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Competitive Advantage of Nations: Lessons from Government-initiated Industry-wide IT Projects in Singapore

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ABSTRACT

Information Technology (IT) in general and the Internet in particular have had a profound impact on business, global trade and governance. In this age of global competition, domestic conditions affecting companies' corporate strategy and business performance are becoming of even greater importance. Many governments now increasingly intervene, through initiation of industry-wide IT projects, to shape a favorable home base for companies seeking international competitive advantage. In this study, we first propose a preliminary theoretical framework to guide governmental intervention in the IT arena by drawing upon existing literature on business strategy and planned change. We then demonstrate and refine the applicability of this framework in the context of several key industry-wide IT projects that have been implemented by the Singapore Government. Based on the empirical data collected, we also evaluate the success of these initiatives by examining the perceptions of the various stakeholders affected by these interventions.

Keywords
IT implementation, government, competitive advantage, planned change.

INTRODUCTION

Information technology (IT) in general and the Internet in particular have had a profound impact on the way we live and conduct business. It has paved the way for global marketplaces and companies, inter-firm collaborations, and greater participation and competition in international trade. With new business models and inter-firm collaborations made possible by IT and the Internet, the set of possible sources of competitive advantage in business has widened. As a result of globalization and rising global trade, one important context of competitive advantage is now international. In recent years, many governments have imbibed the e-business spirit, seeking to put IT to innovative use in the governance of citizens and businesses. There is an increasing trend of government intervention targeting businesses and seeking to entrench productivity gains and innovative business practices, so that the home base (the country in which companies are based in) is also a source of sustainable competitive advantage for these companies. In this regard, Singapore has gone beyond just the basics of e-government with implementation of many industry-wide IT projects (Gwee and Tan, 2002).

Roadmap of Paper

We begin with a review of extant research on competitive advantage and planned change. Based on these theoretical foundations, we first propose a preliminary framework to investigate governmental interventions in the IT arena for national competitive advantage. We then demonstrate and refine the applicability of this framework in the context of several key industry-wide IT projects that have been implemented by the Government of Singapore. Finally, we evaluate the perceived success of these initiatives from perceptions of citizens and businesses alike that are the targets of such interventions.
LITERATURE REVIEW AND THEORETICAL FOUNDATIONS

Evolving Views of Competitive Advantage

Over the years, many theories have been proposed to explain differential firm performance: the industry structure view (Porter, 1985), resource-based view (Barney, 1991), relational view (Dyer and Singh, 1998) and dynamic capabilities (Teece, Pisano and Shuen, 1997). However, all of these frameworks, while of great assistance to our understanding of the evolving views regarding sources of competitive advantage, exhibit a relatively narrow focus – firm-level (resource-based view and the dynamic capabilities model), at the level of a small alliance or dyad of firms (relational view), or industry-level (industry structure view). Competitive advantage of nations (as a home base for companies) is fast becoming an issue of great interest and importance in this age of globalization and pitch battles for world trade.

In this regard, Michael Porter’s ‘diamond’ theory of national competitive advantage links international success to high-intensity domestic competition (Porter, 1990). Competitive advantage is facilitated by a home base with ‘demanding buyers, stringent needs and able competitors’, one that satisfies all four points of Porter’s national ‘diamond’ – factor conditions, demand conditions, related and supporting industries, and company strategy, structure and rivalry. Tough domestic conditions pressurize firms into pursuing constant innovation and upgrading of their products, which leads to profitability at the international stage. Favorable conditions in any and all factors are sustainable, because determinants such as education, industry networks and social structures are less permeable across national boundaries and thus country-specific.

Government, as an external variable, can influence national competitiveness via its trade, education, and industrial policies (Porter, 1990). International business, in the form of foreign direct investment from multi-national enterprises (MNEs), is incentivized by factors such as the structure of the host economy, market and customer clusters, the host government’s policy, and the nature of the local business culture. Favorable regulation and attractive incentives from governments had been seen to result in MNEs setting up capital-intensive, high-technology industries, which is highly beneficial to markets, especially those of developing economies. Thus sustained competitive advantages for a nation’s firms at the international level result in competitive advantage for the nation as a whole. The government can influence this competitive advantage and company behavior through a portfolio of intervention actions in the home base.

