

Strategies of ICT Firms in Developing Countries: Strategic Group Analysis on Tunisia's Software and IT Service Industry

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This article reports on an investigation of firm strategies in the software and information technology service industry in Tunisia. The research contributes to the ongoing discussion on competitiveness of information and communication technology businesses in developing countries. It is based on the results of a survey conducted in 2004 with software and information technology service companies in Tunisia looking at their strategy implementation, utilization of external input factors, market focus and global reach. The article presents an analytical framework for the quantification of competitive challenges through the concept of strategic groups which clusters the industry structure along patterns and barriers in the strategic space of firms. The analysis identifies six groups, and discusses their competitive positions along the different patterns of diversification, internationalization and corporate control. The article argues that the view on the heterogeneity of the industry structure is key to an enhanced understanding of competitiveness. The results show that the concept of the strategic space of the software and information technology service industry and its challenges in Tunisia may be captured to some extent by prior research. Nevertheless, the complexity of the strategy construct still conceals much of the true sources of performance and international success that are frequently discussed at both the economic and business policy level.

INTRODUCTION

Tunisia is one of the leading developing countries regarding its achievements in information and communication technologies (ICT) and competitiveness (UNCTAD, 2004). Recently published comparative indicators illustrate some remarkable performance in both fields. Tunisia is ranked 34 out of 82 countries in the Networked Readiness Index (NRI) measuring the degree of preparation of a nation to participate in and benefit from ICT developments (Dutta and Jain, 2003). The country holds the highest ranking in Africa and in the Arab world. In the Growth Competitiveness Index (GCI) the country is ranked 34 (Cornelius, Blanke and Paua, 2003), and in the Microeconomic Competitiveness Index it comes 32nd out of 80 countries (Porter, 2003). With the exception of South Africa, Tunisia's competitive indicators outperform all African and Arab states in the rankings. Also with regard to government efforts to successfully promote ICT competitiveness, Tunisia is clearly showing the way among poor and middle-income countries (Lanvin, 2003).

The government e-strategy defines the overall framework for national ICT development. In Tunisia the underlying e-policy framework is embedded in the national development plan, currently the Tenth Plan 2002-2006. This intends software and information technology (IT) service companies to play more of a key role in furthering the ICT development process both as suppliers of technology at the core of the information economy and increasingly as exporters (Ministère du Développement et de la Coopération internationale, 2001).

Various institutions and researchers have analyzed opportunities and challenges for such businesses in the context of developing countries and several contributions to this discussion exist on Tunisia (FIPA, 2002; ITU, 2002; World Bank, 2002; Dutta and Coury, 2003; Lanvin, 2003; Made IT, 2003; Porter, 2003; Chaabouni and Zghal, 2004; UNCTAD, 2004; UNDP and CEPEX, 2004; Neumann, 2005). Most of the work shed light on comparative advantages and disadvantages that reside in the national business environment of firms. This has enhanced our understanding of competitiveness and ICT development in Tunisia but is not sufficient to explain how exactly the supposed internationalization and exports challenge software and IT service firms. Not all firms are affected by the same competitive challenges to the same extent. Firms can capitalize on different environmental attributes, focus on different sources of competitive advantage, and develop them in different ways. This confirms the Tunisian experience in the software and IT service industry. Relatively little attention has been paid to the differentiated view on firm strategies, even though the strategies are the key to develop and enhance competitive advantages, sustained success, higher performance and exports (Porter, 1991; Barney and Arian, 2001).

Chaabouni and Mezghani (2001), Jouili and Chaabouni (2005), and Raffe, Esposito, Iandoli and Bruno (2002) provided first exploratory insights into the subject of strategy formation and the strategic positioning of software and IT service companies in Tunisia. This empirical study aims to differentiate their view on firm strategies and makes particular reference to the heterogeneous nature of the industry in terms of strategies, performance and internationalization. The concept of strategic groups presents an appropriate approach to analyze systematically such heterogeneity (McGee and Thomas, 1986; Hatten and Hatten, 1987; Cool and Schendel, 1988). The conceptual framework for strategic group research involves multiple levels of analysis which permits to differentiate also competitive challenges like barriers to performance for firms, firm groups and the industry as a whole in the national and international context (Pehrsson, 1990; Dranove, Peteraf and Shanley, 1998; Thomas and Pollock, 1999; Leask, 2004).

Eventually, this study makes the attempt to answer two research questions: 1/ Which strategic groups exist in Tunisia's software and IT service industry? Strategic patterns among firms are being analyzed. Mobility barriers are being hypothesized and tested; 2/ Which competitive challenges exist towards internationalization? Strategic strengths and weaknesses, opportunities and threats of firms are being discussed.

THEORETICAL BACKGROUND

Strategic groups are a widely discussed but still controversial term. Therefore, the analysis of such firm groups and their competitive effects should not lack a brief overview on its evolution and the current stage of the scientific debate in the field of strategic management. The first contributions to the subject were based on traditional concepts of industrial organization (IO) economics but analyzed firm groups within an industry instead of industries as a whole (Hunt, 1972; Caves and Porter, 1977). Numerous authors have been following this school of thought and provided conceptual extensions such as mobility barriers between groups that act as equivalent to entry barriers of industries, and methodological extensions towards more sophisticated analytical techniques (Porter, 1979; McGee and Thomas, 1986; Cool and Schendel, 1988). The cognitive approach, as second main stream in strategic group research, focuses on the perceptions of managers whose cognitions tend to simplify the industrial environment and drive the convergence of strategies and group formation (Fombrun and Zajac, 1987; Porac, Thomas, Carroll, Wilson and Paton, 1993; Reger and Huff, 1993; Lant and Baum, 1995; Hodgkinson, 1997).

