"Economic Analysis on E-Government"
(A case study of e-Government in Singapore)

CONTENTS

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Abstract

Technology and Innovation has been rapidly recognized for their significant contribution to the economic growth, promoting efficiency in economic procedures and bring about a unique way in conducting business in the new era, so called “New Economy”. This paper is especially meant to discuss the significance of Internet and Technology in shaping the Government services through its online application called e-government services. It has been widely recognized that good governance will try to bring the best services available for the interest of public, business, and the country itself as a whole. Singapore as one of the leading country that has been utilizing IT nationwide, will be taken as a case study of these e-government services. Network Economics will be the main interest for Economic discussion in this paper and the issue of Positive Network Externality and Strategy adopted by the Government to promote online “public administration” will be discussed as well.

Keywords: Adoption Dynamics, Network Externality, Positive feedback, Open Migration, Non-Proprietary Issue, Switching Cost, Economies of Scale (Supply and Demand Side).

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1 Introduction

In line with the rapid globalisation of business practices, the Singapore government departments are embracing the latest technologies to computerise its operations. It requires the establishment of an e-government that recognises the impact of Internet technologies on the governance in the Digital Economy, and exploits these technologies in the workplace and delivery of citizen-centric public services.

Internet Technology has been seen as the key enabler to Singapore global competitive market since the 80s. In addition, the new business landscape requires a new IT infrastructure and a forward-looking population to distinguish the countries from its competitors. There are four main waves of progress that charts Singapore move towards e-government.

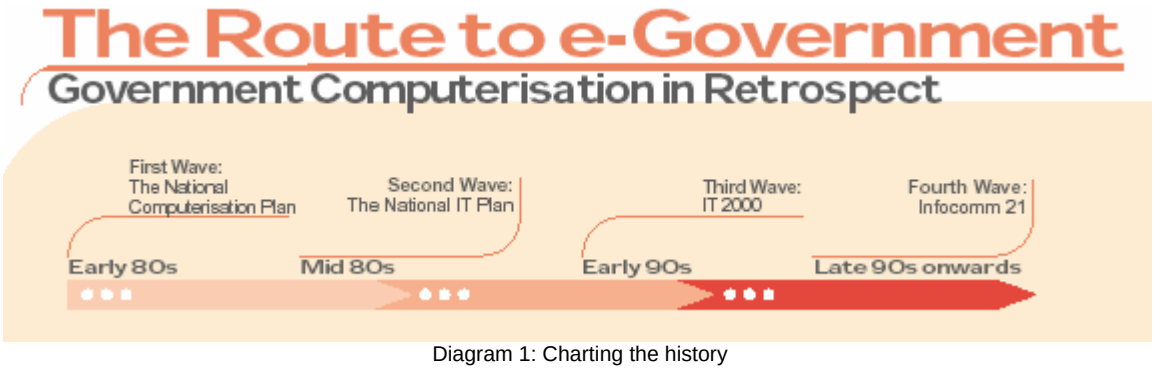


Diagram 1: Charting the history
Source: IDA

1st Wave (early 80s)	Adopting a start small-scale fast strategy which emphasis on building IT knowledge and capabilities and create demand for budding IT industry.
2nd Wave (early 80s)	Providing integrated services to the public and better coordination between inter agencies.
3rd Wave (early 90s)	Formulates strategic thrusts by improving the quality of life, boost effective economic engines and link communities locally and globally.
4th Wave (late 90s)	Infocomm21 (a five year plan) was developed to bring Singapore into a world of e-economy. E-government is one of the key programmes in the implementation of infocomm21.

