Whither business-to-business electronic commerce in developing economies? The case of the South African manufacturing sector

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Abstract. Business-to-business electronic commerce has become a priority area for many international development organisations, particularly since concerns about the ‘digital divide’ have put the policymaking spotlight on the connection between ICTs and industrial development policies. This paper aims to explore the current state and likely future direction of B2B e-commerce in the South African manufacturing sector. The empirical research is based on 120 firm-level interviews, and 31 personal interviews with industry experts. The results suggest that B2B e-commerce is in an embryonic stage in the South African manufacturing sector, and technology and market dynamics are still casting its basic shape. The ability to realise efficiency gains in the B2B electronic marketplace will largely hinge on the climate of confidence and trust that businesses are able to create in their relations with their suppliers and customers. We argue that policy decisions will have a major impact on the kind of environment in which e-commerce will develop and should therefore be crafted with due recognition of its fragile and evolving nature.

1. Introduction

Dosi et al. [11] and Schumpeter [51] argue that technical change is a fundamental force in shaping the patterns of transformation of a country’s manufacturing sector. Today, advanced microelectronics-based ICTs are at the heart of economic transformations in both the industrialised and many developing economies [29]. Emerging patterns in innovation systems suggest that firms are forced to adapt to technological innovation and change, in order to become or remain internationally competitive [2,3,46]. It must be stressed, however, that the diffusion of ICTs throughout the developing world has been extremely uneven, both within and across countries. Moreover, the least developed countries risk exclusion because they often lack the economic and social capabilities needed to take advantage of innovations in ICTs, such as B2B e-commerce.

With astonishing speed, media sentiment on B2B e-commerce has swung like a pendulum from overly optimistic revenue assumptions and cost savings to predictions of doom and gloom in the wake of the dot-com crash and the massive shakeout of B2B exchanges [5]. As with the advent of any new technology that may be widely diffused, there are overly optimistic and pessimistic predictions, which are generally inaccurate [7,17,37,55]. One of the grand myths of B2B e-commerce is that it offers a ‘friction-free’
Table 1
The potential benefits of B2B e-commerce

<table>
<thead>
<tr>
<th>Lower costs</th>
<th>Network scale</th>
<th>Improved service levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process and transaction cost savings:</td>
<td>Reach, i.e. access and connecting to</td>
<td>Offer more products and services</td>
</tr>
<tr>
<td>includes developing supplier relationships,</td>
<td>customers and suppliers. Competing</td>
<td></td>
</tr>
<tr>
<td>handling quotations, and processing purchasing</td>
<td>globally through deepening upstream and</td>
<td></td>
</tr>
<tr>
<td>orders</td>
<td>downstream linkages in the value chain</td>
<td></td>
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<tr>
<td>Speed (time-to-market)</td>
<td>Richness, i.e. the depth and detail of</td>
<td>Provide better information faster and</td>
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<tr>
<td></td>
<td>information that the firm provides suppliers</td>
<td>cheaper, through lower agency and inter-</td>
</tr>
<tr>
<td></td>
<td>and customers, which is regarded as</td>
<td>intermediary costs</td>
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<tr>
<td></td>
<td>being important for building close</td>
<td></td>
</tr>
<tr>
<td></td>
<td>relationships with trading partners</td>
<td></td>
</tr>
<tr>
<td>Streamline and optimise inter-firm</td>
<td>Target lucrative, particularly export,</td>
<td>Shorten delivery time</td>
</tr>
<tr>
<td>transactions, and exploit systemic efficiencies</td>
<td>markets</td>
<td></td>
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<tr>
<td>in the value chain</td>
<td>Access to new business: a larger pool of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>buyers create a larger market for developing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>country producers</td>
<td></td>
</tr>
<tr>
<td>Reduce inventory</td>
<td>More suppliers mean more choices for buyers</td>
<td>Better supply chain management and logistics</td>
</tr>
<tr>
<td>Shorten sales cycle</td>
<td>Cheaper inputs through increased supplier</td>
<td>Improve the management of transporting and</td>
</tr>
<tr>
<td>Increasing pricing flexibility</td>
<td>competition</td>
<td>inventorying products</td>
</tr>
<tr>
<td>Unit cost savings arise when a firm solicits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bids from multiple buyers, rather than repeatedly</td>
<td>More efficient and effective customer</td>
<td></td>
</tr>
<tr>
<td>awarding the contract to the same firm/s</td>
<td>service</td>
<td></td>
</tr>
</tbody>
</table>

Source: (Based on [30,31,35]).

environment for transacting business. Rather, owing to new costs associated with establishing trust and reducing the risks inherent in this type of activity, it requires new intermediaries. A more sober analysis suggests that B2B e-commerce represents an enormous challenge for developing country firms, but its impact will be felt in rather different ways, and perhaps at a different pace, than many analysts originally anticipated [28]. It would appear that the intoxicating talk of revolutionary business models during the days of internet fever are giving way to a renewed focus on how best to apply the potential of e-commerce to existing intra and inter-firm operations [26].