The advancing conceptual work of strategic group researchers has been accompanied by a large body of emerging concurrent schools in management theory that refueled the fundamental discussion on the strategic space in which firms compete. According to the resource-based view (RBV), firm-specific capabilities and unique resources can cause widely varying levels of performance of firms in the same environmental settings and groups, pursuing the same strategies (Cool and Schendel, 1988; Yami and Benavent, 2000; Short, Palmer and Ketchen, 2002; Leask, 2004). Contributions from the new economics of industrial organization (NEIO) stressed the relevance of interaction effects between strategic groups to explain performance differences of groups (Peteraf and Shanley, 1997; Dranove et al., 1998).

Obviously there is little agreement on the meaning of strategic group research for strategic management, the characteristics which classify groups, and the effects of strategic groups on the way firms compete (McGee and Thomas, 1986; Barney and Hoskisson, 1990; Hodgkinson, 1997; Dranove et al., 1998). Nevertheless, the ongoing debate on advanced concepts of strategic group analysis provides several valuable approaches that may guide researchers; i.e. in the delineation of the strategic space (Kim and Lim, 1988; Fiegenbaum and Thomas, 1993; Yami and Benavent, 2000; Kim and Lee, 2002; Dornier, 2004; Zúñiga-Vicente, de la Fuente-Sabaté and Rodríguez-Puerta, 2004).

DELINEATION OF STRATEGIC SPACE

McGee and Thomas (1986) emphasized the primary necessity of detailed knowledge and understanding of the industry context as key condition for an adequate specification of the strategic space, the operationalization of relevant strategy variables and dimensions along strategies are measured for the strategic group analysis. The literature

review on theoretical and empirical implications from strategic group research suggests five levels to analyze what Thomas and Pollock (1999) called 'The Puzzle' when they reflected on competitive strategy and the delineation of its space:

– Global level: internationalization can distinguish competitive contexts and shape the way firms compete (Chetty and Campbell-Hunt, 2001). Globalized enterprises may capitalize on different demand and supply characteristics across different countries (Pehrsson, 1990). For instance, multi-point competition at a global scale can result in different international product-market combinations (Duysters and Hagedoorn, 1995).

– Country level: local idiosyncrasies of countries may have significant influence on the competition (Kim and Lim, 1988; Ariyawardana, 2003; Peng, Tan and Tong, 2004). Such idiosyncrasies may relate to the stage of economic development in terms of the business environment and the sophistication of firm strategies and operations. For instance, theory concepts on the role of technology in competition in developed economies can be compromised by the country-specific context as technology development processes may differ in developing economies (Kim and Lee, 2002).

— Industry level: every industry requires intimate knowledge and understanding of the industry-specific focus of competition. The strategic space delineated through traditional IO concepts may apply in industries following more stable patterns of competition based on advantages through lower costs or greater differentiation (Hatten, Schendel and Cooper, 1978; Hayes, Spence and Marks, 1983; Hergert, 1987; Cool and Schendel, 1988). In more dynamic industries other concepts may better capture the essence of the strategic space, for instance, when innovation rather than solely structure drives competition (Thomas and Pollock, 1999; Miles, Snow and Miles, 2000; Lee and Harrison, 2001).

— Group level: a strong interdependence of firms and partnerships may cause significant interaction effects that make interaction an important aspect of competition in an industry (Duysters and Hagedoorn, 1995; Sanchis Palacio and Ribeiro Soriano, 1997). All types of strategic alliances and firm networks may bear potential for such strategic interaction and competitive processes at the group-level (Moldoveanu, Baum and Rowley, 2003; Thomas and Carroll, 1994). This applies particularly when competition is characterized by collusive behavior (Cool and Dierickx, 1993; Dranove et al., 1998). Similar resource endowments of firms can also result in comparable objectives of managers and strategies, which can be understood as mental model at the group-level (Porac, Thomas and Baden-Fuller, 1989; Dornier, 2004).

— Firm level: the RBV shows that the firm-level is a rich source of diversity within an industry because of unique firm-specific resources such as particular licensed technologies and technical know-how, organizational configurations and managerial skills (Ketchen, Thomas and Snow, 1993; Lant and Baum, 1995). An industry may compete on the demand side with similar strategies in similar markets. If one or

more firms obtain core competencies that others cannot acquire or imitate then this may indeed cause significant performance differences and is a significant element of competition in an industry (Cool and Schendel, 1988; Yami and Benavent, 2000; Short et al., 2002).

The diverse approaches mentioned above demonstrate, not surprisingly, that it is hard to develop a unified model of the strategic space through a fixed set of strategy variables since it will be outdated as soon as it is applied in different industries and in different competitive contexts (Leask and Parker, 2004). In other words, the delineation of strategic space must consider strategy as complex multi-dimensional construct and reference the competitive context in which this space expands as a recipe tailored to a specific industry (Thomas and Venkatraman, 1988).

MOBILITY BARRIERS AND ISOLATING MECHANISMS

According to McGee and Thomas (1986), strategic groups can be classified by their mobility barriers and isolating mechanisms. Mobility barriers between groups within an industry are the intra-industry equivalents to barriers to entry of an industry as a whole (Caves and Porter, 1977). The basic logic is that a firm within a group can make strategic decisions that are hard to imitate for firms outside the group because imitation would require substantial cost, take a long time, and have uncertain outcome (Mascarenhas and Aaker, 1989; Sudharshan, Thomas and Fiegenbaum, 1991; Merha and Floyd, 1998).

Isolating mechanisms generalize the concept of mobility barriers at the level of the firm. Such mechanisms make a firm's competitive position sustainable by unique resources and firm-specific capital (Rumelt, 1984). This position can be isolated to the extent that others cannot imitate the strategy to achieve it, which preserves rents above the industry average (Lippman and Rumelt, 1982). Therefore, isolating mechanisms are regarded as the strategic complement of resource barriers from the RBV (Wernerfelt, 1984; Kor and Mahoney, 2000).

