

Software Industry of an Emerging Economy: A Case of the Western Cape, South Africa

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Abstract

As the world is transitioning to an information and knowledge-based economy led by innovation, the functional versatility of new technologies is increasingly becoming dependent on the ability to program and embed them with software that will enable them to undertake a range of tasks. Developing countries are also increasingly realising the potential impact of software and the overall Information, Communication and Technology (ICT) sector on structural transformation, education, innovation, service delivery, job creation and export revenue. This study is an attempt at identifying key issues implicated in a software industry of a developing country. The key findings reveal a strong desire, predominantly from the private sector, to grow the industry and develop competencies that will enable them to competitively service both local as well as international markets. However, there is an increasing frustration amongst businesses in; dealing with a continuous decline of quality and quantity of software related skills, tension from competitors (mostly India), and absence of a nationwide software strategy which can be linked to an outcome of a lack of leadership in the sector.

Keywords: Software industry, ICT skills, Developing countries, ICT policy

1 Introduction

The Information, Communication and Technology (ICT) sector is increasingly becoming a key player in developing countries' economies for both developed as well as emerging markets. According to Parthasarathy (2010), ICT forms an integral part of the third industrial revolution by virtue of its ability to transform pre-existing sectors of the economy to improve efficiency, productivity, as well as the overall standard of living. A careful look at the ICT sector reveals a decline in the advances in design and manufacturing technologies to enable the inexpensive production of information processing devices, as predicted by Moore's law.

The significance of computer software in the third industrial revolution has positioned the software industry to be one of the fastest growing industries. It is a relatively low investment, environmentally friendly, high growth industry. It has formed an integral part of development and innovation in developed countries and, as we are witnessing currently, even more so in emerging economies.

On the other hand, developing countries are also increasingly realising the potential impact of the software sector on structural transformation, education, innovation, service delivery, job creation and export revenue. Businesses and the private sector in general are now cognisant of the role of the software industry, in terms of its impact on their ability to be effective and innovative as well as to compete globally. Governments are also experiencing the need for a strong software sector if they endeavour to effectively provide service delivery in areas such as education, health and job provision, as well as other key social, political and economic issues (UNCTAD, 2012).

Currently, the success of software industries in developing countries is more commonly measured based on the ability to master software production techniques and business models that allow them to compete with the global market (Avgerou, 2010). This goes hand in hand with an implicit assumption that success in the software industry will have a direct positive impact on the economic well-being of a country (Carmel, 2003b). However, research points to several instances where a trade-off existed between efforts to foster a particular (unfit) model of software industry, and innovation in domestic organisations and a country at large (Avgerou, 2008).

Furthermore, while the positive impacts of a successful software industry for a developing country have been well documented, a failure to establish the right framework that will bring about the required domestic capabilities to seize such opportunities may instead severely hinder the prospects of such a country to grow both its private as well as its public sector. This may subsequently result in failure, not only to compete globally, but also to deliver its basic services (UNCTAD, 2012).

Having recently been recognised as an emerging economy, South Africa is under pressure to at least keep up with other emerging economies, namely Brazil, Russia, India and China, the other four BRICS countries, which have all made significant progress in the software as well as ICT industry at large. However, at the infancy of an industry, in this case software industry, a discourse on understanding the need of the industry is vital (Parthasarathy, 2004). Therefore, to fully exploit the potential of South Africa's software industry, it is important to first explore and develop an understanding of the sector looking at the unique social and contextual issues (Tessler, Barr, & Hanna, 2003). Such an understanding, or at the very least the attempt towards developing it, is crucial if the industry is to have a sustainable and meaningful impact both economically and in the broader society. As posited by Hilsop (2010), for it to be effective, sustainable and relevant, the South African software industry cannot simply rely on copying winning models from other countries. Instead, there is a need to build a software industry that will recognise innovation and excellence within its own contemporary society. This study represents one such effort.

According to Avgerou (2008), a need exists for research that links software development, and the software industry at large as an ICT innovation practice, to its socio-economic context. Such research will consider technological innovation as a practice enacted by social actors and will emphasise understanding the practices within the power dynamics of the immediate settings of the innovating organisation. As put by Tessler et al. (2003, p. 1), "every software-exporting country has evolved a unique industry shaped by its own resources and situation and by the particular global opportunities present at the time".