In South Africa, the critical importance of B2B e-commerce in shaping the performance of domestic enterprises in the global networked economy, has recently come under the policymaking spotlight [8,10]. The issue of engaging more openly in global production and trade networks has become central to debates on how formerly inwardly-oriented industrial sectors restructure themselves to maintain competitiveness in a more open, trade-liberalised environment [32,34]. The use of the internet to co-ordinate production through domestic and cross-border inter-firm networks is therefore likely to have a significant impact on the competitiveness of South African firms. The value of B2B e-commerce rests squarely on the ability of the firm to extend processes and integrate with other companies, and on a broader level, to integrate and consolidate supply chains (see Table 1). The question is whether this potential can be translated into reality for South African (SA) manufacturing firms.

The key issue facing researchers and policymakers is to be able to assess what the baseline state of e-commerce in South Africa’s manufacturing sector is in regard to the global demands of the new information economy. There is a paucity of empirical research in this field. The objective of this paper is to provide a preliminary foundation in order to help focus the policy debate and discuss the results of pilot research work recently undertaken on the potential and uptake of e-commerce in the SA manufacturing sector.
sector. This empirical research is based on 120 firm-level interviews, and 31 personal interviews with industry experts. The panel of industry experts included representatives from academia, government, trade unions, employers’ associations, NGOs, the Export Council and business and IT consultancies. The analysis remains tentative, and should be taken only as a first empirical approach to suggest lines of analysis on the evolution of e-commerce in South African industry. The preliminary findings and broad policy implications reported in this paper constitute an initial analytical basis for identifying areas for future research. The sectoral specificity of organisational impacts have been reported elsewhere [30–36].

This paper aims to: (1) explore the current state and likely future direction of B2B e-commerce in the South African manufacturing sector, and (2) identify the key ingredients that policymakers have to focus on to create a successful environment for e-commerce development. The author is well aware that manufacturing is not a homogenous sector. For this reason, the IDRC and European Union funded E-Business Research Project has drawn on three ‘typical’ sub-sectors: apparel (a technology follower), automotive components (a technology leader) and wood furniture (a technology laggard).

Firms were selected on the basis of interviews with key informants who have a good overview of e-commerce in the three sectors identified by IDRC. In order to extend the range of respondents, the snow-balling technique was used. In addition, we also used the profile of firms that the School of Development Studies has compiled over the last five years. Due to limited resources, statistical random criteria for selection was not used for this pilot study. The carrying out of sample surveys of producers would have meant data collection on a large number of firms. Every effort, however, was made to capture the full range of experiences within the three sectors. The firms selected were generally large enterprises (over 100 employees) and were more or less evenly distributed among the three sectors.

2. B2B e-commerce: A comment

We define B2B e-commerce as any form of commercial transaction or structured information exchange that takes place between firms via an ICT-based, computer-mediated network. B2B e-commerce can be divided into two categories: open marketplace-based trade and direct trade between business partners. The former takes place at various internet-based auctions or exchange sites, whilst the latter occurs either through a firm’s website which has an online purchasing function or an electronic data interchange network.

While B2B e-commerce forecasts vary, researchers agree that it is growing rapidly and that it constitutes about 90% of total e-commerce transactions [4,26,52]. This trend is in line with the emergence and dominance of global value chains which require the organisational linking of the manufacture of components according to clear standards and protocols. And it is likely to entail a radical shift in the way in which enterprises in poor countries trade with the rich countries of the North, but with uncertain results. It is important to remember, however, that the growth and development of e-commerce has been highly uneven both within and across countries.

The issue of electronic commerce holds critical implications for developing country policymakers in terms of fostering competitiveness and maintaining industrial growth. B2B e-commerce is being promoted internationally as a means of enabling producers in developing countries to become more integrated within the global economy [7,29,54]. Although there remains considerable debate about

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1See the contents of the special issue of the IDS Bulletin [56], ‘The Value of Value Chains: Spreading the Gains from Globalization’, with contributions from the leading academics focusing on global value chain analysis.
the nature, extent and implications of e-commerce technologies, there is no doubt that the generation, diffusion and utilisation of such technologies is being played out on an increasingly global arena. And this in turn is likely to have a potentially profound impact on both the shape and character of production, trade and financial relations within global value chains. The latter is particularly important for value chain relationships which link producers in developing countries with buyers in the highly industrialised countries of the North. It has been argued, for example, that under certain circumstances B2B e-commerce could enable firms in developing countries to overcome problems of exclusion from the global economy or to overcome problems created by their inclusion on unfavourable terms [43].

How, whether, and on what terms, producers in developing countries will benefit as a result of changes induced by B2B e-commerce will depend on geographic location and the economic resources and capabilities of different countries. There is a substantial gap in the literature between the potential advantages of e-commerce and the actual experiences of those firms who are beginning to apply B2B technologies. It is, therefore, important to move beyond the ‘promise’ of e-commerce, which is largely based on untested extrapolation from the experiences of the industrialised countries which are themselves only beginning to be examined systematically, to the actual benefits as experienced by firms in developing countries.