Dranove et al. (1998) emphasize the strategic interaction among group members to control mobility barriers and isolating mechanisms. They argue that mobility barriers are necessary to identify strategic groups but not sufficient to discuss their real effect on performance. Nevertheless, the argument that strategic interaction would be a prerequisite for strategic group effects should be rejected since it has been shown that one-firm groups can occur when one company is, for example, by far the largest, most specialized, or technologically superior player in an industry (Duysters and Hagedoorn, 1995).

The literature review shows that, in contrast to Barney and Hoskisson (1990), the group-level cannot be abandoned in the analysis of strategic group but should be placed in a consistent analytical context based on mobility barriers and isolating mechanisms. Table 1 integrates both elements into a framework that will guide subsequent analysis on the application of the multi-level concept of strategic space outlined above.

PERFORMANCE EFFECTS

There is no strong evidence of performance differences between strategic groups. However, drawing conclusions is complicated by differences across studies in the way performance is defined and measured (Cool and Schendel, 1988). In terms of performance differences as group-level effect, Porac et al. (1989) acknowledged the divergence of the strategic and the competitive space and suggested to distinguishing competitive groups from strategic groups. Several authors demonstrated that some companies may compete in the same markets to mutual benefit, and hence satisfy even the idea of group effects based on interaction. Nevertheless, these companies were not necessarily assigned to the same strategic group (Porac et al., 1989; Bognner and Thomas, 1993; Duysters and Hagedoorn, 1995; Leask and Parker, 2004).

Hatten and Hatten (1987) eventually rejected the necessity to imply the performance link to group-membership or a supposed mobility barrier in case of lacking empirical and theoretical evidence for the linkage. Research should then confine the understanding of the concept of strategic groups to an analytical convenience to detect firm-level commonalities.

Table 1. Mobility Barriers and Isolating Mechanisms

		Mobility barriers and isolating mechanisms as structural and behavioral properties of groups with...				
		Outward effect		Inward effect		
Mobility barriers (a)	Barriers to entry: group-entry causes substantial cost, time, uncertain outcome	Non-group members are deterred		Group members preserve rents		
Isolating mechanisms (b)				Barriers to exit: group-exit causes substantial sunk costs		
		Mobility barriers and isolating mechanisms may intersect the strategic space in different levels...				
		Global level (c)	Country level (d)	Industry level (e)	Group level (f)	Firm level (g)
Different levels may contain different determinants of competition	<i>Globalization</i> controls for the way firms compete and shapes their strategic posture	The local <i>business environment</i> determines the essential competitive context	The <i>industrial structure</i> determines the way firms compete	<i>Group interaction</i> controls the height and integrity of mobility barriers	Firms compete primarily on the basis of <i>resources</i>	
		Structures of strategic space and competitive context may follow a multi-level model/configuration				

(a) Caves and Porter, 1977; McGee and Thomas, 1986; (b) Rumelt, 1982; Lippman and Rumelt, 1984; (c) Pehrsson, 1990; Duysters and Hagedoorn, 1995; (d) Kim and Lee, 2002; Peng et al., 2004; (e) Kim and Lim, 1988; Zúñiga-Vicente et al., 2004; (f) Porac et al., 1993; Dranove et al., 1998; (g) Cool and Schendel, 1988; Thomas and Pollock, 1999; Dornier, 2004; Leask, 2004.

STRATEGIC SPACE

It has been widely discussed that strategic group analysts need to develop 'industry recipes' for an appropriate delineation of the strategic space (Barney and Hoskisson, 1990: 191). This underlines the importance of an analytical framework with a strong industry focus based on intimate industry knowledge in order to decipher an optimal set of strategy variables (Leask and Parker, 2004: 31; Kim and Lim, 1988: 808).

Following this understanding, a vast literature review of currently available studies, reports, and empirical research on the performance of Tunisia's ICT sector, competitiveness and firm strategies was accomplished in preparation of this study. Material from statistical raw data to recent scientific articles was examined from various international organizations, ministries and other governmental bodies, universities, and private research institutions. A short-list of possible strategic concerns of firms and corresponding variables for the strategic group analysis was compiled on the basis of the literature review.

Subsequently, interviews were held with 21 ICT experts from various Tunisian institutions such as venture capital firms, public administration, business associations, and ICT firms in order to validate the relevance of the issues listed, and to complete the list. Personal interviews took place in Geneva, Switzerland, and in Tunis, Tunisia. In addition to the interviews, open-ended discussions on the telephone were conducted. This way, strategy variables could be identified that represent true strategic concerns of software and IT service firms in Tunisia.

As noted already by Kim and Lim (1988), independent from which stream of strategic group research, most studies have been undertaken in relatively mature or declining industries and primarily focused on developed economies. Therefore, on the one hand, expert interviews and literature review on the Tunisian software and IT service industry were an essential input to capture accurately true strategic concerns of firms. On the other hand, integration of this industry knowledge into a concept for strategic group analysis could not resort to a large body of similar studies.

The final delineation of the strategic space considers the five levels as proposed above: global, country, industry, group, and firm.

FIRM SIZE

Firm size refers to inter-firm differences in capabilities to generate economies of scale. In this sense, it is an appropriate indicator of economic magnitude (Duysters and Hagedoorn, 1995: 362). However, size is clearly a structural and arguably not a behavioral property of firms. It rather reflects the result of successful strategies (Leask and Parker, 2004: 16). It might be argued that true strategic group formation can only emerge from similar strategies that need to be seen detached from structural aspects such as size (Fiegenbaum and Thomas, 1995). However, structure-related characteristics of companies are important phenomena for understanding strategic group for-

mation. If the structural dimension is not included then the existing barriers that limit the scale and scope of the behavioral autonomy are ignored (Barney and Hoskisson, 1990: 190). This underlines that the economic magnitude of a firm has a number of strategic implications. Companies are undeniably moving between a rather specialized or rather diversified status according to their size (McGee and Thomas, 1986: 151). However, as the following sections show, the specialization or diversification of a firm's activities does not only depend on size.