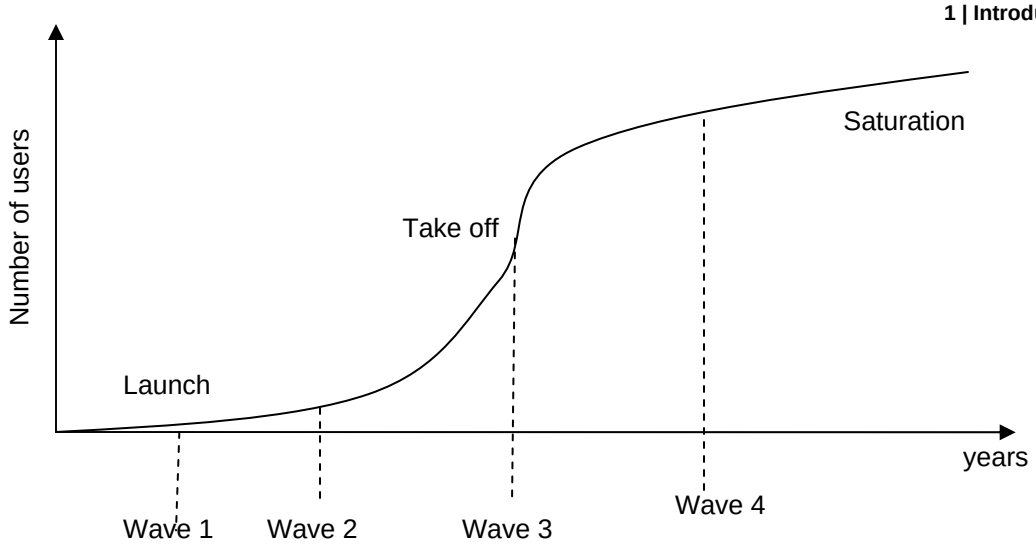


Diagram 2:The dynamics of eGovernment adoption with positive feedback

The quantity demanded of e-government services by consumers (the private sectors and citizens), increases in response to an increasing usage by more offline consumers. For example, if more and more people use the online government's e-filing services to file for tax, it increases the incentive to use the services too because the offline mode has become less attractive and efficient. There is a positive feedback because of this network externality that drives the new economy adoption of online services. Since in a network market the value of connecting to a network depends on the number of other people/users already connected to it, the value of using e-government increases as the government encourages more citizens to use it. Thus the e-government has a higher success rate right from the beginning. The issue of positive feedback will exist and government can be confirmed to be a winner from the fact that government is the only party that offers the system.

We can examine the logistic curve to explain the fusion of the use of technology for public services. Firstly, after the launch of Singapore e-government initiatives, the government continued to push for more and improved technological knowledge in the citizens, hence the number of users of the government's online public services increased up to a critical mass of substantial number users somewhere in 1992. Once the critical mass of users was reached, many people found it more useful to learn to use the online

public services because it is easier to compete if one is on equal grounds in terms of knowledge and skills as its competitors. (See appendix).

2 Obstacles to e-government

1. Scepticism about e-government arose initially. Transactions with government agencies are rarely a matter of choice and agencies collecting tax or fees do not see the Internet as a challenge to their existence. As monopoly suppliers, they are not worried about a new web based competitor with the potential to destroy their business.
2. The poor, the less educated and the elderly are usually less IT savvy and do not master the competency of English Language. This poses as a major obstacle in the government consideration in implementing a full-blown e-government.
3. Government is a big and complex organisation, comprises of many agencies competing for resources. IT implementation usually takes longer to implement, cost more and deliver.
4. Implementation of e-government also results in the redundancy of some jobs (as replaced by IT). Moreover, existing workers may not (or reluctant) adapt to new working patterns due to the lack of IT expertise. In private sectors, these can be resolved by redeploying people. But that is not an option for government departments as their goals and powers are usually mandated by statue.
5. The process of tendering big government IT projects is cumbersome especially if tender documents are massive, hence slowing down the time picking the tenders. To make matters worse, the tenders are awarded based on prices and not credentials. This inevitably impedes the government decision in adopting e-government in the running of government services.

6. Lastly, security and trust are even bigger concerns for government than private sector. Unless the integrity of that information can be guaranteed, the scope for governments to make constructive use of the Internet will remain limited.

3 A bold government initiative

In June 2000, Infocomm Development Authority of Singapore (IDA) had launched a Government Action Plan – a framework to align the government agencies with e-Government vision. It is centred on three main components: Government and Citizens (G2C); Government and Businesses (G2B); and Government and Employees (G2E).