This study was an attempt to landscape the software industry in South Africa with a special focus on the Western Cape region. Being socially embedded, the study aims at looking at the unique contextual issues surrounding an industry that is positioned to emerge as the strongest software industry on the continent. An understanding emerging from this study forms part of a crucial step towards building a competitive, innovative and sustainable software industry that can effectively serve not only South Africa but also the continent, and compete with other emerging markets worldwide.

The study was set out to get, from the leaders of companies operating in the industry, a sense of key issues (including opportunities, strengths, weaknesses and threats) that they see their businesses facing (and the industry at large) in terms of their ability to enable service delivery or business competitiveness within the region in which they operate. The study then sought to categorise these issues or 'pressure points' as referred to in the list of objectives, so as to look at each of the issues in more detail relating

it to literature on software industries in other countries. This was an attempt to get a more in-depth understanding of each issue specifically with relation to its unique context. The following section presents the literature review.

2 Literature Review

2.1 Software Industry in Emerging Economies

The emergence of the software industry globally dates back to the 1980s primarily in developed countries (Commander, 2005). However, as of the mid-1990s, the focus started to move from developed Western nations to emerging economies. Currently, a large body of literature exists discussing the state as well as the role of the software industry in emerging economies (Arora & Gambardella, 2006; Carmel, 2003, 2003b; Commander, 2005; Heavin, Fitzgerald, & Trauth, 2003). The increase in research is a result of what is seen as a significant growth in size and importance (in terms of contributing to economic growth) of the software industry in emerging countries such as India, Brazil, China, Israel and Ireland.

A review of literature on software industries in several emerging economies highlights that, in spite of a common engagement in software development, the countries remain very heterogeneous in their characteristics as well as in terms of the local dynamics of the industry. For instance, while India's, Ireland's and Israeli's software industries have been fuelled by exports, those of China and Brazil have grown largely due to their domestic market (Arora & Gambardella, 2006).

Even in those countries with what can be perceived as a similar market orientation, a review of literature reveals vast differences in their industry development paths. A vivid example is India and Israel. While both are known for significant exports to Europe and America, India's software industry originates from its popularity in body shopping and the provision of large numbers of low to mid-range software development skills. Israel, on the other hand, has a background of extensive research and development (R&D) with the software industry being championed by research centres and academic institutions.

So far, no country has been able to build a successful software industry by simply copying the successful models of other countries. On the contrary, a successful software industry first requires recognition of innovation and excellence within its own community. Once a clear national strategy had been realised, with the support of businesses and public institutions, these industries are easily able to expand and grow and compete domestically as well as internationally.

In Table 1, a summary of the emergence as well as characteristics of software industries of the several emerging markets is presented.

Table 1: A summary of the Brazilian, Chinese, Israeli and Indian software industry

	Brazil	China	Israel	India
Market Orientation	Focus mostly on serving domestic market	Focus on domestic market	Exports	Exports and body-shopping
Strength	The presence of strong domestic demand as well as supply of software and related products provides opportunities for learning and competence deepening, a necessary preparation if you want to effectively compete at a global scale	Strong government support especially to local companies. The large size and broad, rapid economic growth of the Chinese economy and its increasing use of IT has generally benefited the industry by providing demand for software	A highly innovative industry due to significant involvement of the academia in the high-tech industries and the highly advanced level of scientific research conducted in the country. Massive inflow of foreign direct investment in terms of venture capital from American investors	Abundance of skilled labour Strong government involvement in terms of setting policies which have been favourable to the software industry. The time zone difference between India and US, which provided an opportunity for providing round-the-clock services. A large body of English-speaking personnel allowing them to swiftly operate in the international space
Challenges	The pressure of global competition as other international software companies start penetrating the Brazilian market. Most of the Brazilian software companies have no international recognition making it difficult for them to compete globally. The language barrier makes it difficult to expand in the region as well as worldwide	The local and fragmented nature of most operators has significantly hindered their growth into large scale, specialised software manufacturers which is essential considering the growing interest of international firms to break into the Chinese market. The language barrier making it difficult for Chinese firms to expand into global space	Lack of market diversity, since the industry relies mostly on American investors or exports to America	Slow rate of adoption or integration of the software industry to other local economic sectors. A limited domestic market as well as lack of firm-to-firm interaction within the local space which seems to hamper the innovativeness of the industry
Sources	(Arora & Gambardella, 2006; Botelho, Stefanuto, & Veloso, 2005; Breznitz, 2005; Nusca, 2012)	(Commander, 2005; Kshetri, 2005; Tschang & Xue, 2005)	(Breznitz, 2005; IVC Research Centre, 2013; Tessler et al., 2003)	(Arora & Gambardella, 2006; Athreye, 2005; Chaminade & Vang, 2008; Parthasarathy, 2004, 2010; UNCTAD, 2012)