PRODUCT LINE BREADTH

In terms of products and services, small firms may search for ways of offsetting the cost advantage of size and economies of scale by providing more sophisticated and specialized customer-adapted products (McGee and Thomas, 1986: 151). Yet, in Tunisia's software and IT service industry, the increasing sophistication of the demand for technology controls the diversification behavior rather than any opportunity to offset cost advantages of larger firms through a specialization on certain products and services. Firms follow a certain «technological determinism» (Chaabouni and Mezghani, 2001: 49). Even though there are some types of software and IT service solutions that are gradually losing in importance, at the industry-level the technological offer is continuously extending. This indicates that the corresponding product line breadth reflects the advancing technological needs in customer segments. Customers in turn have increasingly developed their needs towards more sophisticated technological requirements on software and IT service solutions (Chaabouni and Zghal, 2004; UNCTAD, 2004: 196).

MARKET SEGMENTATION

Regarding market segmentation in terms of specialization in target industries, the nature of the markets served can differ significantly. Given that knowledge-based competition plays at least some role in the software and IT service industry, differences in target industries require specific intimate industry knowledge in order to produce tailored customer-adapted products (Capaldo, Ianoldi, Raffa and Zollo, 2003: 350). The necessary organizational availability of experience and expertise is clearly related to different growth strategies and size-attributes. Knowledge of individual business units might be hard to transfer from one target industry into another. Nikolova, Reihlen and Stoyanov (2001: 30) presented a corresponding dichotomy of qualitative and quantitative aspects of firm size which appears to be very applicable in the context of knowledge-based competition. When companies serve customers in different market segments then they may either employ transferable capabilities which implies standardized products and services, or they may have additional capabilities for different customer-adapted products. The first option draws a quantitative link from size to standardization which can be frequently found in Tunisian software and IT service firms. The latter option draws a qual-

itative link from size to sub-market specialization. Furthermore, at the industry-level, companies appear to increasingly explore new customer segments. Specialization efforts are hard to find to a significant extent (UNCTAD, 2004: 197-198).

GEOGRAPHIC COVERAGE

According to McGee and Thomas (1986: 151), geographic coverage and the choice of international markets cause initial investment cost and require time in order to successfully enter a market. Not surprisingly, the ongoing discussion on barriers towards exports and internationalization in Tunisia's software and IT service industry confirms that especially the economic magnitude limits business opportunities abroad. Only few companies have obtained the necessary critical size (World Bank, 2002: 51; UNDP and CEPEX, 2004: 26). Therefore, firms and respectively strategic groups can be expected to differ significantly in firm size along with different modes of geographic coverage (Chaabouni and Mezghani, 2001: 51).

Duysters and Hagedoorn (1995: 362) noted that different distances between international markets can also be expected to play at least some role in group formation. Distance in this sense comprises a variety of differences between international markets that are market-specific cost drivers; i.e. political and technical barriers, geographic and physical barriers, and social barriers (Mélitz, 2002; Martínez-Zarzoso and Márquez-Ramos, 2004). Table 2 illustrates vice-versa that proximity and similarity of markets can be key sources of competitive advantages of firms in the Tunisian software and IT service industry in the international competition.

If companies perceive and communicate proximity in language, culture and geography as a significant aspect in their business relations abroad then it is logical to theorize that the market choice of at least these firms has also significant implications on their strategic posture to cope with different market distances and types of trade barriers.

GEOGRAPHIC DISTANCE

Geographic distance is a significant cost driver in international businesses (Ceglowski, 1998: 20). Regarding the strategic space of firms this distinguishes companies by their choice of target markets by dis-

Table 2. Country Advantages of Tunisian Firms

Groupement d'Entreprises Tunisiennes IT (GET IT)

In 2004, nine enterprises from Tunisia founded the common platform GET IT in order to give to foreign customers a global technological offer of Tunisian software and IT service solutions. The companies involved in this project are 3S, Discovery, Hotix, Netcom, Net-Concept, Oxia, Progidec, ST2i and WebOne. The platform is supported by two public key institutions in the ICT sector development: FAMEX at the national level, and FDSP at the international level.

Key target markets are Africa, Europe, and the Middle East. Advantages of Tunisian firms in these markets towards international competitors are geographic proximity, proximity in terms of culture and language (GET IT, 2004).

tance. If the height of costs reflects the geographic proximity of a market then distance implies investments. Such investments can present substantial costs and constrain firms in their freedom to move into a market, as it has been acknowledged in a number of reports on export development in the Tunisian software and IT service industry (UNDP and CEPEX, 2004: 26). Larger firms may easily send business people to distant markets in order to explore a market's opportunities while such exploration presents a serious challenge for smaller businesses that do not have the necessary resources to do so (World Bank, 2002: 51).

CULTURAL DISTANCE

Countries have an idiosyncratic cultural heritage that separates them from other nations, while cultural variations within a region are usually much less pronounced than across regional borders. Cultural distance between countries can cause substantial constraints for the activities of international companies (Hofstede, 1980; Hofstede, Pedersen and Hofstede, 2003). It has been shown that such constraints cause costs, referred to as cultural costs, that relate to investments in learning (Kónya, 2002: 6). It is necessary either to learn and to acquire country-specific knowledge, or to make an alternative commitment to offset the cultural distance; both ways present advantages in a specific country (market) towards competitors that can not afford the underlying investments. However, the choice of the regional market implies less effort in learning than a distant market (Chetty and Campbell-Hunt, 2001: 23).

