

## Models and Requirements for Using Strategic Information Systems in Developing Nations

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### **Abstract:**

Strategic information systems (SIS) are a reality in the United States and other advanced nations. They are being developed and used in many organizations to provide them with a competitive advantage. We contend that such systems would have significant value for developing countries as well. This article extends the SIS concept to developing countries. Two models are presented: a model for strategic information systems for competitive advantage in developing countries, and a model for strategic information systems for economic development (SISED). The SISED model, while primarily targeted for developing nations, would also be applicable to advanced and developed nations. The article concludes with a discussion of desired preconditions for SIS development.

### **Article:**

#### *Introduction*

In recent years, there has been a considerable interest in the development of strategic information systems (SIS). Many scholarly articles related to SIS have appeared in the information systems literature. The discussion in the literature has ranged from the technical aspects of SIS construction to its use as a planning technique. In our view, a strategic information system is conceptually much more than a certain type of management information system (MIS). It represents a radical departure from other information systems concepts — a completely new way of thinking about the role of information systems in the strategic planning process. A strategic information system is not just a new competitive weapon in the corporate arsenal. As part of the strategic planning process, SIS has been adapted and applied to a myriad of models and strategic constructs.<sup>1</sup> We believe that the idea that information systems are an integral part of the strategic planning process is more revolutionary than evolutionary.

There is a widespread organizational interest in such strategic systems and they are considered vital for the long-term survival of organizations. They (SISs) have been identified as one the ten information systems megatrends.<sup>2</sup> The conventional wisdom is that SISs are essential in supporting, shaping, and implementing organizational missions, policies, and direction. This capability has been called the SIS vision.<sup>3</sup>

To date, most strategic information systems have been developed for use in the private sector of advanced and developed nations. The literature abounds with examples of strategic information systems for competitive advantage (SISCA). Examples include the SABRE and APOLLO reservation systems for airlines, a clinical laboratory installed in doctor's offices by Metapath Inc.,<sup>4</sup> and SISCAs that provide pricing information used for competitive advantage (Grand Union, Red Lobster, and GE).<sup>5</sup> The value of strategic information systems, however, is more ubiquitous, and extends beyond the private sector and the developed nation.

Indeed, what is conspicuous is the absence of applications of strategic information systems for competitive advantage (SISCA) and strategic information systems for economic development (SISED) in developing nations. Both can be invaluable to less developed nations. The former (SISCA) focuses primarily on profit, with

a secondary objective to make selected domestic companies in a given nation more competitive in the world market. The latter (SISED) is aimed at improving the economic health of a developing nation. It should be noted that SISED can also be used in developed nations.

When a strategic information system is applied to the public sector, the focus is on the commonwealth — the provision of high quality goods, services, and utility for the promotion of national economic development and international trade. Human and economic welfare are paramount. For example, in a deregulated airline industry, cut-throat competition may de-emphasize safety (reduced maintenance expenditure, long hours for pilots, etc.), whereas in a government regulated airline industry, safety would be a primary consideration. Being convinced of the importance and relevance of such systems (SISCAs and SISEDs) in developing countries, we are proposing two conceptual models designed to identify such strategic opportunities. We realize that modelling on a national scale is much more complex; however, one must start with a relatively simple paradigm, which can be refined with further experience.

	Suppliers	Customers	Competitors
Differentiation	Offensive Defensive	Offensive Defensive	Offensive Defensive
Cost	Offensive Defensive	Offensive Defensive	Offensive Defensive
Focus	Offensive Defensive	Offensive Defensive	Offensive Defensive
Innovation	Offensive Defensive	Offensive Defensive	Offensive Defensive
Growth	Offensive Defensive	Offensive Defensive	Offensive Defensive
Alliance	Offensive Defensive	Offensive Defensive	Offensive Defensive

**Figure 1.** The SIS scanning grid

### Current research and models for identifying SIS opportunities

Most of the current research and applications in strategic information systems relate to companies and organizations in a free economy. Based on the body of knowledge in strategy formulation,<sup>6</sup> and especially Porter's model,<sup>7</sup> several authors have proposed systematic approaches for identifying SIS opportunities in an organization.<sup>8</sup> The following is a synthesis of the important models for SIS identification.