2.2 The South African Software Industry

The review on the four emerging software industries points to a number of issues that play a big role in the emergence of a country's software industry. The three key issues that emerged are: market orientation (or industry focus); skills availability; and the role of the government. This is not to say these are the only factors. Other factors include availability of infrastructure, the role of academic and research institutions, and various geopolitical issues. In order to gather a deep and meaningful picture of South Africa's software industry, the study will mostly focus on a review of those three key issues. This was deemed important if this study is to achieve one of its key goals of making sure that its findings are relevant and its recommendations actionable.

2.2.1 *The Software Market Orientation*

In the past decade, the South African software industry has experienced a tremendous growth from an estimated worth of under R4 billion in 1998 to above R20 billion in 2009 (James, Esselaar, & Miller, 2001; Wills, Pater, King, Booie, & Netshisaulu, 2005). Currently, the local market seems to represent the majority of the overall software industry in South Africa. A recent study done in the Western Cape indicated that only 39% of the software companies surveyed make any revenue from exporting their products and services (Gale & McKinnell, 2011).

For those companies involved in software export, 76% export within the continent, 32% trade with Europe, 17% with North America and 7% with the Australasian region. Only 4% of exporting companies trade with South Asia, the Far East and South America (Wills et al., 2005). These figures clearly indicate that the South African software industry is currently focused on serving the country and to an extent the African continent.

Industry reports point to a wide variety of software solutions being developed in the region, from back-end business support systems to web-based front-end systems. This includes software products and services aiming at enhancing and supporting the management of information, documentation and business processes such as: point of sale, Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) systems, operational support, and e-Commerce. Although there seemed to be a bias towards the financial industry in the markets targeted, there is still a wide variety of industries being served such as legal, business process outsourcing, health, travel and tourism, real estate, NGOs, government, retail and education (Gale & McKinnell, 2011).

Looking at the market alone, the South African software industry displays some resemblance to China's and Brazil's, where the focus has also been mainly on serving domestic markets. This brings about an important question of whether the focus on the local market is a sign of inferior capabilities and reveals an inability to develop an internationally competitive industry, or rather an alternative strategy to prepare and structure the industry to enter the more competitive international domains (Botelho et al., 2005).

2.2.2 *Skills Sourcing*

One can hardly discuss the South African software industry without touching on the issue of skills availability. According to a series of private and government sanctioned reports on the software industry as well as the ICT industry in general, skills availability is a principal challenge facing the industry (Sewchurran, Mwalemba, Harpe, & McKinnell, 2012; Wills et al., 2005). In a study conducted in the Western Cape, 65% of organisations operating in the region cited availability of appropriate IT skills as one of their critical challenges (Gale & McKinnell, 2011).

Studies on profiling of ICT skills have highlighted a contradiction implying that while the country in general is faced with significant levels of unemployment, the ICT sector is faced with a shortage of skilled workers (Melina, 2007). In addition, companies are also sceptical about the quality of ICT graduates from local universities. Most graduates tend to struggle to attain productivity once placed in projects. This has resulted in organisations questioning the relevance and suitability of programmes offered by higher learning institutions.

On the other hand, higher learning institutions have attributed the source of the problem to the overall shortage of students enrolling in ICT-related degrees as well as the ability of those students to successfully complete the training (Melina, 2007). Studies show that learners are instead choosing careers in medicine, arts, engineering, law, accounting and politics (Calitz, 2011). Even worse, those who enrol in ICT-related degrees and who graduate with high grades, tend to migrate overseas in search of not only better payment, but also exciting ICT careers in large multinational companies as well as a better quality of life in European and other Western countries. The low supply of ICT graduates within the country has resulted in an increase in the cost of sourcing ICT professionals. Salaries have gone up, resulting in not only large but also small to medium sized companies looking for alternative sources of skills including seeking and sourcing professionals from outside the country.

