Software for Export–Can Small Be Beautiful?

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ABSTRACT

The upsurge in global software outsourcing(GSO) by client organizations in the developed countries, chiefly in the US, has provided opportunities for many developing countries (DCs) to follow the example of India and seek to participate as software developers. Jamaica and Barbados have, through partnerships with international software developers, enhanced their software development capabilities to get a slice of the outsourcing pie. The pool of local programmers has been supplemented by information technology(IT) professionals recruited from India. Special initiatives in education and training and in strategic IT planning at the national level have been undertaken as these Caribbean countries attempt to leverage their geographical proximity and cultural affinity with the US. While small DCs will hardly ever make a significant impact on global outsourcing, participation in software for export brings much needed foreign exchange and serves as a stimulus for the domestic IT environment.

INTRODUCTION

Since the early Seventies DCs have sought to harness IT to attain social and economic development. Some countries in the Caribbean have additionally attempted innovation in IT utilization through the creation of an Information Services Sector(ISS), offering new products and services, and the establishment of new relationships with corporations in the developed world. During the initial phase of the ISS, established three decades ago, these countries were content to operate at the lowest rung of the ladder with data entry. They would eventually progress toward software development and other professional services at the top rung through a gradual upgrading of skills and technical capability.

Over a decade ago, Jamaica and Barbados, in particular, decided that it was opportune to become involved in software development for export. Up to this time in both countries much of the software utilized had actually been developed in-house. This was a reflection both of the types of applications implemented and of a desire to develop the programming competence and confidence of their programmers.

The success of India, Ireland and a few other DCs in this pursuit also served to motivate these Caribbean countries to stake their claim for a piece of the pie.. This would call for adherence to standards and deadlines such as had seldom been required with software development for domestic entities. In their attempt to tackle software development for global markets they were apparently convinced of their ability to leverage their initial success in the sector. However it is doubtful whether policymakers really appreciated the difference between involvement in data entry operations and participation in global software teams.

In this contribution the Jamaica and Barbados experiences with software for export are discussed and future prospects are assessed. The lessons, challenges and prospects for these two countries can be of some assistance for any small DC in its search for advancement in IT utilization generally and particularly in involvement in software for export.

GLOBAL SOFTWARE OUTSOURCING

GSO is the outsourcing of software development to subcontractors or developers who operate away from the client's home country. Clients tend to be mainly US corporations but may originate from Europe or even Asia. India can claim to be the original developer and, with over 800 IT service firms, has dominated the market, its share being worth almost $4 billion(US) in 1999/2000. (Heeks et al, 2001). However, almost 50 countries now participate as developers with Ireland, Israel and Singapore being among the more successful ones. In the Caribbean, Jamaica and Barbados have been the leaders.

GSO has been undertaken by the clients for two main strategic reasons, namely cost considerations and access to a larger pool of competent professionals. Business relationships have therefore had to be established and maintained between these clients in the developed countries and the developers who might be, physically and otherwise, poles apart. Various studies have been undertaken to evaluate the strategies for achieving the most satisfactory relationships.

GSO has been fraught with difficulties, principally communication between partners and coordination of the various tasks in the software development process. Distance between the partners can play a major role in exacerbating the problem. Modern communications technologies, it has been claimed, can remove physical or geographical distance as a constraining factor. However, experience has shown that, for communicating between business partners, videoconferencing and other technologies cannot substitute for actual face-to-face contact. In coordinating the several tasks, national, cultural and organizational differences, along with physical and temporal distance, have been identified as factors which reduce effectiveness.(Carmel et al, 2001)

Developers in the Caribbean clearly have great advantages with North American clients through close linguistic, cultural and business ties. To capitalize on this Caribbean countries would be advised to market themselves as "near-shore" rather than offshore developers.

Yourdon(1994) was one of the earliest to recognise the potential of DCs for producing world class software and possibly becoming a threat to the American programmer. He identified the following growth stages for foreign software industries:

- body shopping with offshore programmers working on-site in US corporations.
- on-site systems analysis and design done in the US with programmers working offshore to develop that software.
- offshore development of generic software products to be marketed in the US and in other developed countries.
- global marketing of indigenous applications developed offshore. Egypt with its multimedia cataloging of its historical and cultural artifacts and Singapore with its port management systems have been successful in this area.