Mansell and Wehn [29] argue that, for developing countries, e-commerce is a necessary step on the path to becoming a ‘knowledge society’. According to Lundvall [27, p. 1]: “...the most fundamental resource in the modern economy is knowledge and, accordingly, ... the most important process (of economic development) is learning”. E-commerce is an important contributor to the learning process (which shapes economic performance) because it provides improved access to structured business information and it offers opportunities for innovation when it is embedded in manufacturing processes. A comparative advantage that stems from the generation and application of knowledge is the desired outcome.

It is incumbent on the SA government to assist the manufacturing sector to build a sustainable competitive advantage, i.e. a competitiveness which is based on sophisticated technological knowledge rather than price. In the global economy, technological barriers to entry are generally high [50]. According to Lundvall [27], in the new growth regime ‘knowledge’, ‘information’ and ‘learning’ are crucial for economic growth and competitiveness, and policies relating to ICTs are especially important. Therefore, the SA government needs to take a leading role in the technology policy sphere, partly since its room to manoeuvre in the macroeconomic and labour market policy arenas are being curtailed. In this sense, industrial policy focuses on ‘empowering firms’ rather than ‘picking winners’.

An important lesson from business history is that innovation and the use of new ‘systemic’ technologies is a highly unpredictable and uncertain process [1,3]. E-commerce is unlikely to be any different. It is important to bear this in mind when assessing the hopes and expectations of developing country producers vis-à-vis e-commerce applications.

3. The South African context

The inward-orientation of the South African manufacturing sector has been fostered by a history of state protectionism and import-substitution industrialisation (ISI) during the apartheid era [23]. This inward focus was reinforced by trade isolation, disinvestment and the imposition of economic sanctions during the 1980s and early 1990s. As a result, domestic producers were for a long time insulated from international competition. Since the transition period (post 1994), however, the South African manufacturing industry landscape has been substantially altered by the twin pressures of globalisation and the rapid liberalisation of the trade policy regime, and reinforced by a major shift in state policy
to open markets, a rapid erosion of both tariff and non-tariff barriers and the implementation of an export-oriented industrial policy [18]. The key challenge thus confronting the SA manufacturing sector is not whether to participate in global processes, but how to do so in ways which provide for sustainable growth.

South Africa has experienced rapid growth in internet use, and is placed at number 35 by the Economist Intelligence Unit’s (EIU) ‘E-Business Readiness Rankings’ of 60 countries [22]. The number of dial-up subscribers grew by an average annual rate of 80% since 1994, and the number of internet users had surpassed the one million mark by 1998 [57]. According to EIU’s Pyramid Research, South Africa had 540,000 internet dial-up accounts in 1999, and will reach 1.1 million by 2002 [45]. Of the estimated three million internet users in Africa, two million are in South Africa. In addition, more than 90 per cent of Africa’s internet traffic is generated in SA [35]. The internet service provider (ISP) market is becoming increasingly competitive, with over 150 ISPs already operating in the country. The three main ISPs in SA (viz., UUNet, Telkom’s SAIX and Internet Solutions) have always targeted large firms. At this end of the market, bandwidth demand and usage have, to an extent, levelled off. However, once the main ISPs start targeting small and medium firms where pent-up demand for bandwidth definitely exists, the demand for bandwidth will increase. Currently, pricing of bandwidth appears to be the problem rather than network capacity.

SA has produced some very successful IT companies based on e-commerce, such as Ariel Technologies, Dimension Data, Johnnic, Ixchange, McCarthy’s, Nedbank and Super Group. In line with global trends, B2B e-commerce procurement hubs (such as Motoronline, Autris, Miraculum, Commerce One and ProcureTrade) have also been developed. SA now ranks in the world’s top 20 countries in terms of number of internet sites [35]. With the rapid growth in internet use forecast in South Africa, the potential for growth in e-commerce is promising. BMI-TechKnowledge, a market research consultancy, predicts that the B2B e-commerce market in South Africa will increase from US$2.3 billion in 2000 to $9.7 billion in 2002 [13]. The survey puts the percentage of large companies generating sales from electronic networks at 25 per cent, and for medium-sized firms at 20 per cent [13]. The B2C market in SA is presently very small. The total value of internet retail shopping reached $26.4 million in 2000, which is equivalent to 1% of total retail turnover [57].

According to the IDC, by the end of 2001, nine countries (including Argentina, Australia, the Netherlands, Norway and South Africa) are likely to generate more than 8 per cent of their revenue from online sales [45]. The IDC cites the use of electronic B2B exchanges and the large number of in-house computers connected to the internet as possible reasons for the success that these countries are experiencing. With a well developed telecommunication infrastructure and deep integration into global economic networks, South Africa is better positioned than any other African nation to take advantage of growth opportunities in e-commerce. South Africa has a well developed internet infrastructure in business and academia, and its degree of connectivity places it in the top 25 in the world [16]. SA has an advanced telecom network in the commercial centres, but this contrasts with very low penetration of services in rural and remote locations, especially in the previously ‘independent’ black homelands. While the costs of access are generally affordable in most cities because of the existence of local points of presence (POPs), there is no low cost method of access outside of these areas.