LANGUAGE DISTANCE

Similar to cultural distance, language distance can act as a barrier to international trade which can be reduced by learning (Kónya, 2002: 6). In this context it is important to specify how the impact of a truly common language of trade partners is different from that of linguistic diversity of trade partners including the capabilities to speak 'open-circuit languages' such as English (Mélitz, 1999). Linguistic diversity encourages trade with all foreigners indiscriminately. However, a common tongue promotes businesses with those foreigners with whom communication is especially easy (Mélitz, 2002: 16; Noguer and Siscart, 2003: 10). In terms of differences in firm strategies and strategic implications, companies benefit from two aspects if they choose markets that permit to leverage language commonalities. First, investments in language trainings for international business people might be saved. Second, there is an increased opportunity for communication across a firm's whole organization since everybody speaks the same language.

UTILIZATION OF INPUT FACTORS

According to Dranove et al. (1998: 1035), the influence of environmental input factors on strategic group formation and vice-versa the control of strategic groups over such inputs cannot be overestimated.

The behavioral and structural posture of groups can be crucially shaped by scarce environmental resources and imperfectly competitive factor markets.

Lanvin (2003) outlined a comprehensive set of crucial factors promoting and hindering ICT business development in a country. Compatible taxonomies adapted to Tunisia and the Maghreb region confirm the following three factor categories (Raffa et al., 2002: 334; Neumann, 2005):

- ICT infrastructure: availability and quality of access to communication networks, sophisticated communication services;
- Human resources: availability of scientists and engineers, quality of higher education, quality of professional training programs;
- Venture capital and finance: availability of venture capital, presence of foreign investors, sophistication of financial services.

Heeks (1999) narrowed down a concept of roadblocks for software and IT service companies that captures these factor markets and specifies the environment-strategy link. Through the clear isolation of such roadblocks, this study responds to the need in strategic group research to concentrate only on those factors that are truly integral to behavioral and structural properties of firms and have a direct strategic impetus (Dranove et al., 1998: 1035).

ICT INFRASTRUCTURE

The communication infrastructure is crucial for the growth of IT, in particular for value added services such as IT outsourcing and e-commerce (UNCTAD, 2003a). Among other fundamental strategic functions of infrastructure for firms, the access and affordability of quality communication networks facilitates the delivery of intangible digital products and services, and supports efficient information flows between companies and their customers (Mann, Eckert and Cleeland-Knight, 2000).

According to the Digital Access Index (DAI), Tunisia is the most advanced country in the Maghreb region in successfully facing the infrastructure development (ITU, 2003). For the period of the Ninth Plan between 1997 and 2001, the Tunisian government invested 1.016 billion US dollars in the ICT infrastructure. The Tenth Plan provides 2.070 billion US dollars to advance this process between 2002 and 2006 (Ministère du Développement et de la Coopération Internationale, 2001: 86-87).

Despite governmental efforts, Tunisia has still a below average position in the global comparison –NRI rank 52 of 82– regarding the average availability and quality of access to communication networks (World Economic Forum, 2003b). The main reason is the heterogeneous proliferation of ICT across different geographic segments. As with many other countries, Tunisia is still working on the densification of its existing telecommunication infrastructure (Dutta and Coury, 2003). Table 3 provides an overview.

Strategic implications on imperfectly competitive markets are hard to derive from the ICT infrastructure. Companies locate their offices in larger cities such as Tunis, Sfax, Sousse, Monastir, Gabès, and Djer-

ba (Chaabouni and Mezghani, 2001: 47). They do not choose locations where they might be affected for example by poor rural network densities. Thus, it is logical to assume that they have equal access to adequate communication networks.

HUMAN RESSOURCES

The national human resources development in Tunisia supports excellent production conditions for software and IT services (Neumann, 2005). Education plays a key role in the governmental development strategy as the international comparison of public spending on education may illustrate—NRI rank 8 of 82 (World Economic Forum, 2003b). For instance, relative expenditures for higher education increased between 1997 and 2003 from 1.27% to 1.80% of gross domestic product (GDP) (Ministère de l'Enseignement Supérieur de la Recherche Scientifique et de la Technologie, 2003). Table 4 shows how technical studies and the generation of technological know-how have been vigorously promoted.

The effort made in the promotion of such studies results in a relatively high international ranking of Tunisia –NRI rank 14 of 82– regarding the availability of university graduates and scientists in the field of ICT. In addition, the high quality of math and science education shows how the

Table 3. ICT Infrastructure Development in Tunisia

Telephony	The number of fixed-line and mobile phone subscribers per 100 inhabitants increased from 6.5 in 1997 to 15 in 2001. Further progress of the network densification can be expected due to the liberalization of the market for mobile communication in 2002 when the monopoly of Tunisie Télécom (TUNTEL) has been broken and a second mobile provider Orascom Télécom Tunisie (TUNISIANA) entered the market. The costs of mobile telephony are declining constantly and the number of mobile phone subscribers is increasing significantly. In 2002 there were 400,000 subscribers and by 2006 the government estimates up to 3,000,000 users (Ministère du Développement et de la Coopération Internationale, 2001).
Internet	Regarding the Internet, Tunisia plays a pioneer role for the region. In 1991, it was the first country connected to the Internet in Africa and the Arab world (ITU, 2002). Nevertheless, the international comparison shows that the competition in the ISP sector is still rather low—GCI rank 62 of 80 (World Economic Forum, 2003a). Consequently, the level of prices is still relatively high, there is poor pressure on ISPs to improve their technological basis, and the variety of services available to individuals and businesses is rather limited compared to other countries.

Table 4. Number of Students in ICT Related Studies

Year	1997	1998	1999	2000	2001	2002	2003
Students	3,534	6,995	9,995	11,729	18,288	23,071	30,260

Source: Ministère de l'Enseignement Supérieur de la Recherche Scientifique et de la Technologie (2003)

ICT education system fulfills both qualitative and quantitative requirements—NRI rank 6 of 82 (World Economic Forum, 2003b).