India has been the only DC capable of promoting body shopping as a development strategy. Most DCs have had to be content with utilising their relatively cheap labour resources to provide programming support in their participation in global software development.

Schware's "walking on two legs" proposition has been advocated as a development strategy for DCs wishing to become involved. The production of software for domestic markets, he argues, provides opportunities for domestic companies to develop their skills, capabilities and possibly market niches. This could result in the establishment of successful consultancies. The transition to software for export can then be approached with greater confidence and expertise gained from the domestic production effort.(Schware, 1992)

There is great variability among DCs according to their size, and stage of economic and technological development. Thus the application of Schware's proposition to any particular DC would depend on the similarity between its domestic applications and those being demanded by corporations in developed countries

Typically the applications which are outsourced have tended to be of a financial nature and are based on on-line, web-based and multi-media technologies. In many DCs only a few applications, for example in the banking sector, depend heavily on these technologies. The requirements for the export market include exceptional programming standards and practices and the existence of an appropriate legal and regulatory environment to safeguard against piracy and copyright infringements.

Unfortunately participation in global software development brings challenges and difficulties which have often been minimized or even ignored by many officials who promote software production in DCs. Very often they wish to have their country regarded as being a technologically capable country that has been able to bridge the digital divide. However the reality is that some basic questions have to be answered:
• What software can or should be produced?
• Will the user-interface be acceptable?
• How and where will it be marketed?
• How will it be supported?
• Are relevant tools and people available?
• Is documentation adequate?

Any small DC can hardly make a very significant impact on the provision of software for export but the opportunity and challenge to participate have been accepted by a few. One important factor is that virtually any slice of the pie could make a considerable contribution to such countries through the foreign exchange earnings.

SOFTWARE DEVELOPMENT

Global Perspective

The availability of appropriate software has been a major factor in IT diffusion. Cane(1992) classified software and its utilization as follows:
• embedded software for the electronic products and telecommunications industry.
• customized software for commercial and financial sectors and for government services.
• packaged software, the driving force behind many PCs utilized in all areas of human endeavour in today's information age.

Initially computers for commercial use were acquired primarily by large corporations for centralized environments. As technological improvements came in the form of mini computers and later PCs, small and medium sized businesses and eventually homes were able to afford computers. Three market segments for software development could be identified:
• large corporations which favoured the building of proprietary systems from scratch using basic languages such as COBOL to provide systems of the management of their operations. Maintenance and upgrading of the legacy systems constituted an important activity.
• small and medium sized businesses for which packaged software was ideally suited. Application software included spreadsheets, accounting and other management packages, bought and then adapted to the special needs of the business.
• the PC market for which off the shelf products and user friendly programmes mainly on CD-ROMs were mandatory.

This assessment of the market for software globally reflects the overall situation which prevailed up until the start of the Internet era. Web-based business opportunities have for the past five years been sought by corporations and small businesses alike. In this radically new environment, software applications and services utilize easy-to-use graphical web browsers with new companies daily seeking to network their businesses.

For businesses which seek a mere presence on the web all that is required after the page has been designed, possibly by the client, is the integration of the graphics and sound. To achieve greater benefit web pages should be integrated with the databases and the legacy systems. Successful entry into the electronic commerce(EC) environment necessitates a complex IT environment. There is a coexistence challenge as one seeks greater advantages from web technologies. Several platforms, programming languages and strong de facto standards coexist and often have to be managed in parallel. The high level of complexity in the IT and communications infrastructures along with variable commitment to standards in software production have led to difficulties in the management of today's IT environments.(Hoch et al, 2000)

The industry has become quite fluid and unstable with the entry and demise of companies and constant search for innovation among the leading players. The ever-present threat of viruses and worms and the persistence of hackers have not helped the management of current systems.