SA’s e-commerce development is weak in two critical areas: a deficient IT skills base and limited access to low-cost, high-bandwidth internet. Training and indeed basic education of the black majority

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2E-readiness refers to the extent to which a country’s business environment is conducive to internet-based commercial opportunities.
were largely neglected during the apartheid era. As a result, companies tend to rely heavily on a small nucleus of skilled white and Indian workers for their IT requirements. This is obviously an unsustainable policy in the long-term. In a recent report, internet networking consultancy Cisco Systems forecasts that the shortage of skilled IT professionals in SA will be among the most severe in Europe, the Middle East and Africa [35]. The local skills shortfall is forecast to rise from 33 per cent in 1999 to 62 per cent in 2003. This is likely to have an adverse effect on growth of e-commerce in the country.

The other critical concern is to establish access to high bandwidth ICT infrastructure at an affordable cost. Large SA firms pay on average $22,222 per month for a dedicated 1.5Mbps leased line. In the US, the same capacity costs $1,795. At the lower end, in SA a 128Kbps line costs $1,222 per month compared to $842.1 in Britain and in the US a firm can get six times the capacity for just $768 [14]. Network bandwidth in SA is leased from Telkom, which is a parastatal organisation. This will probably continue some time after Telkom’s monopoly ends in May 2002. The government’s recent decision to license one additional full service network operator and one international-only operator introduces competition into the fixed line voice market for the first time [9]. The key issue is whether this competition is likely to be sufficient to bring about improved efficiency in the market and to lower prices for consumers. With proper regulatory oversight, it is possible to have vigorous competition among two firms. It is, however, of critical importance that the regulator, ICASA, has the resources and technical capacity to monitor and act decisively against any potentially anti-competitive actions by Telkom.

4. Preliminary findings

A substantial 86.7% of the 120 manufacturing firms interviewed have access to the internet, but only 49.2 per cent have a corporate website. Currently, the internet is used most extensively for intra- and inter-firm communication and for marketing and lead generation, rather than for inter-business transactions and supply chain management. An internet survey of the respondents’ websites shows that they are invariably not much more than a front-end, an online catalogue with orders being emailed, faxed and/or taken over the telephone. Customers are generally unable to check, for example, service call status, order shipping status and delivery information via the internet. Only 22 per cent of firms use their websites to take orders and deliver products, but even they have not added any capabilities such as customisation or interactivity to distinguish the service from other types of direct selling. It would appear as if too much emphasis is being placed on establishing a Web presence and too little stress is placed on ensuring that the ICT infrastructure supports online trading.

There is a dissonance between what firms consider to be the expected benefits of B2B e-commerce and their own adoption and use of e-commerce infrastructure. It would appear that while the firms are generally familiar with the obvious, and sometimes exaggerated, gains of B2B e-commerce which are frequently espoused in popular business and IT magazines, and ardently promoted by IT consultants, they do not seem to be in any hurry to actually implement e-commerce business models. There are two main reasons for their inaction: (1) their inability to develop an apposite e-commerce model which is tightly integrated into their respective value chains; and (2) the large, unanticipated barriers impeding their progress to a functional e-commerce system.

E-commerce is not yet a strategic imperative in the SA manufacturing sector. The majority of firms in the industry are unable to support e-commerce ventures as yet, because they do not have the integrated customer and supplier ICT interfaces in place. Currently, most of the firms’ prime focus is still on a functional orientation (Level 1 in Table 2) or on operational efficiency across the enterprise (Level 2).
Table 2
Levels of e-commerce development

<table>
<thead>
<tr>
<th>Levels</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sphere</td>
<td>– Functional orientation</td>
<td>– Integrating across functional departments</td>
<td>– Cross-enterprise involvement</td>
</tr>
<tr>
<td>Rationale</td>
<td>– Departmental focus</td>
<td>– Integrated business activities via internet/intranet applications</td>
<td>– A virtual ecosystem that connects employees, suppliers and customers by extending existing EDI</td>
</tr>
<tr>
<td></td>
<td>– The purchasing &amp; sales department using EDI</td>
<td>– Integrated business activities via internet/intranet applications</td>
<td>– The extranet aims to: build trust and increase customer satisfaction; increase collaboration and knowledge sharing between customers and suppliers; and maximise synergies to lower costs, improve efficiencies and increase quality</td>
</tr>
<tr>
<td></td>
<td>– Individual departments developing specific internet applications, e.g. a marketing website</td>
<td>– Developing and exploiting intellectual capital to create opportunities</td>
<td>– Developing and exploiting intellectual capital to create opportunities</td>
</tr>
<tr>
<td></td>
<td>– Cultivating knowledge workers</td>
<td>– Developing and exploiting intellectual capital to create opportunities</td>
<td>– Developing and exploiting intellectual capital to create opportunities</td>
</tr>
<tr>
<td></td>
<td>– Building relationships</td>
<td>– Developing and exploiting intellectual capital to create opportunities</td>
<td>– Building relationships</td>
</tr>
<tr>
<td>Levers</td>
<td>– Technological infrastructure and software applications</td>
<td>Business processes (process efficiencies within the firm)</td>
<td></td>
</tr>
</tbody>
</table>

Source: [34].