2.2.3 Government Support

Just a few years after the end of apartheid, the newly formed South African government identified the significance of fostering a strong ICT sector as a key enabler for national development. This came hand in hand with the recognition of the importance of fostering a strong local ICT sector as a means to effectively exploit the ICT revolution worldwide (Moodley, 2003). Tasked with the responsibility of driving the ICT strategic plan, the Department of Trade and Industry (DTI) identified eight key success factors for the ICT national strategy which include: “Developing human capacity: skills and knowledge; Cost effective and ubiquitous ICT network infrastructure; Sustainable growth of the domestic ICT industry; Strong content and application development for domestic and international markets; Rapid diffusion and adoption of ICTs through the economy; Government as a model user of ICTs; Enhanced innovation and R&D capabilities; and Proactive, coordinated and transparent policy and implementation processes” (Moodley, 2003, p. 112).

These key success factors were then used to set focus on various programmes. Examples of such programmes include the Technology and Human Resources for Industry Programme (THRIP) which was a joint research venture between government, industry and academic institutions, and the Innovation Fund, aimed at supporting large scale science, engineering and technology innovation programmes with social implications (Moodley, 2003; SAITIS, 1999).

At provincial level, we find organisations such as the Cape Information Technology Initiative (CITI), established in 1998, which operates on a vision of creating an “ICT cluster that is regionally and internationally recognised for excellence in its ability to innovate, generate investment, create jobs and grow revenue” (CITi, 2009).

With a current investment of about R187 billion, it is clear that the government has given some attention to the ICT sector (Pule, 2011). The central government as well as provincial governments have recognised the importance of the ICT sector and specifically the software industry as an important catalyst for economic development. However, in spite of such investment, there is a general feeling in the industry as well as in academia that there is room for the government to do more in support of the software sector within the broader ICT industry.

From the baseline studies commissioned by the DTI in 1999 to a most recent study of the software industry in the Western Cape, a lack of a coherent government strategy for supporting the ICT industry has been identified as one of the key challenges faced by existing as well as upcoming businesses (Melina, 2007; SAITIS, 1999, 2000). Currently, none of the government ICT strategy documents, including the Minister of Communications' most recent budget vote speech, clearly articulate the country's strategy with regard to the software industry. The focus has mostly been put on implementing the infrastructure (telecoms and broadband) with little attention given to content and applications development as initially outlined by the DTI.

A survey of the Western Cape software industry revealed that 49% of companies cited government regulations as a constraint on effectively doing business (Gale & McKinnell, 2011). Therefore, although the government, specifically in the Western Cape Province, has directed some level of attention to the software sector, concerns exist ranging from bureaucratic incompetence and contradictions to incoherence and inconsistency of policies which result in shortcomings during implementations (Sewchurran et al., 2012; Singh, 2010).

3 Research Methodology

The empirical research in this study is focussed on an *in-depth* exploration of the broad parameters of the identified pressure points, their interactions and impact on the overall software industry, as perceived by key actors operating within (affecting and/or affected by) the industry. In this study, the researchers embrace an interpretative perspective of the world rather than a positivist worldview. According to Orlikowski & Baroudi (1991), interpretative researchers believe that an understanding of the world can only be accessed through social interaction, and that such interaction in turn is understood in terms of the context of the interaction (time and place).

The research is primarily qualitative in nature. Qualitative studies involve studying 'things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them' (Denzin & Lincoln, 1994, p. 12). This is in line with the study's interpretive philosophy, as well as with the study's aim of soliciting the understanding of stakeholders' perspectives of the software industry.

The research strategy used to implement the empirical research is a case study. A case study is concerned with close observation of how a particular population group behaves in a particular context. According to Yin (2002, p. 13), 'A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident'. This research is concerned with studying a phenomenon of an emerging software industry in a contemporary context [Western Cape, South Africa] where the boundary between the characteristics of a software industry per se and that of the region are not particularly obvious. Furthermore, according to Cohen, Manion, & Morrison (2011, p. 296), a case study is a careful observation of how a particular population group behaves in a particular context. A case study approach will thus enable this study to carefully study the characteristics of various players implicated by the software industry in the Western Cape context. This is in line with the review of literature on other emerging software industries presented, which has shown variations of industry characteristics from one region to another.

The study used semi-structured interviews as the main data collection technique. Interviews are an appropriate means of collecting qualitative data, and are commonly used in case studies. Indeed, Yin

(2002, p. 89) believes that “interviews are essential sources of case study information”, principally because most case studies are human affairs (as is this case study) and because interviews can provide insights into complex situations (an expectation of this research).