Another challenge relates to the business skills competence of current software developers. A decade ago software engineers would most likely have had experience in the development of information systems for businesses prior to their involvement in software for export. They would have been quite knowledgeable about business applications. Today's software developers, brought up in this networked and object oriented environment and fast-tracked into dealing with web-based applications, are less likely to be familiar with basic business practices. This trend poses difficulties when, in EC applications, web-based interfaces to legacy systems have to be developed and maintained.

Such challenges must be addressed in the education and training of current software developers. In particular, greater emphasis on business skills and project management should be reflected in the respective training programmes.

Domestic Market

In both Jamaica and Barbados, businesses entered the computer era using in-house software and, with expertise and experiences gained, moved on to the acquisition of packaged software which had to be customized. These packages were mainly supplied by US software corporations although a few local packages have been acquired by companies throughout the Caribbean. In a few cases, major businesses, such as a utility company, having successfully implemented computer applications now feel ready to acquire best practice software globally and modify their procedures to fit the software.

The banking sector has been a major user of information technology with the internationally- affiliated banks using the same systems as found in their respective head offices. The indigenous banks have attempted to innovate with their systems which are developed by local or international software producers.

In the public sector, a major IT user, the specialized nature of their systems has meant that, until recently, most systems had to be developed in-house. Local software developers and others from North America have also been contracted to develop application packages, mainly payroll and national insurance systems. With growing demand for the better information provision expected in an electronic government environment, much interest is being shown in Intranet and Internets.

In the near future there will be a demand for educational software in both countries which have committed themselves to greater implementation of educational technology. It is uncertain how much of the available software can be described as being culturally relevant or desirable or whether domestic production of courseware will be required. Any local production of courseware would have to be preceded by substantial training as there is already much concern about quality. Unfortunately, the emphasis, at least in the case of Barbados, has been on the purchase of hardware with the considerably more complex questions of software evaluation and acquisition being given minimum attention.

PARTICIPATION IN SOFTWARE FOR EXPORT

Software development is a prime activity in the ISS where companies at this higher value-added end of the sector undertake programming contracts from many North American corporations.

From the perspective of a small DC, such participation has become an attraction for two main reasons:

i) Successes gained from their initial involvement in the provision of lower end services have made DCs aware of the possibly greater gains to be made through advancement to higher-valued services such as software development.

ii) Many computer science graduates from these DCs, imbued with an entrepreneurial spirit, armed with PCs and with contacts in the US, now seek to become global 'infopreneurs'.(Heeks, 2001) Involvement at this level provides an excellent opportunity for these graduates to experience the latest technologies. IT professionals in local companies eagerly expect to function with such novel technologies. Overall the presence of these high tech operations has a positive effect on the domestic IT environment.

For such countries successful participation will be determined largely on the contribution of foreign currency earnings to the national economy. It follows that while a new software product at a major US developer only shows up as a 'blip' in the accounting system when it generates $50M annually, such an earning opportunity would be readily grasped by a small DC.(Yourdon, 1992) The global software pie was estimated at $400 billion in 1997 and any country that can provide reliable and efficient software services at competitive prices can expect to get at least a small contract for software production.

STRATEGIES

Various authors have outlined possible development strategies for involvement of DCs in software for export.(Heeks, 1999; Yourdon, 1994; and Reichgelt, 2000) The following reflects a Caribbean perspective on the issue but should provide useful insights for small DCs elsewhere.

• Market existing locally developed software. This was usually custom-written for single client and hence tended to be unsuitable for mass packaging. At one time some thought was being given to the marketing of some public sector software in other DCs in the Commonwealth which had adopted the British administrative systems for that sector. Fuller analysis led to the abandonment of this idea. The few software packages already written and implemented regionally would have had much difficulty competing against similar but globally written packages when continued maintenance, support and purchase costs were considered.