Theories of Planned Change

Theories of planned change posit that there is a need to incentivize innovation and change to mobilize action in order to overcome barriers given the inertia in human and organizational behavior. There are many ways of looking at government interventions which could take the form of innovation directives such as providing incentives to encourage compliance to a certain policy and/or penalties to discourage non-compliance. For example, Nelson, Soete and Dosi (1988) recognized that governments exert the most powerful institutional forces affecting innovation. King, Gurbaxani, Kraemer, McFarlan, Raman and Yap (1994) suggested that governments could impose influence and regulation to affect IT adoption. Teo, Tan and Wei (1997) cautioned that innovation directives are risky, and are likely to succeed only in cases of win-win situations, where the benefits are present and clearly visible to all parties involved.

Against this backdrop, Huy (2001) proposed a comprehensive intervention scheme aiming to alter many distinct elements of organizations: commanding, engineering, teaching and socializing intervention. Commanding intervention brings about change via enforcing compliance of coercive actions. Powerful change agents direct visible, speedy change actions through clearly defined objectives, formal roles and stringent deadlines. The engineering approach is generally used to cause a shift from old work processes and routines to newer ones. Change agents analyze, re-engineer and upgrade existing processes, with the aim of bringing about benefits to everyone involved. Intervention via teaching is influencing in nature, and involves outsiders questioning and changing the mindsets of the change targets, generally by emphasizing the benefits of the new beliefs. Teaching intervention deploys knowledge through training programmes, seminars and the like. This approach does not involve a change in the mindsets of the change agents, and has a moderately long-term perspective of time. Socializing intervention involves self-motivated employees seeking to change behavior in a company by changing beliefs and values. This approach involves continuous communication and assistance to help a company’s employees migrate to a new system. This differs from the teaching approach in that the mindsets of the change agents too are necessarily changed. This approach is long-term, allowing ample time for change in people’s beliefs and culture.

More importantly, this comprehensive portfolio of intervention actions recognizes the importance of ‘clock time’ in successfully effecting change within organizations (Huy, 2001). At the national level, since such interventions are necessarily multi-faceted and involve complex economic and social considerations, a temporal perspective towards such intervention is critical. In this study, we therefore extrapolate this portfolio of intervention actions from the organizational to the national context so as to examine the Singapore government’s efforts in the IT arena. Such extrapolation is appropriate as
Singapore is well-known internationally as a country that is being run like a global corporation. Figure 1 shows the preliminary conceptual framework that we will use in this study.

![Diagram](image.png)

**Figure 1: A preliminary conceptual framework for investigation**

**RESEARCH STUDY**

**Research Questions**

This study seeks to answer two questions:

- How does the Singapore government target or tailor IT initiatives to boost national competitive advantage?
- How are such government interventions in the IT arena perceived by the target elements?

**Research Site**

This study is set in the city-state of Singapore, whose government has proved to be a keen adopter of IT. It has promoted state-of-the-art technologies and infrastructure, facilitated e-business, and effectively familiarized its public with IT and the Internet. Timely amendments to Singapore’s legal framework have ensured that electronic transactions are enabled and tailored to e-commerce and e-business needs. In less than forty years, Singapore has transformed herself into a fully developed nation with a second place world ranking standing for competitiveness (IMD, 2004). Singapore’s strategic and successful efforts in IT arena make it an ideal case to study government intervention related to these initiatives.

**Research Methodology**

In taking a case study approach, this research seeks to augment existing IS literature on governmental intervention. It aims to understand and assess the phenomenon from a new perspective, using an intervention framework in Part 1 of the study and evaluate the success of these initiatives by examining the perceptions of the various stakeholders affected by these initiatives in Part 2.
Part 1 of Study