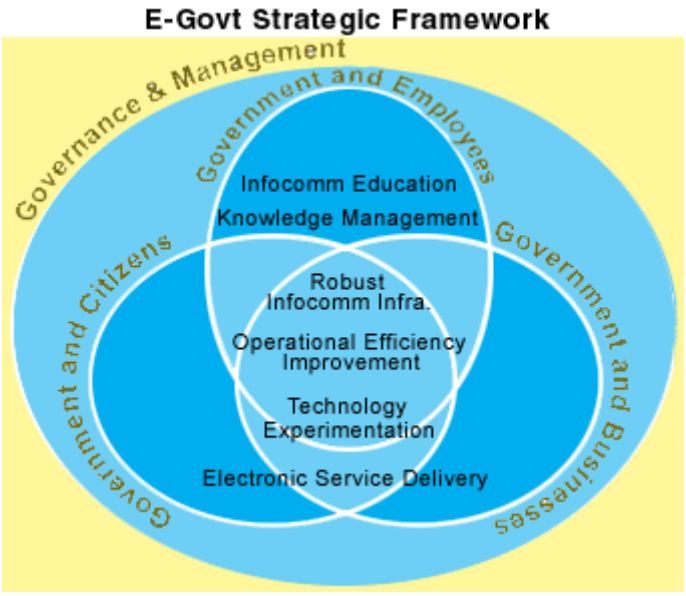


Diagram 3: The 3 main areas of government thrusts
Source: IDA

To move the three critical sectors - public, private and people – towards the e-Government vision, the Action Plan also prescribe the broad directions of ICT deployment. It charts five strategic thrusts:

1. **Reinventing government** through a constant rethink of all aspects of governance to explore the nature and quality of how the government interacts with its citizens, businesses and employees;
2. **Delivering integrated electronic** services centred on customers' needs;
3. **Being proactive and responsive** by adopting a 'sense and respond' approach;
4. **Using ICT to build new capabilities and capacities** for achieving quantum leaps in service delivery;
5. **Innovating with ICT** by embracing enterprise and experimentation.

4 Different components of government

GOVERNMENT TO CITIZENS (G2C)

The focus of G2C is customer-centricity and integrated e-services packages. Citizens will carry out 'complete' transactions with the government and not with several agencies individually.

The Internet has allowed government services to be delivered to the citizens anytime, anywhere. This has made transactions with the government more convenient. Citizens will be allowed to carry out "complete" transactions with the government, and not with agencies individually. For instance, the eCitizen Centre (www.ecitizen.gov.sg) provides one-stop online services and information that are intuitively grouped along the important events in the life of Singaporeans (e.g. education, national service, business, health…). This process of re-intermediation, i.e. aggregating all agencies into one centralised single portal not only reduce asymmetric information but also boost cost efficiencies obtained from automation of transactions over the net. For instance, Inland Revenue Authority of Singapore (IRAS) has calculated that the cost of submitting tax returns online ($0.15) is substantially lower that doing via snail mail ($0.50).

To turn a digital divide into digital dividend

However, no matter how sophisticated the e-services are, it will defeat the purpose of providing these services if a large segments of the population are unable to access them.

Government as a monopoly can “tip” the market as a regulator to enforce the optimization of IT usage in doing the online services. In Singapore, there exists a digital divide between the IT haves and haves-not (esp. the old folks and the uneducated). A big success factor is access and affordability, which is critical to fulfil the vision of an e-society. This belief has galvanised the government to assist the disadvantaged through cash subsidies (to purchase PCs) and also to beef up the existing Internet infrastructure (e.g. Singapore ONE) to ensure fast and smooth Internet connectivity.

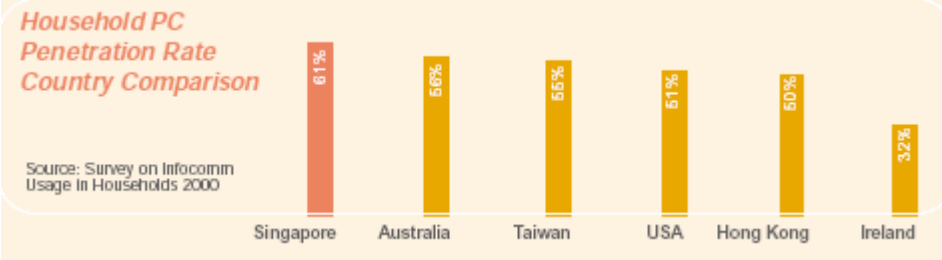


Diagram 4: One of the highest ownership of PCs of 61% in 2000.
Source: IDA

Introducing an e-lifestyle

Besides financial assistance, Government of Singapore has been supporting the National IT literacy program to support the knowledge of IT (the National IT Literacy Programme). The target is to equip 350,000 Singaporeans with basic computer and Internet skills over the next three years at affordable charges. Lastly, eCitizen Internet access kiosks are positioned at Community Centres to provide non-PC users accessibility to the Internet.