Typically, three major strategic dimensions (or factors) are cited: strategic target, strategic thrust and strategic mode (see Figure 1). Each factor has several qualitative values. The targets identified are: supplier, customer, and/or competitors; the thrusts are: differentiation, cost, focus, innovation, growth, and/or alliance; and the modes are defensive or offensive. SIS opportunities may exist for one or more factor value combinations. In addition, Warren McFarlan<sup>9</sup> has suggested answering the following five basic questions for identifying SIS opportunities:

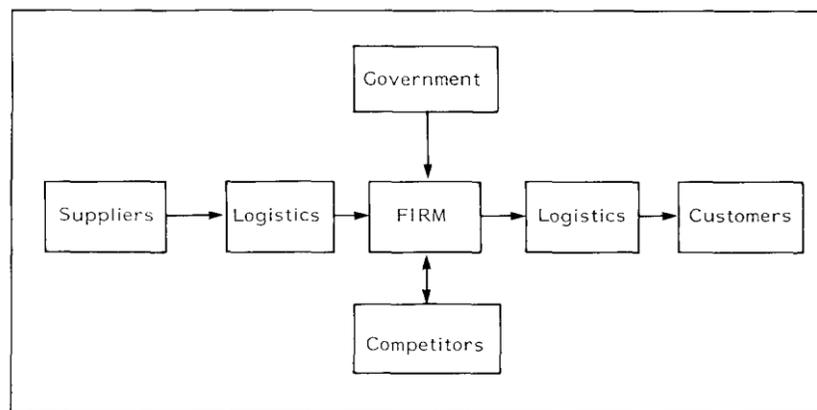
1. Can information systems (IS) technology build barriers for competitors?
2. Can IS build high switching costs for customers?
3. Can IS change the basis of competition?
4. Can IS technology change the balance of power in supplier relations?
5. Can IS technology generate new products?

Ives and Learmonth have suggested using a 13-stage customer resource life cycle for identifying SIS opportunities.<sup>10</sup> It has also been suggested<sup>11</sup> that critical success factors<sup>12</sup> may be used for focusing on more important areas of the SIS grid of Figure 1. Finally, a variety of planning processes<sup>13</sup> and technological forecasting techniques<sup>14</sup> have been discussed for SIS implementation.

### Strategic information systems in developing countries

While most of the literature on strategic information systems is written for implementation in an advanced, largely free and competitive economy, we believe that this body of knowledge has application for developing countries and more controlled economies as well. For example, it is hard to imagine that every country in this class will answer 'no' to all of the five questions posed by Warren McFarlan.<sup>15</sup>

In this section, we extrapolate the SIS model discussed earlier (Figure 1) to developing countries. We are convinced that SIS opportunities exist in developing countries both for the private sector (to gain competitive advantage) and the public sector (to promote economic development). The specific strategic forces will vary; however, the underlying model is still a valuable tool. We develop and report two conceptual SIS scanning models for developing countries; one for the private sector and one for the public sector. Note that the latter model (SISED) enables the public sector (i.e., the government) to use SIS for providing the best quality of necessary goods and services to promote national economic development and international trade. Although the SISED model has been developed in the context of developing countries, it should also have applicability to developed and competitive economies.



**Figure 2.** Strategic forces for a firm in a developing country

### Strategic information systems for competitive advantage for a firm in developing countries

The strategic targets identified in Figure 1 are based on the strategic forces present in developed nations with free and competitive economies. These in turn are largely based on a firm's value chain and value system, as discussed by Porter and Millar.<sup>16</sup> In a competitive economy, the value system of a firm is primarily comprised of suppliers, customers and competitors. It is our argument and experience that there are additional strategic forces in developing countries (and semi-controlled economies) that must be incorporated in the underlying model. Also, the relative importance of strategic forces will vary from country to country. These forces for a firm in a developing country are shown in Figure 2.