In the first part of this study, we focus on three industry-wide IT projects initiated by the government of Singapore. To obtain insights into the relevant interventions, we interviewed various stakeholders involved in CoreNet (Sing and Zong, 2001), LawNet (Oskamp, Lodder and Apistola, 2004) and the healthcare industry project (hereinafter called the “HealthNet”). CoreNet is an e-government initiative promoted by the Building and Construction Authority of Singapore as part of a strategic move to revamp and modernize Singapore’s construction industry to make it globally competitive. LawNet (another strategic national information network within the legal sector to improve productivity) operates as a one-stop center for various information repositories, thereby helping to achieve effective, efficient and economical dispensation and administration of justice. Similarly, “HealthNet” also aims at an effective and efficient delivery of healthcare services by allowing seamless and transparent transfer of patient information between different healthcare organizations. The relevant government bodies responsible for coordinating the projects and the organizations in the industries affected were interviewed. In this part of the study, more than thirty key stakeholders were interviewed, including three Project Managers from the Building and Construction Authority of Singapore and the Executive Director of the Singapore Contractor’s Association (for CoreNet), a Supreme Court Registrar, a Subordinate Court Registrar and several Singapore Academy of Law Directors (for LawNet) and the Chief Technology Officer and Corporate Manager of a hospital (for HealthNet). In addition, we also collected secondary data from various sources, including newspaper archives, government websites and articles on other similar IT-related initiatives in Singapore such as TradeNet, GeBiz, PortNet, etc.

Part 2 of Study

To gain an in-depth understanding of what the targeted businesses felt about the Singapore government’s interventions, we drew upon a further range of interviews. Preliminary interview questionnaires were developed at the start of the study and they were gradually refined over time. Our focus was firmly trained on eliciting perceptions regarding Singapore’s government initiatives and efforts. In particular, the interviews tried to gauge awareness of the efforts, motivations for usage and views regarding the government interventions. In addition to the stakeholders interviewed in Part 1, altogether we interviewed another twenty people affected by the said interventions. Interviews were first transcribed on paper, and then compared alongside one another for emerging themes. Interviewing people only formed part of our data gathering. Through interaction with the staff of the organizations involved, including brief immersions and access to documents, we obtained better understanding of their work processes and how technology has affected them (e.g. as a result of integration between internal and external systems). In this way, we were able to better understand the respondents’ attitudes and perceptions towards IT. Keywords frequently repeated in the interviews and our investigator notes were coded to generate and construct the main themes, which in turn provided the premise for our eventual findings.

RESEARCH FINDINGS: THE SINGAPORE CASE STUDY

Part 1: Analysis of Government IT Interventions

Commanding Intervention

Commanding intervention enforces mandatory compliance and thus directly coerces actions of change targets. Government regulation has broad implications in shaping business strategies, practices and development (Gow, 1997). Possible approaches to commanding interventions are regulatory measures such as subsidies to offset inherent costs which encourage compliance to change and penalties to discourage continuance of status quo, and standards to stabilize technological environment.

The Singapore government has commanded a diverse range of changes, starting from compulsory computerization of the civil service to automation of library structure. Examples of commanding interventions include the promoted migration to TradeNet, CoreNet, and LawNet. The government incentivized and necessitated the use of TradeNet for declaration of trade documents, quickening and ensuring the adoption of the more efficient system (Teo et al., 1997). Similarly, a phased adoption of a key component – e-submission of real estate-related documents was made partially mandatory to ensure conformity to the CoreNet system.

Commanding intervention has been documented to work best in changing formal structures. The government employed the commanding approach to intervene in favor of new infrastructure. Regulations can enforce standards to stabilize technological environments and encourage innovation. The comments from the Executive Director of Singapore Constructor’s Association echo this:
"Before we can go into IT proper, we need standardization."

Engineering Intervention

Engineering intervention is an ideal planned change approach that involves analysis, re-design and upgrading of work processes. This desired shift from old processes to new ones may be gradually achieved via building knowledge regarding processes, setting standards and offering subsidies to facilitate change.

An instance of engineering intervention in Singapore is the government’s identification and re-design of processes associated with a certain task to achieve greater efficiency and productivity, and thereby competitive advantage. The Singapore government recognized the need for a slower, more empathetic approach for a successful migration to new processes. For example, to drive the adoption of CoreNet, the Building and Construction Authority of Singapore (BCA) standardized documents and redesigned processes in the construction industry. In general, the construction companies involved agree:

‘The construction industry is complex. The current practices are paper-intensive. Minor modification takes a long time and it is very difficult to track workflow and share information ... let alone cross-team collaboration and communication’

‘To improve productivity, quality and margins, we need to reduce design and construction conflicts’.