• Develop software locally, explicitly for an identified overseas market. Even if the technological capability and competence existed in a small DC, major factors such as venture capital support, product identification and marketing would prove to be major hurdles. Opportunities have been identified in the past through the initiatives of government investment promotion agencies hired consultants to procure outsourcing contracts on their behalf. With the possibility of the project exceeding the capability of a single developer the formation of project teams from among local software entities and even individuals as well as the actual project management had to be satisfactorily addressed. In Barbados a project implementation unit, called Project INFOTECH, was contemplated as a means of assisting locals firms which sought to become involved on software development for US corporations. A team of IT professionals was nominated to serve as a liaison between the client and the developers and to provide any further professional assistance. This well-intentioned initiative was short-lived as difficulties arose with the establishment of consortium teams of small local software units to tender for software projects. While the engagement of a consultant could generally be seen as a positive step, the fear, uncertainty and doubt experienced by US clients in doing business with developers in the DCs would present a virtual roadblock. Participation in joint ventures with software developers from the developed countries may be the only logical course of action.

• Develop software locally in collaboration with an overseas company as a sub-contractor, in a joint venture partnership or as a participant in a global software team. The major advantage with this arrangement is that the overseas company would handle the marketing function, secure contracts and provide specialist tools and training as required for each project. Contract work would generally originate in the US and would feature the same level of technology found in US corporations. A certain minimum technological competence would be expected from local counterparts in the global team. Training initiatives toward this goal are being implemented in both Jamaica and Barbados.

• Seek out market niches to take advantage of a country's unique expertise. Reichgelt(2000) has suggested that, in the case of Jamaica, the development and marketing of application software related to all-inclusive hotel operations in the tourism sector, an area where that country is a world leader, could be considered. A few years ago the millennium bug provided DCs with a good opportunity to earn valuable foreign currency since their programmers seemed more au fait with the Cobol language in which many legacy systems were written than those from the developed countries.

CHALLENGES

Many challenges will have to be overcome by DCs if the expected benefits are to accrue from their involvement in software for export.

Training

Increased training should be provided in areas such as systems analysis and design methodologies, case tools, Java-based programming, project management and documentation. An initial improvement should be seen in the quality of the system development process with more formalized procedures being applied. Better management control of the development process will ensure the quality assurance necessary in a competitive environment. Other improvements should also be evident in cost management and in the ability to measure specific processes.

In both Jamaica and Barbados the governments have, in collaboration with universities in the US and UK and with ISS companies, established special training institutions to assist with human capital development. These feature short, high-impact and modular courses specially oriented in respect of the languages and methodologies studied toward applications found in this sector.

The University of the West Indies at its campuses in these two countries has been modifying its Computer Science programmes to pay greater attention to areas such as information systems and software engineering. Management and Accounting options and separate courses in these disciplines are now available to Computer Science majors.

With the absence of software business incubators the involvement of IT corporations in the design and even teaching of programmes should be encouraged. Job attachments with ISS companies are now a regular feature in the training of IT personnel.

Availability of Programmers

The size of the pool of competent software developers is seen by Reichgelt(2000) and others as a major challenge since large software projects can absorb hundreds of software engineers. Indeed, Reichgelt argues that a necessary condition for the establishment of vibrant software engineering projects is the availability of a large pool of highly trained individuals. He however admits that small DCs such as Singapore, Israel and Ireland have become important players in the global market.(Reichgelt)

For a better appreciation of the prospects of small DCs, it should be noted that the actual size of typical software teams is quite small. In India over 75 per cent of companies have had fewer than 25 professionals and in Egypt company size has varied from being one to five persons up to maximum size of 50 to 100 professionals. The existence of global software teams suggests that, generally, programming modules are being assigned to individual teams which can be quite small.

One common project in today's networked environment is the development and maintenance of a web site for a corporation. This

can be undertaken in a small DC by a company staffed with only a few professionals. Technical competence along with the requisite team work appears to have a greater impact on the eventual success of the project than the actual size of the team.

In both countries there have been attempts to bring in IT professionals from other DCs, mainly India, to boost the numbers of trained personnel. These have been unsuccessful because of the cultural differences and also the desire of these migrants to seek greener pastures in the US.

