 53.7	13, 15.1 31.7%	7, 14 18.4%
Lack of awareness of suitable technology	**19,14.2** 32.2%	**12, 10.6** 27.3	3, 9.2 7.9%

The above internal barriers can be grouped into major categories of internal barriers, namely a) barriers pertaining to owner/manager characteristics, b) firm characteristics and c) cost or return on investment (ROI), thus reinforcing the system of categorisation of the internal barriers in the model for adoption.

Staff lacking in ICT skills (firm characteristic) is the most significant internal barrier, followed by lack of time to investigate (owner/manager characteristics), lack of financial resource (cost or ROI), and lack of awareness of suitable technology.

The analysis of the contingency Table shows the barriers are more evident when progressing from stage 1: SMEs with "No website" to stage 2: SMEs with a "Basic website".

Further analysis of the contingency Table shows that the barriers are more predominant at stage 1. The barriers become less evident progressing from a less advanced stage to more advanced stages. SMEs seem to have the maximum difficulty in getting started on ICT and e-commerce. Once they have taken the initial step, with time they seem to cope better with the issues they had in the initial process.

The barriers, "lack of skills" and the perception that e-commerce is not suited for products and services, was not evident as a barrier in moving from "Basic website" to "Interactive site". Product information on websites indicates confidence about suitability of products and services for e-commerce. However, the barriers "e-commerce is not suited for customers and suppliers" and the perception that e-commerce cannot give any financial gain surfaces in attempting to move from Basic website to an Interactive site. In Sri Lanka customers and suppliers are not in favour of e-commerce and this presents a barrier. If the customers and suppliers are not connected and do not engage in e-commerce it is understood that SMEs do not have any confidence in the financial benefits e-commerce can bring. It can be concluded that these two barriers are not significant in more advanced stages of adoption.

In a similar fashion internal/external barriers to ICT and e-commerce; internal/external support required to resolve the barriers were analyzed on both external processes and internal processes of the eSME Roadmap. Table 12 below summarizes the barriers and support for ICT and e-commerce as predominant at different stages of the eSME Roadmap.

This identification of barriers and support at different stages illustrate that SMEs are faced with a set of barriers; some of which are different and some, more significant than those in a developed country. There is a strong need for support activities and progress with the eTransformation process. These support activities are more significant to SMEs in a developing country where there is an apparent lack of support as reported in the empirical studies (Kapurubandara & Lawson, 2007). However, these barriers and support have varying degrees of significance at different stages on the eSME Roadmap. In other words only a subset of barriers and support is more significant at a particular stage. The eSME framework captures this information as illustrated in Figure 4.
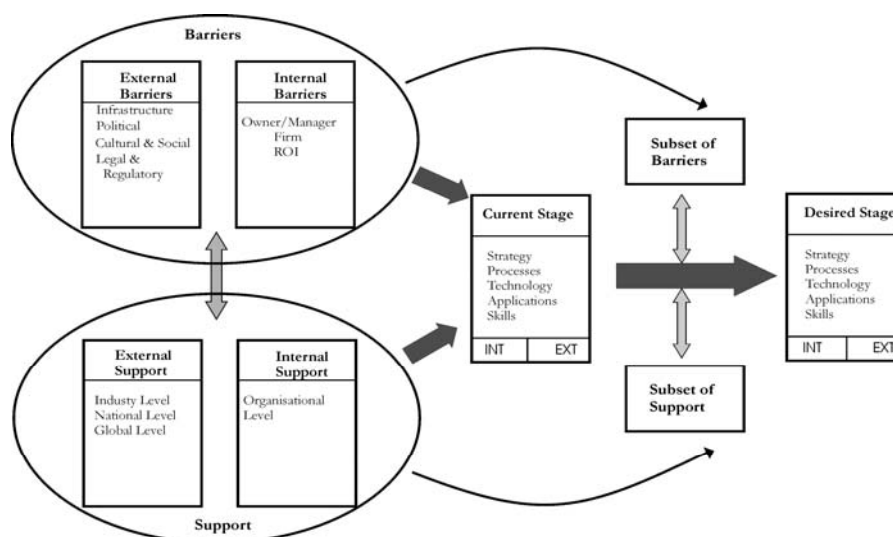

Figure 4 – eSME Framework

Table 12 - Barriers and Support at Different Stages

Type		External Stages			Internal Stages		
		1-2	2-3	3-4	1-2	2-3	3-4
Internal Barriers to ICT	Staff lack required skills	✓			✓	✓	
	Lack of time to investigate	✓			✓	✓	
	Lack of financial resources	✓			✓	✓	
	Lack of awareness of technology	✓	✓		✓	✓	
	Extending the use of computers cannot benefit us				✓	✓	
Internal Barriers to EC	Not suited to customer /supplier	✓	✓		✓	✓	
	Lack of required skills	✓	✓		✓	✓	
	Cannot give any financial	✓	✓		✓		
	EC does not suit products or services	✓			✓	✓	
	EC not suited to the way we do business				✓	✓	
External Barriers to EC	Unstable economic climate in the country	✓					
	Constant change of government & rules and regulation	✓	✓				
	Difficult to promote website	✓	✓				
	No access to reliable expert help	✓	✓				
	Lack of available information on e-commerce	✓	✓				
Support to EC	Assist SMEs with guidelines for HW/SW	✓		✓	✓	✓	✓
	Awareness building programmers	✓	✓		✓	✓	✓
	Advise & direction to overcome risks associated with EC				✓	✓	✓
	Govt. & industry sector to take leadership & promotion				✓	✓	✓
	Improve low computer & internet penetration				✓	✓	✓