One of BCA’s managers responsible for the CoreNet project noted the reasons behind the decision to engineer change: ‘Many players are bounded (sic) by existing practices, which may bind them to certain processes’. CoreNet thus sought to engineer a stable new environment that would facilitate easier migration:

‘we need to establish standards before e-procurement can take off. For instance, we need to standardise the measurement so that it can be cross-referenced to procurement’.

Engineering intervention is ideal for shaping factor conditions such as skilled labor, infrastructure and labor conditions, since changing these involves effecting changes in both work processes and beliefs. Sometimes, the factor conditions that need to be changed include the government’s own processes and routines, and perhaps even changes in roles. For instance, with the migration of trade documentation process to TradeNet system, the function of Trade Development Board, now re-named International Enterprise Singapore, underwent a subtle shift from regulating to facilitating trade, prompting a change in its mission and strategy.

Teaching Intervention

Teaching intervention is ideal when the desired change is in beliefs and values and is of a gradual nature. A direct commanding approach is unlikely to achieve the desired results in this case. Possible approaches to teaching intervention are knowledge deployment mechanisms such as education and training, as well as campaigns aimed at mobilizing awareness of benefits and a resulting favorable perception of any initiative.

In the case of the Singapore government, such teaching interventions were also used. In order to familiarize prospective users with the CoreNet system, BCA organized ‘hands-on sessions to teach the users how to use the systems’. This teaching intervention was undertaken because the BCA perceived that ‘many players (in the construction and real estate industry) are reluctant to adopt the system and standards due to the perceived cost and learning curve’. One stakeholder of CoreNet recognized the importance of teaching with this comment:

‘sometimes … people are not comfortable with IT … people are reluctant to adopt new technology’.

As such, changes to complex determinants require a long-term approach that allows ample time for the change targets to migrate to a new culture and belief system.

Socializing Intervention

Socializing intervention effects gradual changes in mindset, using constant, subtle change management techniques as part of ongoing interactions between change agents and change targets. Mobilization via promotional and awareness campaigns and the use of prominent role models are possible approaches to socializing intervention.

In Singapore’s case, regular articles and advertisements in newspapers and mass media publicizing the government’s electronic efforts have helped attract the attention of citizens and businesses and inform them of their benefits. Events such as Annual IT Week and frequent sponsored public lectures showcasing evolving research on IT also promote and accord
public attention to the government initiatives. In the LawNet project, the Judiciary has employed socializing interventions by being a role model to institute a change in the attitudes of the profession. As explained by one of the Supreme Court registrars:

“The judges themselves, especially the older ones were trying their best to use it, especially since many have come from a generation when IT was still absent…”.

Thus, when lawyers noticed how the Judiciary was adopting the systems, they too became less averse to the idea. Such socializing interventions can greatly influence public awareness and perception, and carve a change in mindset favoring the government initiatives. Socializing interventions can convince the targets that the imminent change is beneficial, which is necessary because they are unlikely to adopt the system otherwise.

“Indirect” Commanding Intervention

In our study, we found that beyond Huy’s (2001) portfolio of commanding, engineering, teaching and socializing interventions, often a softer approach than commanding is being used. This approach exhibits some sort of pressures from various channels. It is a rather “benign” way of presenting a commanding edict. We shall term it “indirect” commanding to distinguish it from Huy’s original commanding or “direct” commanding. For example, in the LawNet project, it was generally accepted over time that improving the legal services offered is one of the most important steps that needs to be undertaken by Singapore to ensure worldwide competitiveness. This subtle “indirect” commanding tactic was evident from the comments of two lawyers:

“It is controlled... we have no choice but to follow, but it is ok, there are quite a few advantages of using it as well”;

“...they had to force certain small firms into it, some didn’t even have PCs at that time…”

Similarly, a senior executive from the National Healthcare Group (NHG) involved in the HealthNet’s patient information integration hinted at this “ressurizing” or “indirect commanding”:

“The patient must see and feel [this seamless integration of information between healthcare organizations] when he shows up at any institution under the NHG.”

In addition, local healthcare providers also experience rivalry with competitors around the region against the backdrop of the Singapore Government’s intention to be a regional medical hub. A corporate manager was resigned to the continuing high-priority push for greater efficiencies as part of HealthNet: “consolidation was deferred in favor of more pressing needs”.