None of the firms are using e-commerce to increase the organisation’s effectiveness outside the enterprise by linking across the internet with suppliers and customers to create virtual supply chains (Level 3).

Table 3 reveals the types of e-commerce models that the firms plan to use in the next 3 years. The findings in Table 3 suggest that the firms are still largely fixated on a functional orientation, more specifically automation of their trading functions (i.e., purchasing and sales) (Level 1, Table 2). While only 15.8% of firms are considering using e-commerce to network the different departments within the enterprise to reap cross-functional synergies (Level 2), a significant 47.5% are planning a more ambitious application of e-commerce, i.e. to interconnect with their suppliers and customers (Level 3). This finding clearly indicates that a large number of the firms do not realise that systemic cross-enterprise networking is dependent on integrated intra-enterprise IT systems (i.e., both front and back office applications).

The findings clearly indicate that B2B e-commerce development in the SA manufacturing industry is still evolving. The main uses of the internet by the firms includes: accessing commercial databases or services; information searches; marketing; monitoring prices; keeping abreast of technology and market trends; using online catalogues for contracted parts; checking supplier financials; email applications; and, to a lesser extent, actual transactions between firms. The main advantages that the firms associate with e-commerce are: strengthening customer relationships; reaching new markets; optimising business processes; and reducing costs. The survey findings suggest that although the majority (73.3 per cent) of the respondents had positive expectations of B2B e-commerce, they were generally not well prepared for it. Few companies understand:

– the impact they can have by running their supply chains electronically; and

Only 15.8 per cent of the firms had a formal e-commerce policy, while 20.8 per cent of companies were attempting to generate sales through the internet. Electronic procurement and electronic catalogue management systems geared to move corporate purchasing and selling online have not been widely adopted. Firms mentioned the following supply chain problems: high inventory levels; long lead times; poor inter-firm communication; lack of trust and obligational relationships; limited collaborative forecasting, planning and replenishment processes; little strategic supply chain thinking; and an imbalance between supply and demand. Thus it would appear that companies have much to gain from an appropriate B2B
Table 3
What e-commerce model/s is your firm planning to use in the next 3 years ($N = 120$)

<table>
<thead>
<tr>
<th>Model</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual supplier catalogues</td>
<td>72.5%</td>
</tr>
<tr>
<td>Internet-based extranet</td>
<td>47.5%</td>
</tr>
<tr>
<td>Online trading communities (portals)</td>
<td>47.5%</td>
</tr>
<tr>
<td>Internet-based electronic data interchange</td>
<td>42.5%</td>
</tr>
<tr>
<td>Open buying on the internet (OBI) systems</td>
<td>31.7%</td>
</tr>
<tr>
<td>Aggregated multi-supplier catalogues</td>
<td>20.8%</td>
</tr>
<tr>
<td>Internet-based enterprise resource planning</td>
<td>15.8%</td>
</tr>
<tr>
<td>Internet auctions</td>
<td>15.8%</td>
</tr>
</tbody>
</table>

Source: Interview data.

E-commerce strategy geared towards advanced supply chain management. However, making the transition to B2B e-commerce will not be easy, as there are formidable obstacles that need to be overcome. These include:

- Limited understanding among firms of the opportunities, challenges and risks of e-commerce;
- Uncertainty about returns from e-commerce investments;
- Security concerns;
- Lack of technical standards for sharing data;
- Firms spend little time developing a strategic view of their business. They are preoccupied with survival, i.e. a vision which is tightly focused on the short-term and on issues such as profit, tax, competition and regulations;
- Management’s reluctance to change existing operating structures;
- Evolutionary path dependencies which focus on the reduction of labour and input costs as competitive advantage rather than pursuing a knowledge and innovation-intensive growth trajectory;
- Management’s ‘laager’ mentality which have locked firms into an insular, inwardly-oriented way of thinking;
- The lack of adequate e-commerce infrastructures, skills and capabilities; and
- The relatively high initial investment costs involved in developing an appropriate e-commerce infrastructure.

The small scale and volume of the South African market perhaps made the viability of full-fledged electronic business information systems questionable. However, the current pressures of globalisation and trade liberalisation, and the challenge to direct overseas market expansion underscores the importance of e-commerce for the manufacturing sector. The long-term challenge for the formerly inwardly-oriented manufacturing firms is to achieve:

- Strategic agility, i.e. flexibility to adapt to changing market dynamics, evolving customer needs and new channels of competition;
- Tighter control of inventory in their supply chains;
- Improved ability to dynamically respond to changing customer delivery requirements in the supply chain; and
- Better integration with input suppliers and customers to efficiently adapt to fluctuating demand.