In international competition in the field of software and IT services much depends also on the affordability of qualified human resources because the share of cost for personnel can be up to 80% in total production cost of software (FIPA, 2002: 23). Table 5 illustrates the factor cost in the international comparison of several essential production factors, including human resources. Consequently, firms in Tunisia can draw on relatively favorable cost conditions which also reflect their stage of economic development since Tunisia is classified as low income country with a GDP per capita of 6,769 US dollar (World Economic Forum, 2003a).

The national human resources development effectively supports ideal factor conditions for firms in terms of technological expertise. Software and IT service companies as employers do not need to compete for such expertise in Tunisia (Chaabouni and Mezghani, 2001: 49).

VENTURE CAPITAL AND FINANCE

Inefficient capital markets are a serious obstacle for entrepreneurship and investments in the information economy in Maghreb states as with many other developing countries (Raffa et al., 2002: 335). This problem materializes in Tunisia as lack of expertise regarding adequate risk evaluation in both banks and the vast majority of venture capital companies (UNCTAD, 2004: 185). They show in general a preference for investment and financing projects with large enterprises in more traditional Tunisian industries such as textiles, logistics and tourism rather than in software and IT services companies (World Bank, 2002: 64). Table 6 presents two exceptions that are currently operating in Tunisia.

Table 5. Cost of Software Production

Country	Tunisia	Morocco	Poland	Hungary	Czech Republic	France
Cost Rank	1	2	3	4	5	6
Cost Value*	115	129	174	179	213	649

* Cost Value: Labor cost, rent and services, general cost, and finance cost. Cost keys aggregated in US dollar per man-day. Source: FIPA (2002).

Table 6. Exceptions in Tunisia's Venture Capital Landscape

Tuninvest Finance Group (TFG)	Tunis Information Technology Fund (TITF)
TFG is a private venture capital company with investment projects in various industries. It addresses specifically the ICT sector since 1998. Until 2004, seven projects have been carried out in various fields of ICT such as hardware assembly, software development, software integration, software distribution, IT consultancy, and ICT education. A TFG team specialized in ICT businesses accompanies all investments in this field with active management and strategy consultancy since 2000 (www.tuninvest.com).	TITF is a venture capital company which addresses explicitly the ICT sector. It is a public-private sector partnership initiated by the government to promote the ICT sector. TITF was found in 2002 by seven large public and private enterprises in the banking and ICT sector. Six investment projects have been carried out in the field of telecommunication, ICT education, software development, and software integration until 2004 (www.titf.com.tn).

Chaabouni and Mezghani (2001: 50) confirm such market inefficiencies and the resulting obstacle for software and IT service businesses in Tunisia since the availability of venture capital is an important precondition for innovation and business development. Financial and consulting services from banks can be vital input factors in customer projects in this sector; and the larger the projects are the more important such factors become (UNCTAD, 2003b).

The government launched a variety of initiatives in order to resolve underlying market inefficiencies. Facing the disadvantage regarding the weak capitalization of ICT firms, the government established a number of public venture capital funds which take part in joint investment projects in the ICT sector together with private finance institutions (UNCTAD, 2004: 185-186). Table 7 illustrates that the strategic effect of the public initiative goes far beyond the financial aspect since the collaboration of firms with public funds often involves special management consultancy and know-how transfers relating to the specific objective of a fund.

Support in terms of finance is designed to provide firms either with private equity or finance. This implies an indirect impact on strategies since the strategic choice on how to use the means is not pre-determined by the Business Development Support (BDS) program. Moreover, programs can aim at specific strategic objectives with a direct strategic impetus. These objectives are in general supported by the transfer of know-how on the design and implementation of specific business processes to support the strategy (UNCTAD, 2004: 189).

There are also a number of international private and public organizations in the field of ICT in Tunisia. Table 8 shows the strategic impact mainly on learning and know-how including trainings on foreign management practices, language skills, legal and regulatory aspects of international trade.

Table 7. Tunisian Business Development Support

Program	Objective	Assistance	Strategic Impetus
FAMEX.- Fonds d'Accès aux Marchés d'Exportation	Export market access, management consultancy	70% subsidies of cost of export marketing plan; up to 50% of market access cost: marketing, market research, business travels	Know-how, finance
FOPRODEX - Fonds de Promotion et Développement d'Exportation	Export promotion, marketing support, international branding, export market access	15 to 50% subsidies and 30% loan for export marketing efforts including promotion material, registration of trade marks, participation in trade fairs abroad	Know-how, finance
FODEC - Fonds de Développement de la Compétitivité (Mise-à-Niveau)	General competitiveness, technology absorption, quality control systems	10 to 20% subsidies of material investments such as in hardware; 70% subsidies of immaterial investments such as in quality certification	Finance
FOPRODI - Fonds de Promotion et Développement d'Industrie	Project finance for ICT investments across all economic sectors, demand stimulation	Up to 45% public venture capital in joint investment projects; shareholders: FOPRODI, venture capital company, investing company	Finance
FITI - Fonds d'Incitation à l'Innovation dans les Technologies de l'Information	Promotion of investments in technological upgrades, technology absorption in small businesses	Up to 49% public venture capital in joint investment projects; shareholders: FITI, venture capital company, entrepreneur	Finance
RITI - Régime d'Incitation à l'Innovation dans les Technologies de l'Information	Promotion of entrepreneurship in software development, systems development, IT services	Up to 49% public venture capital in joint investment projects; shareholders: RITI, venture capital company, entrepreneur	Finance

The capability of firms to attract foreign direct investments (FDI) can also play a key role in getting around the obstacles for business development regarding the poor provision with finance and capital (Raffa et al., 2002). Foreign participation in Tunisia's software and IT firms' capital is as follows: 6% of the firms are entirely owned by foreign capital and 21% have joint Tunisian and foreign owners (Made IT, 2003).