In the proposed model, the three forces of suppliers, customers, and competitors remain. The competitors include firms in the same industry, firms in other industries with substitute products, new entrants, and foreign competition. Two additional forces have been identified in the model, namely the government and the logistics. Generally, the government adopts a significant role in developing countries. From the firm's perspective, this role may be regulatory, supportive, or both. In either case, the firm may take steps to take advantage of these governmental forces. For example, the firm may be able to develop an information system to address massive governmental regulatory requirements.

The second new force is logistics. This force includes all of the physical systems and infrastructure required to move raw materials from suppliers to the firm and finished goods from the firm to customers. Specifically, logistics includes transportation systems, communication systems, warehousing and distribution networks. This strategic force may not be particularly important in developed nations, but is generally very significant in developing countries. Often the logistics systems and the infrastructure in such countries are far from adequate. A firm may be in a strategically stronger position when it uses technology to overcome some of these logistics problems. For example, a telecommunications system may be used to track and expedite deliveries to more crucial distribution points. Note that we have considered logistics as a separate category from government for two reasons: first it represents a formidable force by itself, and second it may or may not be in the exclusive domain of the government.

	Suppliers	Customers	Competitors	Government	Logistics
Differentiation					
Cost					
Focus					
Innovation					
Growth					
Alliance					

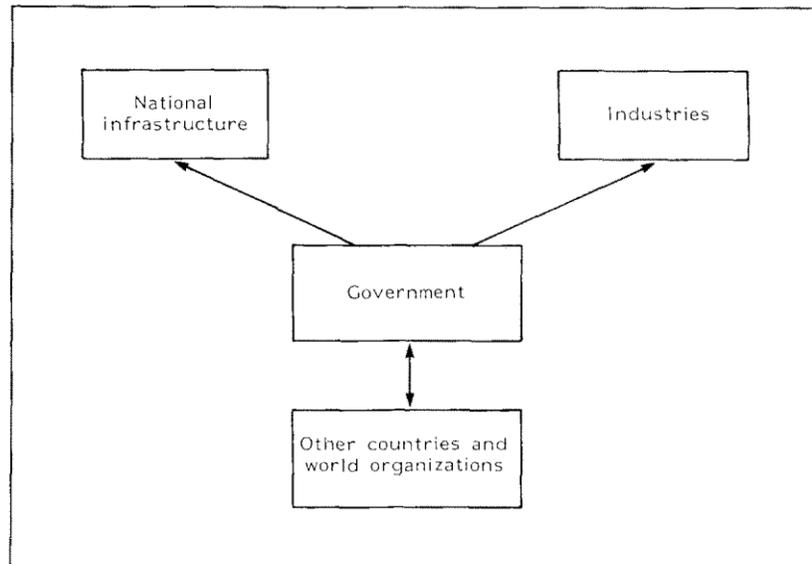
**Figure 3.** Strategic information systems for competitive advantage scanning grid

These then are suggested strategic targets for a firm in a developing country. Again the firm may use one or more of the six strategic thrusts, identified in the previous section. The SIS scanning grid for developing countries is shown in Figure 3. The strategic mode in each cell (though not shown in Figure 3) may again be defensive or offensive. A SIS opportunity may exist for any of the 60 combinations shown in the scanning grid. This, we believe, is a rich model for SIS identification. Of course, depending on the firm and the country, some combinations may be more attractive than others, while some may not be feasible or applicable. A sound planning process will have to be undertaken to generate feasible and implementable ideas.

***Strategic information systems for economic development (SISED) (with special reference to developing countries)***

Many theories of economic development and econometric models have been proposed, discussed and implemented over the years.<sup>17</sup> For example, proponents of balanced growth and big push theories have argued

that the growth of a developing nation would have to be balanced, and many sectors of the economy (e.g., agriculture, industry and public utilities) would have to grow at once.<sup>18</sup> While the models and the developing nations exploit those factors of production that work to their advantage, they typically exclude information as a new and important factor of production. The model that we are proposing exploits the powers of the new information 'resource' and needs to be a part of the process of economic development.<sup>19</sup> As stated earlier, we do realize that modelling on a national scale is a complex activity. However, one must begin somewhere; therefore, we offer a relatively simple paradigm which can be refined and expanded with future experience.