GOVERNMENT TO BUSINESSES (G2B)

The G2B focuses on fostering electronic interactions between Government and businesses. Government e-services should be convenient and have faster turnaround times. The focus of G2B is to take electronic interactions between the government and businesses to the next level.

Ministry of Finance (MOF) and IDA have introduced a one-stop centre called Government Electronic Business (GeBIZ) (www.gebiz.gov.sg) to streamline procurement and revenue tender activities. Launched in December 2000, carrying out G2B e-Procurement transactions have never been easier.

e-Procurement enables enterprises to lower operational costs, empower aggregated cross-enterprise spending and gain wide access to a global supplier base. The public service intends to be a flag bearer for e-procurement to catalyse the penetration of e-commerce in the private sector.

GeBiz provides local and international suppliers easy access to procurement opportunities in the Singapore public sector, allowing them to trade with the government electronically. It also enables public officers to perform a full spectrum of procurement activities online. Since its launch, the cumulative transaction value of procurement through GeBiz has reached more than $80 million.

It also serves to bring buyers, suppliers, tenderers and bidders to a common secured round-the-clock forum for procurement and revenue tender activities. It will also provide better information management of statistics and purchasing patterns as well as fund management through seamless interfacing with financial systems. Moreover, suppliers can also enjoy enhanced security for these electronic communications and transactions through the use of electronic authentication and digital signatures.

Business registration simplified

To facilitate the registration of new local business, business need only to register and make statutory disclosure requirements online with the Registry of Companies and

Businesses (RCB) through eBizCore (www.rcb.gov.sg). eBizCore enables filing to be done electronically, without the need to come in person to RCB. In addition, the public will also be able to obtain up-to-date and accurate information pertaining to companies and businesses through eBizCore, round the clock. This one-stop online submission saves the applicant the trouble of visiting each of the agencies for submission. These initiatives represent a tremendous improvement to the manual application process. No more repeated form filling, multiple physical visits and relaying of the same information from one government agency to the next.

GOVERNMENT TO EMPLOYEES (G2E)

The digital transformation of the public service will empower public officers with new skills and keep them relevant in the digital economy. Public officers are vital to the success of policy implementation and service execution in the e-Government.

Knowledge Management presents a powerful way of looking at and improving the way an entity is organised and how it uses her intellectual resources. Developing and applying its concepts to achieve a quantum improvement in how one manages the formal and tacit knowledge requires a radical rethinking of the internal processes. To encourage good KM ideas in the public service, a Knowledge Management Experimentation Programme (KM-EP) was launched in July 2001 to blaze the trail for a knowledge-based workplace in the public service. This helps to flatten the learning curve through effective sharing of best practices and experiences across agencies.

Adaptive and Robust Infocomm Infrastructure

Good decision-making hinges on having the right information at the right place. Because of the increasing mobility of government officers, it has become critical to enable their access to government resources anytime, anywhere, using the Internet.

Round-the-clock operations at DC@Gov

A new Government Data Centre has commenced business on May 2001. DC@Gov is a robust, secure and comprehensive infrastructure facility for server hosting by government agencies. Critical features are built with redundancies to ensure non-stop systems operations. These include precision air-conditioning systems, uninterrupted power supplies, biometric security access and network connectivity to SGNet. The Data Centre also provides a host of managed services from facility management, security, system monitoring, purchasing of hardware and software, central storage, backup to recovery.

Building a firm foundation of fundamentals

At the core of the government IT infrastructure is a suite of productivity tools such as the Public Sector Smart Card, Government Email System and the Government Intranet. It facilitates communication within the public service as well as with the public by linking up public sector agencies into a 'Connected Government'. The Government Email System, which has a base of 31,000 users is now handling 12 million mails per month within the government and five million email exchanges between the government and the public annually.