The Revised Framework

Based on our findings, we refine the preliminary conceptual framework as depicted in Figure 2. Commanding intervention appears to be best suited to shape the determinant of related and supporting industries through the mandatory adoption of industry-wide IT projects. Engineering intervention may be most appropriate to shape factor conditions (e.g. worker productivity), whereas teaching intervention may be best applied to facilitate the desired factor as well as demand conditions in the home base (e.g. educating the general populace). Similarly, socializing intervention efforts appear to be also suited to shape such demand conditions. Finally, “indirect” commanding interventions appear to be effective in galvanizing the companies involved into competitive action. For example, company structures and strategies in the respective industries in Singapore are being “pressurized” based on the government’s continuing emphasis on the need to compete with rivals in the region or even worldwide. As can be seen, multiple intervention types may be applied to shape any one determinant, and the exclusivity of intervention types is not a necessity. It is important to note that without this “indirect” commanding (to “push” companies to prepare for international competition), there are limits to governmental intervention in liberalized economies in influencing the determinants of company structure and rivalry. Also, not all intervention approaches appear to be equally powerful and effective; commanding intervention has limited influence in shaping the determinants of competitive advantage, whereas slower, more empathetic approaches such as engineering, teaching and socializing could potentially affect a greater range of determinants.
Part 2: Perceptions of the Singapore Government’s IT Interventions

This part of the study seeks to gauge perceptions from the targets of governmental interventions regarding the said initiatives. Keywords frequently repeated in the interviews and our investigator notes were coded to generate and construct the main themes, which in turn enable us to select the following five distinct categories serving as significant evaluators of success of the interventions. Specifically, they can be classified into two groups – that of usage and of impact.

Perceptions from the Standpoint of Usage

From a usage perspective, we are able to categorize the perceptions into two distinct groups: *convenience and potential risks*. Many businessmen view traditional means of interaction with the government, such as paper (post), telephone or face-to-face communication, as time-consuming and cumbersome. For most interviewees, thoughts of such traditional means of interaction conjured up images of queues, travel and bureaucratic red tape. To them, electronic means are more *convenient* as compared to traditional means. A significant number of businesspeople were relieved at the prospect of an end to ‘hassle’, and of ‘no more queues, waiting, and travel’. Specifically, government’s IT initiatives were perceived as making interactions easier and more convenient in terms of content and availability. There are no longer multiple copies of forms to fill up as the single electronic form would be shared between all relevant government departments and statutory boards, and errors are easier to detect and correct.

However, a significant number of interviewees expressed concerns regarding such governmental intervention. This is especially so to those who possess a background in information systems security. In the absence of a coherent policy and implementation, different government departments manage their information in a manner similar to islands of automation in companies of the private sector in the past. The back-office integration of data enforced essentially involves the integration of data and the creation of a single stack of information which will be shared by compatible information systems of various interested departments. A single database is advantageous in that it promotes efficient operations, but security and privacy issues become apparent. The consequences of such potential security failures and of potential occurrences of internal misuse...
or ‘careless handling’ of data are causing anxiety especially among businessmen. Unauthorized access to the integrated databases can have potentially devastating impact on confidentiality because ‘if security is broken for these sites … a lot of private data would become public’. The perception of such unauthorized access does affect public trust in the government initiatives.

Perceptions from the Standpoint of Impact

From an impact standpoint, another three distinct groups emerged: efficiency, wastefulness and differentiating factor. Traditional means of interaction are viewed as inefficient. They occupy as much time of the government as they do of the business people. They demand resources and in most cases they involve at least one extra level of data entry – government personnel keying in data from paper forms into electronic systems – they present significant room for errors to creep into the system. These resources that are commanded and the errors that are allowed increase the cost of both government and businesses. Thus, one popular positive perception from a standpoint of impact is that it is efficient.

Directly contrasting with this view of increasing efficiency is the perception that these initiatives by the government are wasteful. Targets of the IT interventions are not completely convinced of the benefits accorded by these initiatives. As pointed out by one user of CoreNet who did not see a need for the government or the industry to invest so heavily in the new technology: ‘electronic means saving, but this is not translated so fast in the (construction and real estate) industry’. A major construction company, a target of the CoreNet initiative, claimed that their decision not to be part of the initiative was influenced by ‘the high cost. It is simply not worth it’.