One explanation to this is in the relatively little size of the average ICT firm in Tunisia and the correspondingly low interest that foreign investors may have in an engagement in such small businesses (World Bank, 2002: 36). Another argument is that forms of inter-firm co-operation as a crucial pre-requisite for spill-overs are poorly developed among software and IT service companies in Tunisia, independent from whether they are fully or partly Tunisian, or subsidiaries of multi-national enterprises (Chaabouni and Mezghani, 2001: 51).

In contrast to the factor conditions regarding ICT infrastructure and availability of technical expertise, venture capital and finance are clearly scarce input factors. The national and international BDS programs compensate this finance roadblock to some extent (Heeks, 1999: 9). Yet, as shown before, the impact of public and public-private initiatives is both financial and non-financial so that companies likely differ significantly in their strategies and performance compared to other firms when they participate in such programs.

CONTROL SYSTEMS

A firm's organizational production function can be thought of as its organizational structure and the skill of its management in employing it efficiently (Porter, 1991; Barney and Arikan, 2001). There is a systematic link from strategic choices to organization structures to an organization's market behavior. On the one hand, this link may be given through the organization's chart assignment of responsibilities and lower level decision makers. On the other hand, how far the behavior of an organization is consistent with strategic choices depends also on an organization's system of measuring and rewarding performance (McGee and Thomas, 1986: 152).

Table 8. International Business Development Support

Program	Objective	Assistance	Strategic Impetus
CLDP - Commercial Law Development Program (United States)	Promotion of international business relationships, preferably to the US	Know-how transfers on key legal issues and trade law, capacity building, learning US management practices	Know-how
MEPI - Middle East Partnership Initiative Tunisia (United States)	Promotion of international business relationships, preferably to the US	Professional training, learning US management practices, language training	Know-how
PSDF - Private Sector Development Fund (Canada)	Promotion entrepreneurship in the private sector, reduction of administrative barriers to business	Capacity building, know-how transfers, management consultancy	Know-how
USAID - Agency for International Development (United States)	Trade facilitation, support of global business networks, promotion of international business relationships	Business matching services, technology transfers, trade lead follow up services, trade financing referrals, and market information	Know-how

Such control mechanisms are important from two different perspectives. Internally, an important skill in any business is the ability to translate strategy into action. This is increasingly difficult in larger or more complex organizations, where the distance between those who formulate the strategy and those who carry it out is significant (Porter, 1996). With size and complexity comes the necessity for communicating strategic intent and for providing a management framework that aligns the capabilities of the business with the requirements of the competitive environment (Kaplan and Norton, 1992). Externally, control systems can be used for communication purposes towards customers. Therefore, quality standards play a key role for firms in image and trust building with customers (Magee and Tripp, 1997). In the field of software and IT service businesses, the implementation of such standards ties together this internal and external function (Li and Gao, 2003). This crucially shapes a firm's organization in technical and non-technical management linked in interdependent control and leadership mechanisms in software engineering processes (Shoemaker and Jovanovic, 2002). Both the internal and external perspectives have important strategic implications that require some further specification.

QUALITY CONTROL SYSTEMS

There is an increasing awareness of software and IT service companies in developing economies for quality standards. Such standards are essential success factors to approach customers in international markets especially in developed countries (Raffa et al., 2002). In general it is argued that the accreditation by an independent certification body shows commitment to quality, customer needs, and to working towards improving efficiency (Li and Gao, 2003). This demonstrates the existence of an effective quality management system that satisfies the rigors of an independent, external audit. Therefore, the quality certification effectively supports a better company image and gives a competitive edge to an organization's marketing (Magee and Tripp, 1997). It is important to note, as engineering processes and technologies change, so do industry standards and specifications in the field of software and IT services. Therefore, there is a variety of standards that differ in a variety of aspects such as the process area they are applied on, scope and purpose, complexity and size of solutions, originating committee and issuing organization (Caputo, 1998).

Table 9 presents three of the more established international quality standards and illustrates the internal control function for each standard. These are also the most frequently employed certifications in Tunisia's software and IT service industry.

The implementation of these quality standards requires costly investments. First, the certification bodies need to be paid. Second, the organizational realignment of control and leadership mechanisms presents at least some effort in terms of human and financial resources. Hence, companies that implement such quality control systems differ from others in structural and organizational characteristics. The strategic intent towards an improved image and trust building with customers presents the behavioral reference of such system.

Notably, the latter function, related to the organizational realignment, is also a key development goal of export-related BDS programs in Tunisia. Among other smaller and larger investments, companies have been using the public means in order to acquire a costly quality certification in order to support a better image for quality in international markets (UNCTAD, 2004: 200). This may indicate a distorting side-effect of BDS in the competition within the local software and IT service industry. Of course, export-related BDS programs may preferably support the most promising export candidates. These companies then have access to subsidies in order to obtain the quality certification. Whereas, most firms still realize a large extent of their turnover at home. Consequently, companies that only produce for the Tunisian markets may find it harder to compete with quality-certified companies that benefit from such subsidies since the certificate may not only appeal to customers abroad but to those in the domestic market.

STRATEGY IMPLEMENTATION

In terms of pure strategy formation, one can construct a sequence of implementation levels reaching from strategy formation and the definition of a vision, to related incentive systems, to resource allocation, to strategy-guided operational planning, to review and organizational realignment (Kaplan and Norton, 1992). In other words, strategic planning and strategy implementation require a consistent organizational linkage. Consequently, the more consistent a company informs, aligns, controls and rewards its organization the more sophisticated and effective is the strategy implementation (Hambrick and Snow, 1989).