The government also takes into account of the importance of positive feedback to make e-governement a success. Besides the usual supply-side economies of scale (e.g. cash subsidies to buy PC or Internet access), it should also try to extend the pool of users utilising e-government services (i.e. demand economies of scale). These two economies of scale combined to make positive feedback in the network economy stronger.

In this case, IDA has embraced an open migration policy in introducing e-government services to the public. As most e-government websites portals are written in

non-proprietary HTML languages, they are hence readable by most web browsers easily. This reduces the switching costs for the consumers as additional softwares (besides the browsers) are unnecessary. Moreover, the programming of source codes can be outsourced to private sectors easily. This allows the e-government services to continue to remain updated and relevant every time.

5 Economic Analysis on e-Government

The first issue of economic analysis has been discussed in the above section of Adoption dynamics when it is well expected that positive feedback will arise when more and more people connected to a larger network and using more online services provided by the government (e-government services). Another important point to be highlighted is the issue of critical mass, i.e. the “critical” quantity needed by this e-government to take off and reach its final destination which is the long-run equilibrium where it is expected a larger proportion of citizens, businesses, and employee are using e-government services. It is perceived that wave 3 (In year 1992) can be noted as the critical mass for the Singapore’s e-government to take off from, marked by the formulation of strategic thrust to boost the efficiency by using Internet as the intermediary to perform online submission of some public administration and business procedures. The exact number of users is not able to be verified in this critical mass but some important indicators such as Internet connection and PC penetration rate can function as a tool to indicate that all these has substantially high and can be confirmed to support the e-government to take off. The issue of positive feedback that arise from the positive network externality that is exhibited by e-government services can be expected to come from two sides of Economies of Scale. The Supply Side Economies of Scale (SSES) is in the form of cash subsidy for citizen to own and buy a PC. This is to ensure the necessary infrastructure

and basic requirements in conducting this “online” public administration services. The Demand Side Economies of Scale (DSES) is represented by a large pool of users that has been using this e-government services, hence they can create an incentive for other “offline” users to switch and adopt this new system over the net and promoting more efficiency.

Government is a “de-facto” or “natural” Monopoly in this market because they are the only one who promotes and controls these online services although the issue of supporting infrastructure, software design, and maintenance of the system can be outsourced to private sectors. The demand mentioned earlier is somehow not a usual kind of demand based on each and every user’s marginal valuation. This demand is stimulated and enforced by the Government monopoly power to ensure that most, if not all, of the citizens and businesses to adopt the usage of e-government services. We could say in this case, the Government can “tip” the market to ensure the issue of positive feedback exist and Government can capture more benefit from the e-government implementation. What “tipping” a market means is to get a significantly large share of the market and to make sure that this market will adopt optimally the services and once the government is able to do this, they can be confirmed to be the winner in this “winner-take-all” situation arise in the (positive) network economy.

The Strategy used by Singapore’s government is expected to be the one so called: Open Migration Strategy. This strategy offers the product through many suppliers, agents, and other intermediaries and it also offers a backward compatibility with the previous system that has been offered. This strategy is quite feasible to adopt because it has been readily available in the Internet through one single portal, namely: www.ecitizen.com.sg that provides a whole range of public and business “online” services and applications. Open Migration strategy will also benefit from larger total market and, as has been discussed above, government already has this large installed

base of customers using their services from the fact that government is a monopoly in providing e-government services. Open Migration also offers a revolutionized service with the advancement in ICT (Information and Communications Technology) but it is still compatible with the old “paper-based” procedures. Compatibility is in a sense of compatibility of procedures between the usual/paper-based (old) procedures and requirements with these new over-the-net/Online procedures. While the Government is trying at their best to encourage this migration to the new online system, the market respond is somehow quite unpredictable and can’ be forecasted exactly given an ever changing economic condition in the region. The issue of Open Migration is being helped significantly by non-proprietary issue of the Internet as to say that all these over the net applications and transactions is readable, acceptable, and verifiable by most of the web browsers. This is in order to ease users in using whatever browsers pre-installed in their home PC to perform the applications. Another issue that has been helping to smoothen the e-government services to take off is the Lower Collective Switching Cost. Switching cost is loosely defined as the cost incurred of switching from the offline to online applications and collective switching cost means that the whole users’ switching cost that can be measured indirectly from the infrastructure and system needed to support this implementation. A lower switching cost comes from the fact of non-proprietary issue where a user does not have to install a particular platform of web browsers to perform the online applications and hence the cost of doing it “online” can be reduced and hence my induce more users to switch even more to the online applications. Another source that can lower the switching cost comes from the fact that government is outsourcing the infrastructure and software design of e-government system to the private sectors. Some of the key issue and chief consideration in choosing the private company to support the system through the tender process is: Price offered by the company, i.e. how much it will cost the government. While in one side this will benefit the country by lowering collective