Regulatory Framework

A major difference for smaller DCs between participating at the lower and upper ends of the ISS is the mandatory existence, in the case of the latter, of the requisite environment. Intellectual Property and Anti-Piracy legislation and an up-to-date Computer Misuse Act are basic requirements if corporations in the developed countries are to be comfortable with having their software projects undertaken by companies in DCs partners.

Telecommunications

Monopoly companies have for a long time controlled the telecommunications services in most DCs but strenuous attempts are being made to correct this practice. In Jamaica, legislation has been enacted to fully liberalize those services while in Barbados consultations and deliberations are in the final stages prior to the enactment of such legislation The problems with telecommunications would therefore appear to be about to be resolved. Unfortunately ISS companies in Barbados still relate horror stories about the cost of such services, a charge vehemently denied by the monopoly service provider. Government's role then is a critical one. In a situation where they have had little experience with such technical matters, government officials are unable to confront the service provider. Friendly persuasion has been their preferred approach but meanwhile affected companies continue to complain that they are unable to maximize their contributions to the economic development of the country.

Sustainability

The area of software production has come to be regarded as one where survival is a problem. As indicated, starting such an IT operation is easy and relatively inexpensive and appeals to those with an entrepreneurial flair. However, in this fast-paced, dynamic and very competitive environment, business changes come too quickly even for large corporations and suppliers of well known products. As an example, Wordperfect's share of the word processing market decreased from 46 per cent in 1990 to 17 per cent in 1997.(Hoch et al,2000)

The picture from the Caribbean tells a similar tale. The US custom-software design company PRT set up operations in Barbados in1996, staffed by some 300 programmers from India and a few Caribbean nationals who were recruited both from inside and outside of the region. It provided software for Fortune 500 corporations in the US and had a Level 3 rating for its software development. Within only two years it was being hailed as the flagship of software in the Caribbean. However by the end of 2000, only a skeleton staff of less than 50 remained with the company. There has been similar but less high profile failures recorded throughout the region in both domestic and export-oriented companies.

A key factor in these failures has been the quality of management of the company. While many entrepreneurs have good ideas for business start-ups and are able to create effective software products, few are able to complete the transition to become successful managers. The selection and retention of competent software professionals continues to be a major problem as better jobs with higher salaries from North American companies are constantly being offered. The ability to retain secure financing is also a major problem.

There however seems to be some hope for a small company keen to enter the global market through the provision of products and services in a restricted area or to a few clients. The practice of web page hosting and maintenance has been successfully undertaken in a small DC like Bermuda.

PROSPECTS

Software development represents the ultimate attainment for DCs which for almost three decades have endeavored to create an ISS to earn foreign exchange and provide employment opportunities. Software for export presents several challenges for these countries, yet about 50 of them have ventured into the arena.

Jamaica and Barbados have, as joint venture partners or in global software teams, contributed as developers to the GSO movement. In the process, they have had to improve their educational and training programmes for IT personnel. ISS companies have influenced curriculum changes at the various institutions for the development of software engineers. They have actually taught courses at these institutions and have provided job attachments for students within their companies. Recent university graduates have also benefitted from stints in some clients' North American software factories. The impact on human skills development for IT utilization has been considerable.

The adoption of system development tools and methodologies and the adherence to programming standards have been evident in the production of domestic software. Some domestic companies now feel compelled to adopt best practices in their systems planning and have even opted to modify existing procedures so that best practices software can be acquired globally.

In the pursuit of the dream of software for export there has been a heightened interest in strategic national IT planning. Also closer public-private sector cooperation about IT utilization has ensued.

One unfortunate feature however has been the veil of secrecy that surrounds organizations in the sector. This has affected the assessment not only of real financial contribution to the economy but has limited access to critical issues about the general operations of these companies. The true picture about the Sustainability of individual companies and of the ISS itself is difficult to determine.

However government's investment agencies continue to market these two countries as good locations for the establishment of nearshore operations. With the growth of EC and of networked organizations the prospects for these countries and similar small DCs seem bright once the correct training, legal and telecommunications infrastructures are put in place.

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