Such organizational characteristics of strategy formation can become essential success factors the more complex businesses become

Table 9. International Quality Standards in Tunisia's Software and IT Service Industry

CMM	CMM is a model of process maturity for software development. The standard was created in 1986 by the U.S. Software Engineering Institute in cooperation with the Mitre Corporation. The key concept of CMM is organizational maturity that implies clearly defined procedures for software development and project management. CMM defines five levels of organizational maturity: initial level, repeatable level, defined level, managed level, optimizing level.
ISO 9001	ISO 9001 is an internationally recognized series of standards for the quality management of businesses created in 1987. It provides a common worldwide set of quality system guidelines and requirements. It applies to the processes that create and control the products and services that an organization supplies. Companies are supposed to implement a quality management system covering the design, development, quality assurance, testing, and release procedures of software products to be certified. ISO 9001 was modified in 1994 and 2000.
ISO/IEC 12207	ISO/IEC 12207 is an international standard for software life cycle processes. It was developed in 1995 in collaboration with IEC. The standard presents a common framework for a firm's activities and tasks by processes and groups. In 2001, an amendment was made that fixed certain defects and added additional appendices providing a process reference model.

Note: CMM: Capability Maturity Model; ISO: International Organization for Standardization; IEC: International Electrotechnical Commission.

(Porter, 1996). Hence, diversified companies are likely forced to pay more attention to strategy than other more specialized firms need to do. Whereas, diversification has implications on complexity within all areas of a firm's activities including for instance product lines, market segments and the choice of international markets in number and distance.

The potential to distinguish strategic groups exists due to the cost and time to organizationally implement a consistent strategy implementation process which includes several systems relating to organizational performance measurement, reward mechanisms etc. Furthermore, strategy implies certain managerial skills to develop a strategy which extends the primarily structural organizational issue to a structural and behavioral construct.

EMPIRICAL EVIDENCE

The strategic space as outlined above covers a complex set of strategy variables to be integrated into an analytical model. As mentioned before, due to lacking prior empirical and theoretical evidence for the strategy-performance link at the group-level in Tunisia's software and IT service industry, a number of evident but not sufficiently tested features of the strategic space can not be included in this study in favor of the gradual adaptation of the known strategic space to the industry context. Consequently, the analysis follows Hatten and Hatten (1987) and does not primarily imply any performance effects relating to group-membership or mobility barriers. Eleven variables are included in the final framework. Furthermore, there are three different performance measures and one market growth estimate. The following sections present the specifications of the sample population, the data collection, and the analytical methodology.

SAMPLE

The necessary firm-level data were obtained from a survey with 49 of 274 companies in the Tunisian software and IT service sector. This was carried out by the Electronic Commerce Branch (ECB) of the United Nations Conference on Trade and Development (UNCTAD) in Geneva, Switzerland in 2004.

The clear size of the sector made it possible to include all firms in the sample without limiting the choice by any sampling technique. According to the Tunisian ministry of finance (Ministère des Finances), the overall turnover of the sector increased continuously from 24 million US dollar in 1997 to 85 million US dollar in 1999. After this period of steady growth, the turnover fluctuated between 60 and 86 million US dollar during 2000-2002. Tunisia has been exporter of software and IT services since 1999. The exports grew from 15 million US dollar in 1999 to 29 million US dollars, when at the same time the overall turnover of the sector declined. Subsequently, the export turnover fluctuated between 18 million US dollar in 2001 and 26 million US dollar in 2002.

The 49 companies that eventually participated in the survey generate an overall turnover of 28 million US dollar including 7 million US dollar related to exports in 2003. Although the final sample covers 18 per cent of the whole population, it shows an overrepresentation of larger firms. For instance, according to the Tunisian business association of software and IT service companies (Chambre Nationale Syndicale des Sociétés de Services et d'Ingénierie Informatique—CNS SSII), 84% of these firms have less than 10 employees in 2004. This applies only to 53% in the final sample of this study.

DATA COLLECTION AND MEASUREMENT

The firm-level data was obtained from a questionnaire distributed by the Tunisian ministry of telecommunication technologies and transports (Ministère des Technologies de la Communication et du Transport) to all of the 274 software and IT service companies. The questionnaire was sent together with a letter from UNCTAD, explaining the nature and significance of the proposed research. Responses were collected by ECB via email, fax, and on the telephone.

The indicators developed on basis of the survey data reflect all strategic dimensions discussed above. While most indicators are rather simple and could be derived directly from the available data, the multi-dimensional character of the geographic coverage as discussed above required a more advanced construction technique for illustrative purposes and statistical testing.

A separate taxonomy that emphasizes the strategic meaning of a specific market choice necessarily reflects strategic country-specific investments of firms. Available data on the impediments in international trade as discussed above provide eligible proxies for a quantification of such market differences in a multi-dimensional market distance indicator. The dimensions included in the calculation are culture distance (*#CDIST*), language distance (*#LDIST*) and geographic distance (*#GDIST*) from Tunisia to each country, referred to as target market. Culture data are taken from Hofstede's (*YEAR*) database of cultural dimensions. Language and geography data are obtained from the geodesic distances database of the Centre d'Études Prospectives et d'Informations Internationales. The geographic distance measure between Tunisia and other countries includes city-level data to assess the geographic distribution of population inside each nation (Gaulier, Mayer and Zignago, 2003). Culture distance from Tunisia as ordinal reference point to other countries was calculated by Euclidean distance along four sub-indicators per country according to Hofstede's (1980) *four classical dimensions*: power distance, individualism, masculinity, uncertainty avoidance. Even though neither the cost of culture in trade nor the culture-strategy link can be ultimately quantified through these dimensions, they reflect investments that present a company's relative need for cultural learning compared to other competitors. Furthermore, another indicator was recently added to this framework by Hofstede et al. (2003) on long-term orientation. This was not applicable due to the incomplete dataset on the countries included