The interviews were in semi-structured (or focused) to ensure that the interview had a clear direction and theme, but there were opportunities for participants to express their views, explain individual perspectives and expand on answers. The focused interviews met the researcher’s aim of respecting how the participant frames and structures the responses. 18 interviews were conducted featuring 18 different companies operating in the Western Cape Province (Table 2). The companies included external solutions providers (E-SP), referring to those providing services to other external companies, as well as in-house solutions providers (I-SP), referring to those providing services to functions within the same company. Due to resource constraints, only the first 12 of the 18 interviews were used for this study.

Table 2: A list of interviews conducted

Interview Code	Role of Interviewee	Role of Organisation
I1	CEO	E-SP
I2	Executive Development	I-SP
I3	Innovation Director	I-SP
I4	Executive Team	E-SP
I5	Director	E-SP
I6	CEO	E-SP
I7	CIO	I-SP
I8	Executive Team	E-SP
I9	Executive Team	I-SP
I10	CIO	I-SP
I11	Executive Team	E-SP
I12	CIO	I-SP

4 Findings

The findings were collected, analysed and categorised into the following themes: Software Costs & Sourcing Pattern; Labour Profile and Skills Needs; Technology Platforms; as well as Standards, Methodologies and Frameworks. The following sections are a summary of the key responses under each theme.

4.1 Software Costs and Sourcing Pattern

This issue sits between service providers who have an option to outsource some complementary software services and local software vendors who have to sell their services. When asked for a main reason for outsourcing development, in-house service providers made it clear that cost is the main factor. It seems, currently, businesses don’t see the need to incur more costs with local service providers if the same service can be sourced from overseas (India being the popular destination). However, according to other respondents, projects that have been outsourced to India (at a lower cost) are increasingly becoming less feasible. Slowly, executives are starting to come to the realisation that there are substantial resources needed to specify and imagine the needs and to explain these to development teams which are currently not sufficiently considered:

“We tried the India route over the past five years and we found that there wasn’t a business case in terms of benefit and cost and for the last two years we found out it was going to cost us more to offshore....we basically became a commodity and they were simply pushing code which is not what we wanted because we then had to have QA people on this side...” [I8]

Respondents went further and suggested that there is a need to look systemically at cost. Costs in the context of software solutions delivery must be seen from the perspective of their contribution to business goals and the flexibility of the design and architecture to cater for emergent needs. This requires a longer-term view of costs and seeing solutions delivery as an emergent process. It also requires a different perspective towards the sourcing relationship, reflected in the following response:

“...we decided we rather keep it onshore for two reasons, first was to keep the skill set within our teams where it adds value and the other one was to find onshore partners who will assist us with any development work....we’d rather partner with vendors and the benefit we found were two things; one is we get things done quicker, a lot quicker than when we offshore..., and the second thing is they are entrenched and fully understand our business..” [I8]

With regard to the potential for Western Cape becoming an important offshoring destination, it was also revealed that it is becoming less effective and sustainable to position the provinces’ (as well as the country’s) competitiveness through a cost lens. This is due to the increasing personnel costs (partly due to the decrease in the skills pool), as well as significant cost inflation as compared to other popular offshoring destinations such as China and India. As one executive explained it:

“Your biggest cost is your personnel cost in any sort of consulting organisation and our wage inflation outstrips – and for that matter, India and China’s wage inflation massively outstrips the US and a lot of the developed world. So what is happening with our wage inflation is meaning that the competitiveness gap from a cost perspective we used to have is disappearing extremely quickly” [I1]

Finally, there is a perception amongst the big consumers of IT services that local SMMEs do not have enough resources to undertake big software projects as do their counterparts in India and European countries. On the other hand, service providers claim they have the capacity to take on large projects and grow their staff complement in parallel without compromising delivery.

4.2 IT Labour Profile and Skills Needs

Looking at the overall supply and demand of IT skills necessary to boost the industry, the overall consensus amongst respondents is that the skills pool is so small that it is causing both in-house and external suppliers to source from the same market, making it very costly. Overall, there seems to be three critical issues around the problem of skills shortage. Firstly, there is a noticeable decline in the supply of university graduates. As one respondent put it:

“University of Cape Town is a very important indicator of this – you know, I look at IS and computer science honours – a third year group in honours 10 to 15 years ago was a class of 100 to 200 people, it was 150 plus, and now it is very small, hopefully you can get only 30.....that is frightening”[I1]

Secondly, there is an increasing appetite for senior experienced people. This is due to the nature of the complexity of the projects currently undertaken, as well as a growing fear of spending money to train junior, inexperienced people and then losing them to rival companies in the industry. Thirdly, as more and more companies (specifically retailers) embark in huge ERP implementation projects and

Microsoft Ecosystems continue to grow in popularity, companies are now faced with a growing shortage of Java developers as well as SAP qualified employees.