switching cost, the other side some drawbacks is expected to occur. This comes from the fact that instead of choosing credentials of the system offered by private sectors, government simply choose the lowest possible prices and hence we cannot verify that the system will run at its best given a sufficiently low cost of implementing a seamless e-government services.

Some productivity gains are expected to come from the implementation of e-government:

1. Aggregate agencies that have been pooled under a roof of www.ecitizen.com.sg that will reduce the asymmetric information that can be occurred during the offline procedures.
2. Cost efficiencies that come from the automation of the system, i.e. a reduced cost incurred by adopting this new system.
3. Benefits of extranets, where all the government agencies, departments and bodies is linked through an extranet to further improve the exchange of information.

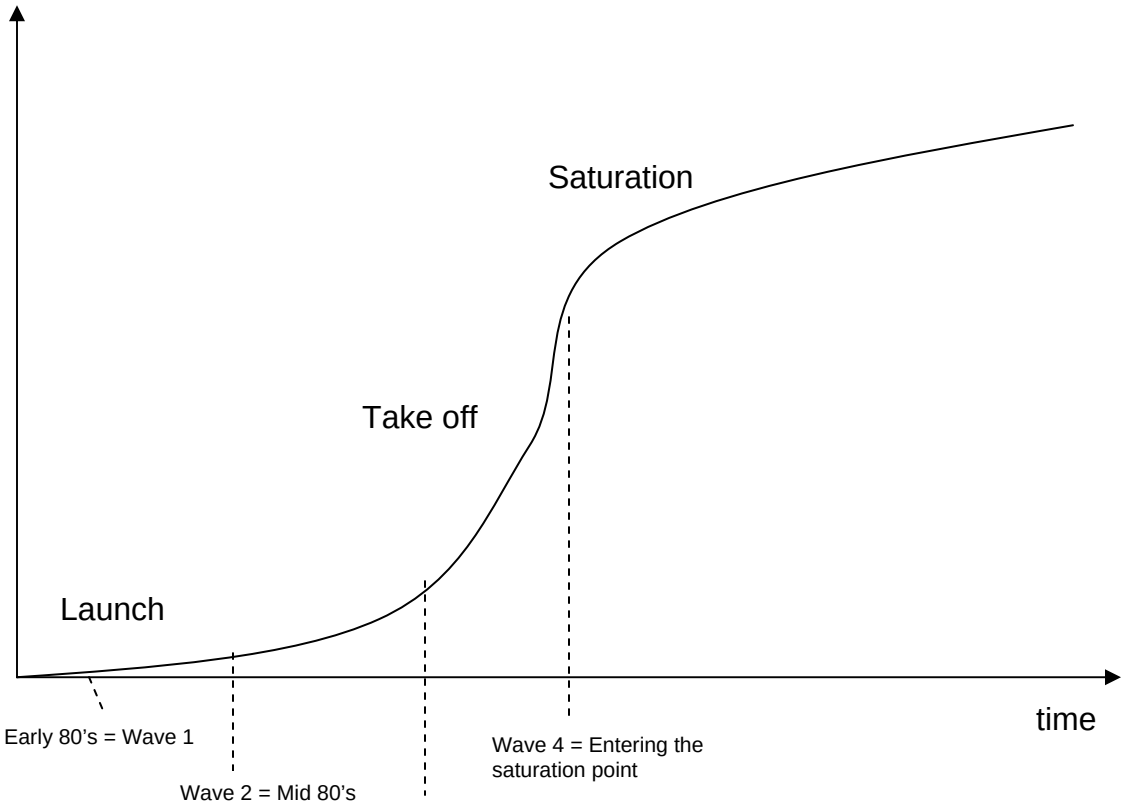
6 Conclusion

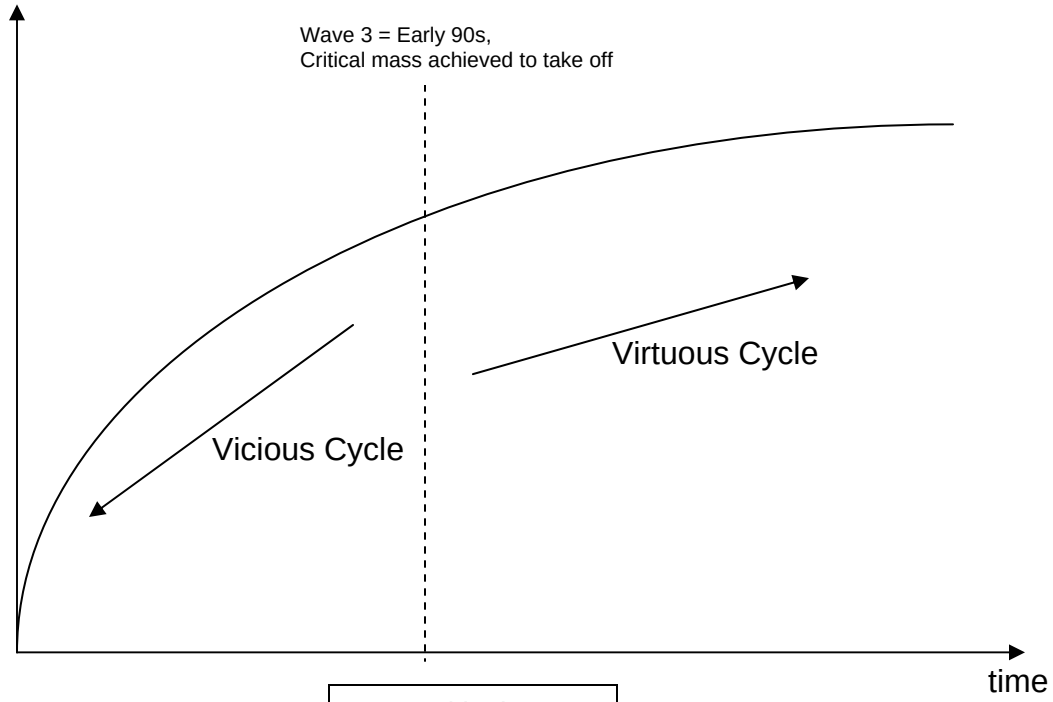
The e-Government Strategic Framework requires considerable attention and co-ordination at all levels, as there will be technology and mindset changes required throughout its implementation. The three components of G-to-C, G-to-B and G-to-E will be used to monitor progress and