**Figure 4.** Strategic forces for the government in a developing country

We believe that a strategic information systems model for economic development in the public sector is a logical extension of the SIS model described above for the private sector. Although homeomorphic in appearance, that is where the similarity ends. The strategic targets and thrusts in this model derive from a variety of sources including: the basic economic theory of international trade,<sup>20</sup> the factors typically considered by multinational corporations before investing capital, and/or plant and equipment in a foreign country,<sup>21</sup> world geopolitics,<sup>22</sup> as well as Porter's theory of Competitive Advantage. From this comprehensive list, only those factors over which a government typically exercises reasonable control were included in the model (e.g., language, culture etc. were excluded from model). Note that while this model is developed in the context of developing countries, it has strong implications for all nations.

**Strategic target:** The strategic targets derive from the strategic forces with which a government may interact. The major forces are portrayed in Figure 4. Analogous to Porter's work,<sup>23</sup> these forces yield the following four major strategic targets.

1. **Government, itself:** The government may use information systems to manage its own internal resources (people, money, machines) as well as to facilitate and support other strategic forces.
2. **Industries:** Information systems may be used in creative ways to promote and support exogenous as well as endogenous industries. Endogenous industries are of domestic origin and include those that are already developed and are soon to be developed. Exogenous industries include multinational corporations and joint ventures with specific companies and industries of other countries.
3. **Other countries and world organizations:** IS technology may be used to support economic cooperation and regulatory requirements of other countries as well as world organizations (e.g., IMF, United Nations and its agencies, European Common Market, Common-wealth group, Third World group, etc.).

4. National infrastructure: The government may find it advantageous to use IS technology in developing its infrastructure. Specifically, the technology may influence the following components of the infrastructure.

- (a) Utilities.
- (b) Telecommunications.
- (c) Educational system.
- (d) Logistics.
- (e) Banking/financial system (sources of capital).
- (f) Labour organizations.

	Industry	Government	Other countries	National infrastructure
Focus				
Innovation				
Growth				
Alliance				
Direct support				
Indirect support				

**Figure 5.** Strategic information systems for economic development (SISED). Scanning grid

**Strategic thrust:** As before, strategic thrusts refer to the kind of advantage gained by actions taken. In this model, however, these actions are initiated by government and not by competitors within an industry. Six thrusts or strategies are identified for the public sector model. These thrusts are:

1. Focus: Concentration by government on a particular industry Or segment of government, etc.
2. Innovation: A fundamental and creative change in the way a segment of government or an industry operates, etc.
3. Growth: Expansion of an industry, government segment, an infra-structure, etc.
4. Alliance: Forging partnerships with specific industries, other countries, etc.
5. Direct support: Providing direct support in one or more of the areas identified as the targets of government strategy.
  - (a) Financial (aid or contribution).
  - (b) Technological.
  - (c) Experts/consultants.
  - (d) Tax advantages.

6. Indirect support: Providing indirect support in one or more of the areas that follow for one or more of the targets of government.

- (a) Information
- (b) Education/training programmes for industry.

**Strategic mode:** Once again in this model there are two strategic modes: offensive and defensive.

The targets and thrusts can be organized into a 6 x 4 matrix or scanning grid (Figure 5). The mode in each cell of the grid may again be defensive or offensive. Again, we believe this grid provides a rich set of SIS opportunities to explore.

### **Requirements for strategic information systems**

Some desirable conditions should exist prior to the successful development and implementation of strategic information systems in an organization. We group them into two categories: business/organizational requirements and technological requirements. We also add a caveat that these requirements not be considered absolute prerequisites; rather that they increase the likelihood of success. The absence of these preconditions poses barriers for SIS development; compensating strategies need to be adopted to hurdle such barriers.<sup>24</sup> Thus these requirements suggest further actions needed to be taken by organizations before deployment of SIS (in both developed and developing nations).