E-commerce is likely to become necessary to meet these challenges.

In South Africa, self-interested IT vendors have latched onto e-commerce with alacrity. This ‘gold-rush’ mentality is not surprising, considering the vast amounts of money that IT companies stand to make from consultancy fees, the sale of expensive software and hardware, and providing lucrative
support services to business. The danger, however, is that IT companies are marketing e-commerce primarily as a ‘technology solution’. The net result of which is that emphasis is placed squarely on expensive technological infrastructure and generic software applications which are fraught with risk rather than on context, people and value chain dynamics. There needs to be a shift in focus towards appropriate business models and e-commerce strategies tailored to the specific business requirements of each firm and informed by an understanding of the ICT strategies adopted by the lead firms in the value chain. In addition, important issues such as the risks and challenges of e-commerce connectivity, and the requisite organisational changes, and knowledge-based skills and intellectual capital needed to leverage the value creation potential of e-commerce are either underplayed or ignored altogether. If this trend continues, firms are likely to get little return on their expensive e-commerce investments.

E-commerce can be used in some value chains as the basis for pursuing a policy of price based competition, and firms and developing countries that get locked into such value chains may well find themselves in a ‘race to the bottom’. In short, e-commerce, in and of itself, is no guarantee of escaping the dangers of an immiserising growth path. It only works if it is integrated into ‘world class’ manufacturing strategies for increasing flexibility, cutting lead times, reducing inventory, eliminating waste and banishing defects.

5. The policy challenge

5.1. The technology policy debate

E-commerce processes constitute a formidable challenge for technology policy. There appears to be two main views emanating from the current debate on the role that government policy can play in promoting technology modernisation. There are those who argue that government policies aimed at reinforcing a country’s technological competence are irrelevant, since resources employed would not necessarily lead to national advantage [41]. In short, globalisation is eroding the significance of the state in promoting technological change [6]. By contrast, there are those who argue that public sector intervention is necessary to better equip firms to face technological change and the pressures of globalisation [1,3,27].

A debate has been unfolding in the literature over whether the nation state is still a meaningful repository of technological capabilities [1]. Although the debate is quite sophisticated and nuanced, at least two main schools of thought can be discerned. On the one hand, the ‘national innovation systems’ advocates argue that the nation state is ultimately responsible for technology modernisation [2, 27,38]. For example, Pavitt and Patel [44, p. 110] argue that the technological competitiveness of firms “inevitably depends on national systems of innovation”, which in turn depends on government policy. 3 On the other hand, the ‘globalisation of technology’ advocates argue that private firms (or networks of firms) are the locus of technological capabilities and their development [12,21].

The author disagrees with the view that the globalisation of technology is making national policy an anachronism. Lall [25], for example, provides an interesting account of how governments might help to assist firms in confronting the difficulties of technological learning in a developing country context. Government can assist by putting in place a set of complementary institutions which encourage IT and knowledge diffusion, especially through their support of education, training and information infrastructure. Market mechanisms alone are unlikely to be sufficient to generate positive spin-offs throughout

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3The national system of innovation is the network of institutions in the public and private sectors of each country that support the initiation, modification and diffusion of new technologies such as e-commerce [15].
the economy. Government has a role to play in supporting new forms of market facilitation, designing and implementing effective national ICT strategies, promoting ‘stakeholder dialogues’, constructing ICT infrastructures appropriate to local conditions, and building capabilities and skills for producing and using ICTs. In particular, the state will need to play a leading role in the modernisation and extension of the national information infrastructure.

The perspective put forth by Ohmae [42] that the nation state is increasingly becoming powerless to implement effective independent policies in a ‘borderless world’ has been challenged by, inter alia, Hirst and Thompson [20] and Kitson and Michie [24]. The extent of the dominance of world markets and their ungovernability has been greatly exaggerated, and that there is still scope for government action to improve economic performance in an increasingly integrated world economy. This notwithstanding, globalisation has changed the agenda for national policy: the state cannot now formulate policy in isolation.

It is counterproductive to think in terms of a purely market-based system (i.e., a laissez-faire ideology), just as it is inappropriate to follow a narrowly statist view (i.e., an interventionist approach). Recently, however, a more appropriate ‘hybrid’ model of development has emerged which focuses on building partnerships among key stakeholders in the economic development process [29,53]. Institutional, technical and human capacity building requires a ‘coalition of resources’, which is best achieved through public-private partnerships [29]. As a result of the pressures placed by globalisation on the nation state, a different mix of policies may be needed to promote awareness of e-commerce possibilities and the diffusion of e-commerce technologies [3]. The establishment of effective coordination mechanisms is key, as well as the creation of “… ‘virtuous circles’ of positive reinforcement and incentives for the participating actors to maintain their commitment” [29, p. 260]. There will, of course, be tensions as a result of competing investment priorities. Nonetheless, creative, dynamic coalitions and partnerships among stakeholders is vital to promote e-commerce development in an upper-middle income developing country like South Africa.