That said, companies are now starting to realise that the only sustainable way out of the skills shortage problem is to invest in internship and employee development programmes both internally as well as through partnership with universities.

"we have got a university graduate internship programme and we are getting two interns now...one developer one BA...we have started this month and we have quite an attractive offer salarywise and we are giving them ipads...we have got the whole training programme...we are spending a lot of money and we are hoping that it will motivate and keep them on"[I12]

Moreover, according to all service providers interviewed, there is a growing need for what can be termed as an analyst-developer skill. IT leaders in the region seem to believe that an analyst developer is crucial to demand generation and identifying future business and new opportunities. This is a strategic point considering that South African businesses are not winning the race with expanding into Africa because they have not been competitive and innovative enough.

4.3 Technology Platforms

From the interviews, it became clear that all service providers have development ecosystems on either Microsoft.Net or Java (or both) platforms. The choice of focus seems to be based on the nature of project and customer demands. The sustainable way forward, according to those who run both platforms, would be to put in place strategies that will enable their human resources, specifically developers, to have skills that span on both platforms. Other common platforms, mostly supported by in-house solution providers, include the typical ERPs (predominantly SAP) as well as legacy systems (two of the service providers also supported COBOL applications).

4.4 Standards, Methodologies and Frameworks

The majority of service providers interviewed are not considering adopting software process improvement frameworks such as Capability Maturity Model Integration (CMMI) because they perceive its adoption and subsequent maintenance and certification as bureaucratic and costly without providing any explicit advantage. They are claiming to have competitive advantage embedded in their delivery processes and they see the adoption of a process framework as an impediment to their competitive advantage. The few who have adopted or are considering adopting CMMI claim to see some value in adopting a framework one being the fact that the framework is highly endorsed by the government, which often happens to be one of their biggest customer.

5 Discussion

From the findings presented, it is clear that key pressure points are the issues of costs, skills, and the relationship between the private sector and government through its various departments as well as institutions in addressing these issues. An initial analysis reflects a sense of confusion towards an appropriate sourcing model for software development projects that will enable the industry to take in big IT projects at a competitive cost. At the moment, the issue of development costs seems to be the driving force towards sourcing decisions. If cost were used as a primary measure, it is assumed that software projects could be fully specified upfront and that the stakeholder needs and project conditions would remain stable. This approach underestimates the substantial resources needed to specify and imagine the needs, and to explain these to development teams. If this is considered properly, it will become apparent that software needs are emergent and fragile, and if this reality is embraced, there would be greater successes and opportunities.

The literature review clearly indicates that the majority of the software market for the local software vendors is local. However, as pointed out, local businesses are currently considering other options in order to cut costs, with India being the popular substitute. On the other hand, local vendors are finding it challenging to lower their costs given the challenges surrounding them such as a shortage of skills and the demand for high quality software.

The need for skills will always be a function of contemporary technologies in use, available regimes of training and certification, commissioned projects, skills available and desirable skilled roles. Consequently, we can assume that within the South African IT industry, skill requirement will be a function of available technologies or the technologies South Africa is planning to adopt. The notion that labour demands can be influenced by two factors, namely, changes in production methods and changes in the structure of the economy, is confirmed by the findings of this study.

Moreover, it seems that off-shoring will continue and grow because South African universities are just not delivering enough skilled resources to bring down the price points for developers and consultants with special skills (e.g. ERP configuration and implementation). At the moment, local training needs are driven by global technology fashions. South Africa cannot sustainably compete in the global software production space by trying to produce more skills than India. There is a need for another strategy to keep a foothold in this space.

South Africa can focus on the skills which are more difficult to mass-produce such as analyst-developers, graduate level software development skills in Dot Net and Java, as well as graduate-level business analysts who have skills in business intelligence, SAP and sharepoint. The aforementioned skills can be focused on developing people who are able to span a number of roles or who can be resilient in a number of contexts. The demand for these skills is latent among South African businesses because there is a growing realisation that they need skilled business analysts and analyst-developers to play a role in imagining solutions, specifying them and working alongside development teams from India. This is due to the realisation that Indian resources do not want to veer too far from technology, and the business context is not something they can easily learn, and if they do, an intimate grasp of local challenges will be a serious shortfall.