(Legend: N- Not adequate data, EC-e-commerce)

The research study data illustrated in Table 12 depicts that on the internal process, SMEs are held back from moving from stage 3 to stage 4. Moving to stage 4 on the internal processes requires a wide range of skills, and it would incur substantial costs for necessary hardware, software and the technology infrastructure.

Table 12 illustrates the barriers predominant at each stage. SMEs seem to be saddled with the maximum number of barriers in the early stages of movement through the external processes. The study population shows that there are very few SMEs in stage 2 of the external processes with most of them in the less advanced sub stage.

With respect to support, SMEs need every support when moving to advanced stages on the internal processes. However, when moving from Effective Individual to Effective Team and Effective Organization stages they seem to require support especially with advice, direction, assistance and awareness raising.

Figure 4 shows the Framework for eTransformation of SMEs. The interpretation of the Chi Square test results shows that only a subset of barriers and support activities are predominant going from one stage to the next advanced stage.

5.   DISCUSSION OF THE FINDINGS

The *eSME framework* illustrated in Figure 4 provides guidance and advice to the SMEs on how to successfully carry out eTransformation providing an insight into the eTransformation journey. It helps understand various stages to go through as well as progressive transformation of business processes.

Similar to other stages of growth models discussed in previous literature(McKay et al., 2000; Poon & Swatman, 1999) the *eSME Roadmap* assumes that organizations move through increasingly mature stages with respect to the way IT is used in their internal and external processes to involve the organization in a variety of e-commerce activities. The rate of the progression through the stages can occur in rapid sequence or they can be very slow (Cameron & Whetten, 1981; Kimberley, 1979). This can be attributed to the various barriers predominant at each stage impeding the SMEs. The problems and issues inherent to each stage need to be resolved before the organization successfully advances to a more mature stage (Greiner, 1972). The empirical studies in this paper have shown that the SMEs have to live with most of the external barriers, which require government intervention to speed up the process. The emergence of sub stages in the empirical studies can be attributed to the current slow progression. The SMEs, compelled to progress at a slow pace due to various barriers, seem to try to make the change even in smaller steps by resorting to move into sub stages within a stage, which does not require them to incorporate all the features.

The *eSME Roadmap* shown in Figure 2 will facilitate an SME to ascertain the company's current level of ICT and e-commerce sophistication and determine the current stages they are in. They can also determine where they would like to progress next by examining the *eSME Roadmap.*

Table 12 indicates the subset of barriers that need to be addressed at each of the internal and external stages of the Roadmap increasing SME awareness of potential barriers and risks preparing an SME to look for appropriate support before embarking on the eTransformation process. The framework consisting of the above set of models would facilitate the SME owner/managers, policy makers, and industry organizations seeking to implement strategies for adoption of ICT and e-commerce. It would enable rational, informed decisions regarding the uptake of e-commerce.

6.   CONCLUSION

This paper provides an understanding of the challenges faced by SMEs at different levels of ICT sophistication in the adoption of ICT and e-commerce in developing countries. It

examines barriers significant at different stages while identifying support predominantly required at a particular stage in eTransformation resulting in a set of models offering a holistic approach to eTransformation. The eSME Roadmap articulates six stages of maturity and therefore offers much more gradual transition. This approach is well suited for SMEs who are constrained by resources and cannot handle large changes.

These models enable SMEs to identify their current stage, the barriers that are holding them back from moving to the next desired stage, and also the support required to progress to the next stage. The stages are the foundation of the eSME Roadmap. It can help trace the evolution of an organization and ensure the support providers align their support services to meet the requirement of each stage of the evolution process. Awareness of the strategy, processes, technology, applications, and skills they need to adopt in the process would help the SMEs plan their eTransformation process in a strategic manner.

The results clearly indicate the necessity to provide support to SMEs if they are to successfully adopt ICT and e-commerce. Accordingly, necessary support to overcome or alleviate the barriers discovered need to be recognized. In an age where information and technology combine to evolve new and emerging technologies that are speedily snapped up by the developed world for their betterment, it is sad to see the developing, trailing behind for the want of necessary financial, and other support. Both industry and government need to step in with the correct advice and support to help SMEs with their uptake of e-commerce. A major outcome of the research is the necessity to review current initiatives aimed at promoting ICT and e-commerce with SMEs and to develop strategies with a systematic focus to help SMEs to eTransform their organizations. This information can be fed up to the relevant government authorities to assist them with strategy formation.

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