5.2. What is to be done?

There is an urgent need for the forging of partnerships to develop e-commerce solutions which are tailored to SA manufacturing firms. Figure 1 illustrates a systematic project-based approach which policymakers could adopt as a guide to developing and upgrading SA firms’ e-commerce capabilities. This approach is justified on the grounds that it provides focus and direction to a firm’s e-commerce project. It forces the firm to think seriously and strategically about the purpose of e-commerce, and to put in place suitable metrics to determine its effectiveness. The model also provides the firms with an analytical framework to evaluate the opportunities and risks that e-commerce poses to their enterprises, and to assess how e-commerce is going to impact on their business organisation, as well as their relationships with their value chain partners.

An incremental approach guided by appropriate technology is preferred to one-off large-scale, expensive transformations such as Enterprise Resource Planning (ERP) which is fraught with risk.

The policy challenge is to create an enabling and nurturing environment aimed at promoting and accelerating the diffusion of appropriate e-commerce technologies and strategies among South Africa’s manufacturing firms. Policy needs to be focused on two key issues:

- Diffusion, including dissemination of information on e-commerce (success stories and best practice), training, skills development and human resources; and
- Enabling, such as systems configuration and integration for e-commerce connectivity (cf. Table 4).
Government and the private sector will need to become actively involved in developing training courses and workshops on e-commerce. The establishment of a centre to provide comprehensive information, advice and training on business usage of the internet as well as support services for the establishment of e-commerce activities is of critical importance. Training and skill formation should be carried out in conjunction with trade unions and industry associations, and with consortia of firms in order to gain economies of scale in developing and delivering training services.

A policy priority is to liberalise the highly regulated and concentrated South African telecommunication market and promote competition in order to stimulate new investment, increase demand for communications access and services through falling prices, and promote greater efficiency and innovation in the provision of infrastructure and services. Policy initiatives to lower network infrastructure costs and internet access charges for manufacturing firms are important. This is likely to provide a stimulus to the growth of e-commerce among SA firms. In the OECD [39,40] countries, for example, the availability of affordable access to high-speed telecommunication infrastructure is closely linked with firm migration to e-commerce.

**Fig. 1. E-commerce strategy.**
Table 4
Multi-level systems integration

Layer I: Application Products
- Collaborative applications
- Customer Relationship Management (CRM)
- Enterprise Resource Planning (ERP)
- Supply Chain Management (SCM)

Layer II: Development Software Products
- Data management
- Application design
- Application life-cycle & management
- Application servers
- Information access & delivery

Layer III: Systems Software & Products, & Technical Services
- Systems management
- Networking & network management
- Security software (transaction security covering authentication and certification)
- Middle-ware
- Server-ware
- System logic

Layer IV: ICT-Specific Infrastructure
- Telecommunication companies
- Internet service providers (ISPs)
- Internet backbone carriers
- Companies providing final access
- Manufacturers of end-user networking equipment
- ICT sector (i.e. software system providers, system integrators and software developers)

Layer V: Support Infrastructure & Services
- Human resource development
- Innovation hub – promotion & co-ordination
- Incubation – bandwidth barn
- Business associations & trade unions
- Research (Council for Scientific and Industrial Research, universities, technical colleges, etc.)
- Consultancies and service companies designing, building and maintaining e-commerce systems
- Web content providers & market intermediaries (brokerage firms, resellers and portals)
- Financing
- State policies (Departments of Trade & Industry, Communication, Education and Labour)
- Firms’ strategies

Source: (Based on [33,36]).

The magnitude of the e-commerce challenge is such that there is a need for various public-private and multi-partnerships, alliances and consortia. There is an urgent need for the forging of partnerships to:

- Assist firms to access capital for their e-commerce ventures;
- Encourage firms to form networks and clusters in order to share knowledge, reduce the average costs of their input transactions, and increase their relative market power in e-commerce transactions;
- Develop knowledge and trust-based strategic, collaborative relationships and alliances in the South African manufacturing sector;
- Educate firms about the opportunities, challenges and risks of e-commerce, and make them aware of cutting-edge security and authentication mechanisms;
Develop ICT capacities and skills through education and training, and counter skill shortages which are greatest in three areas:

* managers capable of completing complex technology projects;
* local content creators aware of the network’s potential; and
* software and hardware engineers.

Policymakers should be especially wary of not slipping into an overly technocratic approach that ignores the priorities and needs of the firms in question, and broader industrial development goals. The biggest e-commerce challenges facing SA manufacturing sector is not technical, since the technology is already available for information exchange, trade and financial transactions. The challenge rather is for the stakeholders to exercise a strategic vision and leadership and to promote organisational change. The stakeholders must focus on what SA manufacturing firms need, and on decisions about how e-commerce is to be incorporated into economic activities, at both the intra- and inter-firm levels. Ultimately, the decision-makers must have a vision of the most important e-commerce applications for the SA manufacturing sector, and how such priorities are to be realised.