If nothing is done about skills, South African companies risk not being able to find talented resources and they may then have no option but to rely solely on resources from India. If this scenario materialises, there is a strong likelihood that South African businesses would not grow their competitiveness with software development and IT at large, as the solutions are bound to be more technology-focused rather than business-benefit focused. Being a sourcing destination for high-end software development skills remains viable as South Africa does have good examples of companies that are competing in international markets. The future of these companies is fragile and depends on South African universities producing more graduate level skills. However, as it stands now, universities are finding it difficult to attract more students to degree programmes in Computer Science or Information Systems because the entry requirements set by faculties are high whilst, at the same time, the country is faced by a the shortage of students enrolling (or doing well) in maths and science (hence IT) classes. The response to shortages is, therefore, fragile and risks being largely un-coordinated with the implication that the Western Cape region and the country at large could become a net consumer of technologies and skills from abroad.

The role of sector development agencies in improving national competitiveness is well reported in the literature. The observation of the sector development within the IT/IS industry in this study is through the experience of organisations such as the Cape IT Initiative. The study unveiled that sector development is not well resourced and often government departments (in charge of policy formulation and implantation in the ICT space) are not close to the situation on the ground and are not willing to engage with the research findings from higher education institutions.

There is a preference for silver bullet strategies rather than seeing the triple challenge of skills, ICT industry competitiveness and business enablement as interrelated. The support for wider dissemination of international frameworks, certifications and training despite the increasing evidence of frustration and immense challenges in adopting them, as well as their ‘fitness for purpose’ given the local context, is one example of a silver bullet strategy being pursued. These projects are well resourced with funds that could have been directed towards cultivating more locally researched and produced techniques that are sensitive to the South African business context and could arguably bring sustainable results. For example, it is widely acknowledged that software development is underpinned by a different logic of operational management and governance, and there is a need to define new ideologies to enable IT/IS ‘production methods’. Internationally, the number of government-funded Software Process Improvement/Improving efforts indicates this. The South African government, however, persists with borrowed frameworks (CMMI and COBIT), which do not enable the new methods of production. This situation points to a lack of understanding, leadership and ownership. Government (such as in the Western Cape) has become preoccupied with clean audits and a tick-box approach to governance, rather than enabling the software sector so that it can eventually develop transversal systems for better service delivery such as patient care.

6 Research Limitations

The study recognises that issues affecting the software sector go beyond the ones given attention in this study. Faced with resource limitation, specifically time, a decision was made to only focus on those issues which were identified as ‘key’ both in the literature as well as in the empirical data. There is a need for a much bigger, well-resourced study that will commit resources to the investigation of all issues, and will interview business leaders from all regions to get a complete picture of the industry and its key challenges as well as its opportunities. Such a comprehensive study is essential if the software industry is to be positioned as a key strategic business enabler and source of competition within the continent as well as internationally.

Another limitation of the empirical study was that, although the literature review pointed to the three key players of government, academic institutions and businesses, the study (data collection) only focused on business leaders. Government representatives were not interviewed at all whereas, academic leaders and NGOs were only informally consulted. However, insights on the government’s position were obtained from official government sources such as budget vote speeches by ministers as well as from official strategy and policy documents.

7 Conclusion

This study has met its objective of exploring the software sector in the Western Cape region of South Africa. According to leader of companies operating in the region, key issues currently facing the regional as well as national software industry include optimising software sourcing options and associated costs, shortage of particular set of skills; choice of technology platforms, as well as challenges of adopting software standards and frameworks. It has become evident that for the regional as well as national software industry to succeed in playing their role in supporting the country’s

economy, the private sector is expected to stimulate the industry by generating demand for software products and services, as well as for the development of such software. The government, on the other hand, has a much bigger role to play. Not only does it have the capacity to formulate policies and regulations that can orientate and steer the industry towards growth, but, by playing its role effectively, the government can also create demand by virtue of information systems that are necessary for the running of government's day-to-day operations as well as deliver basic services to society. This research only focused on perspectives from private sector; therefore, it is imperative that further research is conducted to investigate on how the current overarching ICT policies and strategies, within the relevant government departments, can be shaped to promote the role of software sector.

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