Nonetheless, many interviewees saw the government’s initiatives as a differentiating factor if it is well executed. This perception reflects business people’s concern with the image Singapore portrays to the rest of the world. They view this as a significant contributing factor to Singapore’s achieving the second place ranking in world competitiveness (IMD, 2004).

From the perceptions of the targets, we are able to comprehend and gauge their willingness to use and adopt existing and future government initiated systems. We summarize our findings in Table 1 below.

CONCLUSION

This study contributes to the discussion of IT and Government by examining the possible proactive role of governments in the use of IT for national competitive advantage. By doing so, it departs from traditional focus on firm, alliance or industry levels of competitive advantage and from typical focus on the adopters of e-government initiatives. Specifically, this study employs theories of planned change to study the various possible interventions government could explore to influence the successful adoption and usage of IT systems among businesses and individuals within their organizations, with the objective of improving competitive conditions in the home base (Porter, 1990).

Our study found empirical support that a government could deploy commanding, engineering, teaching and socializing interventions to initiate and promote the adoption and usage of industry-wide IT systems effectively while fulfilling other related objectives. We also found the existence of “indirect” commanding intervention in the Singapore context. Positive perceptions such as “convenience” and “efficiency” among businesses and the individuals they belonged to were uncovered. On the other hand, conflicting and contradictory disapproving meanings do exist – some respondents see the “potential risks” while others consider that many such systems are “wasteful” in their spending. However, most respondents appear to take great pride in the “differentiating factor” that these government-initiated IT projects do provide. The findings of this study could thus constitute valuable feedback for government bodies to audit and improve their future intervention actions.

However, it is cautioned that the role of organizational and individual factors influencing the adoption of government initiated systems should not be neglected as well. In liberalized economies, governments have limited control over company structure. Direct regulatory and commanding intervention is limited, since commanding intervention is not suitable as an independent, exclusive planned change approach to induce slow, sure change. Additionally, the interactions among all the interventions are dynamic and complex. A single change intervention may affect more than one determinant of competitive advantage and may do so in undesirable ways. Therefore, while planning and analyzing an intervention, its consequences must be considered in order to ascertain its true impact, so as to avoid unpleasant surprises.

While we are able to extrapolate our study from an organizational to a national context, we are limited to just one country – Singapore – where government authorities are well known to have strong institutional authority and where governmental interventions in many sectors of the economy and in society at large are generally accepted. In this regard, government bodies in other countries may hold different interpretations, priorities, values and cultures (Stewart, 1997), which would greatly influence the strategies created and implemented by policy makers. Interested researchers may therefore wish to explore these same concepts in other settings.
It’s good for Singapore’s image as an IT island’

- an employee in a law firm

‘Singapore was one of the first in the world to implement EFS (Electronic Filing System of LawNet), it has definitely given them a competitive start’

- an employee in a large law firm

‘Not sure how secure (the websites) are ... will not use them for electronic transactions’

- a citizen

‘security aspect has to be addressed. We do not want unauthorized personnel to see the documents’

- an officer of a major construction firm

‘(there is) no need to remember (things) ... say numbers like country codes when notifying MINDEF (Singapore’s Ministry of Defence) about going overseas’.

- a citizen

‘(it is) easier to file things or gather information online, rather than lick a cover and post it’.

- an employee of a CoreNet user firm

‘Singapore spends ... large amounts of money delivering stuff (via computerization)’

- a senior civil servant

‘if through competition we can get more competitive pricing, then we can reduce the cost’

- an employee of a private firm

‘Many players are reluctant to adopt (CoreNet) system and standards due to the perceived cost and learning curve’

- a CoreNet Project Manager, BCA

‘(there is) no need for a government official to re-enter all the paper forms’

- a senior civil servant

‘(it is) easier to file things or gather information online, rather than lick a cover and post it’

- an employee of a CoreNet user firm

‘It’s good for Singapore’s image as an IT island’

- an employee in a law firm

‘Singapore was one of the first in the world to implement EFS (Electronic Filing System of LawNet), it has definitely given them a competitive start’

- an employee in a large law firm

Table 1: Perceptions of government IT initiatives in Singapore

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