Effective use of e-commerce requires a profound transformation in the internal organisation of the firm and its interconnections with markets and suppliers. The policy challenge is to increase manufacturing firms’ capacity to absorb and use e-commerce technologies. This includes not just technical capabilities, but also effective planning and organisational capabilities [19]. The challenge for the stakeholders is how to facilitate the most appropriate pattern of e-commerce development and to adapt, customise and reconfigure existing ‘e-commerce solutions’ to specific requirements; how best to build upon local institutions and how to encourage a greater coordination of productive activity in the manufacturing sector, and to improve the ability of firms to learn locally from cutting-edge e-commerce developments taking place globally. Priority areas for action by the stakeholders are the skills and capabilities that firms need to acquire for productive use of e-commerce technologies.

6. Conclusion

Clearly, B2B e-commerce is in an embryonic stage in the South African manufacturing sector, and technology and market dynamics are still casting its basic shape. The major constraints that confront the SA manufacturing sector are: the slow pace of planned liberalisation of the telecommunications sector, problems with consolidation of technical standards, unexpectedly high implementation costs, high cost of broadband connectivity and inadequate e-commerce infrastructures, skills and capabilities. The paper has argued that policy decisions will have a major impact on the kind of environment in which e-commerce will develop and should therefore be crafted with due recognition of its fragile and evolving nature. The policy challenges require active public-private sector dialogue focusing on building trust; establishing ground rules for the digital marketplace; enhancing the information infrastructure for B2B e-commerce; and maximising the benefits of B2B e-commerce, while simultaneously minimising risk.

As a share of total economic activity, B2B e-commerce is currently very small and its potential has not been fully realised. Although about 30 per cent of medium and large manufacturing companies have embraced B2B e-commerce, the impact has been uneven. The ability to realise efficiency gains in the B2B electronic marketplace will largely hinge on the climate of confidence and trust that businesses are able to create in their relations with their suppliers and customers. Moreover, achieving these gains is contingent on a number of factors, including access to e-commerce systems and the requisite skills.
expertise coupled with strong business application skills are needed to support e-commerce transactions and applications.

ICT companies, together with the media and the financial community, over-hyped the potential of e-commerce, and underestimated the time it would take to implement new Web-based applications and services. Expectations of what e-commerce could deliver were blown out of proportion and therefore clouded business decisions. This, however, should not mislead us into underestimating its truly fundamental significance in industry. The misguided notion that e-commerce is an instant moneymaking machine has given way to a more pragmatic notion that ICTs are just a part—often an essential part—of running a business in the new information economy.

The domestic manufacturing sector is presently undergoing profound structural transformation in order to rapidly improve its performance to meet more demanding market requirements, both domestically and in export markets, generate economies of scale and to contend with intense international competition. As a consequence of a convergence of the aforementioned trends, it is highly likely that e-commerce will become more widely diffused over the next 2–3 years. B2B e-commerce capabilities are important for SA manufacturing firms as they are struggling to compete in a globalised and interconnected world which is organised around knowledge and information flows.

The critical policy challenge is to build the e-commerce capacity of firms in order to defend local markets, expand their global reach, maximise export sales and gain a sustainable competitive advantage over lower-cost producers under preferential trade agreements. The transition to an integrated internet trading system will, however, not be easy. It is a long-term project which will require a great deal of commitment from different stakeholders. Importantly, the benefits that arise from such a commitment may not be immediately obvious in that the SA manufacturing industry needs to make significant progress simply to maintain its present position in the global operating environment. Notwithstanding this, B2B e-commerce provides a necessary lever to meet ever more demanding performance requirements that depend on information and knowledge-intensive value chain relationships.

B2B e-commerce holds great promise for South African manufacturing firms, especially in terms of collaborating with suppliers; enhancing supply chain management through reducing overall inventory levels, transportation costs and order and delivery lead times; and in increasing the speed and efficiency of economic transactions. The policy challenge is to translate this potential into reality.

Research is urgently needed to assess the gap between technology solutions that are currently being offered and those that would be more likely to enable SA manufacturing firms to participate in global B2B e-commerce on an equitable basis. E-commerce development in the SA manufacturing sector is likely to be a cumulative, incremental and path-dependent process (à la Rosenberg [48,49]), which takes the form of steady accumulation of tacit capability (which is acquired through a collective learning process within the firm), rather than a sequence of discrete acts of technology building. South Africa will need to take great care to avoid overly optimistic and technicist approaches to e-commerce which do not take into account the real world of global trade and production networks and the situation of South African manufacturing within it. Moreover, a technology-focused approach to e-commerce tends to deflect attention away from far-reaching systemic changes that need to be made in SA manufacturing firms. E-commerce technology should not be viewed as an end in itself, but as a means through which the SA manufacturing sector can realise its potential.

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Note the irrational exuberance and speculative excesses accompanying the dot.com bubble.
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