innovation as well as to benchmark Singapore against the e-Government initiatives of other countries. It can be said that Singapore's e-government has been able to substantiate themselves from other countries by continuous support of the e-government services, implementing the National IT literacy

program, aimed to improve the human skills needed to operate the Internet system, and many other “on-progress” plan to ensure the optimal use of e-government.

6 Appendix and bibliography

Adoption Dynamics of Singapore's e-government





O* = Critical Mass

Bibliography

1. The next revolution, Jun 22nd 2000, The Economist magazine.
2. E-government 2001— Accelerating, Integrating, Transforming Public Services, 2001, Infocomm Development Authority of Singapore (IDA).
3. Selected e-governement newsletters (Dec 2000, March 2001, July 2001, Jan 2002), Infocomm Development Authority of Singapore (IDA).
4. Information rules, Carl Shapiro and Hal R. Varian, HBS, 1999.
5. Inland Revenue Authority of Singapore (IRAS) www.iras.gov.sg
6. eCitizen Centre, www.ecitizen.gov.sg
7. Government Electronic Business (GeBIZ), www.gebiz.gov.sg
8. Registrar of Companies and Businesses, www.rcb.gov.sg

Diagram 5: eCitizen portal. (http://www.ecitizen.gov.sg)

Diagram 6: Gebiz portal. (http://www.gebiz.gov.sg/)