#### **Business/organizational requirements**

1. The SIS must be patterned after the strategic vision (or corporate strategy) of a company.<sup>25</sup> Before undertaking SIS development, the organization leaders should be strategically oriented and be explicitly doing strategic planning.
2. Top management must be involved. Since SISs involve significant risk, have long-term planning horizon, involve substantial investment and have a wide scope, active participation of top management is crucial.
3. Information must be recognized as a resource on par with other resources: labour, money, materials. One measure of this requirement is that the chief information officer (CIO) reports directly to the chief executive officer of the company. In this role, the CIO becomes an interpreter, educator, advocate, and stimulator.<sup>26</sup> Another measure is the maturity of the organization in its use of information systems (i.e., it must have systematically passed through transaction processing and management information systems<sup>27</sup>). In terms of the Nolan stage model,<sup>28</sup> the organization should be in or near the maturity stage.
4. The strategic position and nature of the firm and/or industry and environmental factors may require or facilitate the use of IS technology for gaining strategic advantage. Thompson and Strickland<sup>29</sup> identify four generic types of firm and five types of generic industry environment and different competitive strategies for each one of them. Environmental factors include the size and intensity of competition, the relationship with the suppliers and customers, and in some nations the logistics systems as well as governmental influences.
5. Creativity must be emphasized. According to Cunningham,<sup>30</sup> the common denominator for all successful SISs is a 'flash of brilliance'. Harriman, president of Syntectics,<sup>31</sup> states that corporations are pursuing creativity actively to counter the inherent barriers due to organizational structure. Government and individual firms should promote activities and programmes designed to improve the creativity of its human resources.
6. The commitment to change and the use of a rational process for implementing change must exist. The presence of entrepreneurs<sup>32</sup> and the presence of a project champion<sup>33</sup> have been recommended for implementing change. For SIS, the project champion should preferably be from the management team. A well accepted and rational process is the Lewin—Schein's three-stage change process: unfreezing, moving and refreezing.<sup>34</sup> Faced with the seriousness of cyberphobia, entrepreneurs should build support among employees and managers before, during, and after the introduction of computer systems.<sup>35</sup>

### **Technology requirements**

According to Cunningham,<sup>36</sup> 'In a buyer's world in which every customer becomes a market segment, it has got to be a two-way street: market-driven technology rather than technology-driven marketing'. The technology has to constantly adapt to changing needs. The additional technological requirements for a successful SIS, over and above conventional resources, are:

1. Computer-based models. This means acceptable software to do extensive 'what-if' analyses in an interactive and iterative mode. These models include mathematical, decision support systems (DSS), expert systems (ES), and simulation models.
2. Computer-based large databases accessible from remote locations. These databases should include operational and tactical data of the company's internal environment as well as relevant data from the external environment.
3. Telecommunications and distributed processing. The targets for SIS are: competitors, suppliers, customers, logistics and government. Since many of these targets are geographically dispersed, telecommunications and distributed processing play a vital role.
4. A synergism of IS technologies. The confluence and connectivity of the islands of computers (micro and mainframe), communications and office automation leads to significant innovative possibilities.<sup>37</sup> All three islands are relatively volatile and their connectivity is a significant challenge.

### **Summary**

In this paper, we have demonstrated the viability of using models for the development of strategic information systems for competitive advantage (SISCA) and economic development (SISED) for developing countries. The SISCA model is developed from ideas frequently discussed in the literature on developed and competitive economies, like the USA. The SISED model is an extension of the SISCA model. These models, properly utilized, should help developing nations in exploiting information technology to accelerate economic growth and social welfare.

Prior to the industrial revolution, most economists subscribed to theories,<sup>38</sup> which did not include the impact of technology and information. These theories assumed that:

1. There would be no difference in technological levels between nations.
2. Relevant technology would be readily available to trading nations.
3. Relevant information will readily flow between nations.

All three assumptions have since been proven false. The value of being technologically competitive goes unchallenged today. Even attracting foreign investment which has long been considered a function of a plethora of factors, shows technology 'looming larger' than ever before as a major element. Many developing countries are already making determined efforts to assimilate information technology to accelerate economic development (e.g., Korea, Hong Kong). We believe that our models, in this context, will help the developing nations and world organizations in promoting the effective use of strategic information systems.

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