

Taxonomy of New Software Exporting Nations

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ABSTRACT

In recent years dozens of nations have begun exporting software products and services. We label these nations the “new software exporting nations”. We introduce a four-tier taxonomy of software exporting nations. Thresholds for the tiers are defined by export revenues, by cluster size, and by maturity. Tier 1 nations are the major software exporting nations; Tier 2 nations are the transition software exporting nations (China and Russia); Tier 3 nations are the emerging software exporting nations (e.g., Brazil, Bulgaria); and Tier 4 nations are the infant stage software exporting nations (e.g., Vietnam, Cuba).

1. INTRODUCTION

High-tech exporting used to “belong” to the leading OECD countries (the most advanced economies) (Porter et al., 2001). The US is the “hegemonic” power in software argued Carmel (1997). This balance of power in software¹ is changing, however. Dozens of national industries from Brazil to the Philippines are now exporting software products and services. These nations are newly-industrialized economies, transition economies, or developing economies. We label these the “new” software exporting nations.

This phenomenon – of the globalization of software development -- has been of interest since the early 1990s (Jones, 1994; Press, 1993) and later (Heeks, 1999). As the extent of globalization grew and more nations entered the marketplace, some observers began to group and classify software exporting nations. The most pervasive grouping was to combine the three most successful new software exporting nations of the 1990s – India, Ireland, and Israel—which conveniently were labeled the “three I’s”. The second rising group of nations was China, Russia, and the Philippines (Steen, 1998). More recently industry researchers have begun expanding these tiers even further (Overby, 2002). Heeks and Nicholson (2002) present two tiers in their analysis of software exporting nations. Madon and Bhatnagar (1997) take a somewhat related approach, describing nations as going through 4 stages of maturity transitioning from building skills and reputation, to building services, to building products.²

At this historical stage, with so many new entrants, creating a taxonomy of software exporting nations is useful for comparative and benchmark analyses. Such analyses are needed for theoretical as well as policy-making purposes: to analyze the national impacts (both benefits and downsides) of these industries on their own economies (Carmel 2003a, this volume) and to discuss the success factors that lead to a successful export industry (Carmel 2003b, this volume).

The 4-Tier taxonomy³ presented here is more comprehensive and rigorous in a number of respects than those tiers described above. First, the tiers do not stop at just two, but

¹ By software we mean both software services (sometimes referred to as offshore outsourcing), software products, and embedded software. We stress that software covers a wide range of activity and complexity: from routine, structured programming tasks to higher level, innovative software tasks, usually referred to as R&D.

² This maturity model is descriptive of India and a few other developing nations. But, nations advance in their competitive software sectors via many paths.

³ This taxonomy is an extension of Carmel (forthcoming).

range from the most successful nations (e.g., the US) to those that play smaller roles - Tiers 3 and 4. This is important because almost all the new software exporting nations fall into these lower tiers. Second, the thresholds for the tiers are defined. Finally, the taxonomy classifies the “three Is”- which are by now well established software exporting nations - as Tier 1 nations.

2. THE 4-TIER TAXONOMY

We first define the thresholds between the tiers, and then expand the discussion of each of the tiers.

	Maturity	Cluster / Critical Mass (Num. of organizations)	Export Revenues (US\$)
Tier 1	> 15 years	Hundreds	> \$1 billion
Tier 2	> 10 years	100	> \$200 million
Tier 3	> 5 years	Tens	> \$25 million

Table 1: Thresholds of the tiers in the taxonomy.

The thresholds/boundaries between each of the tiers are based on three criteria: maturity, clustering, and export revenues (Table 1 quantifies the tier boundaries; the taxonomy details appear in Table 2). Maturity refers to the number of years that the nation’s firms are exporting (a significant number of firms should be exporting for that period, not just two or three). In a deeper sense, maturity connotes the *tradition* of exporting software from the nation. Clustering refers to the critical mass of enterprises participating in the software export industry. In addition, clustering assumes a maturing agglomeration of secondary services, such as marketing consultants to aid local firms in foreign market penetration. Finally, the notion of a maturing cluster suggests that at least some firms are clustering around an identifiable market niche.

The third threshold, export revenues, are those revenues from products and services. This is the magnitude of national software exports, measured here in millions of US dollars. For example, three of the country analysis articles in this volume report such figures: \$9 million for Viet Nam (Chidamber, 2003, this volume); \$30 million for Indonesia (Bruell, 2003, this volume); and \$65-70 million for Ukraine (Gengler, 2003, this volume). These figures merit some commentary. While some nations, such as India, collect and publish these statistics regularly, in many nations these data are either difficult to find or unavailable. (It is beyond the scope of this paper to locate the software exports magnitudes of all the new software exporting nations). Some Tier 3 and Tier 4 nations are just beginning to collect data and make industry estimates. Another important complication is that these data are prone to exaggeration. It is in the interest of all national parties - governments, industry associations, foreign assistance groups - to inflate the export revenues of their industries.

The thresholds, though quantified, should be viewed as fuzzy boundaries. Purposefully, no definition is given here that states how many of the quantitative thresholds a nation must exceed in order to advance to the next tier (one? two? or all three?). Finally, the thresholds will continue to change and evolve in the coming years as the global software industry continues to expand and transform.

	Label	Nations
Tier 1	Major software exporting nations	Mostly OECD nations such as: USA, Canada, UK, Germany, France, Belgium, Netherlands, Sweden, Finland, Japan. Switzerland, Australia. Includes entrants from the 1990s: Ireland, Israel and India.
Tier 2	Transition software exporting nations	Only Russia and China
Tier 3	Emerging software exporting nations	Brazil, Costa Rica, Mexico, Philippines, Malaysia, Sri Lanka, Korea, Pakistan, Romania, Bulgaria, Ukraine, Poland, Czech Republic, Hungary, others. (Note ⁴)
Tier 4	Infant stage software exporting nations	Cuba, El Salvador, Jordan, Egypt, Bangladesh, Vietnam, Indonesia, Bangladesh, Iran, others. (Note ⁵)
Non-Competing	Non-Competing	Most of the (smaller, least developed) countries of the world. (Note ⁶)

Table 2: The 4-tier taxonomy of the world's software exporting nations.

Tier 1 nations are the *Major Software Exporting Nations*. These nations have a tradition of exporting high tech and software products and services. The traditional software exporting nations have been the advanced industrialized economies. Until quite recently close to 100% of tradeable software products and services came from G-7 nations. In particular the USA (with Microsoft and IBM) dominated world markets (Carmel, 1997). Japan, Great Britain, Germany, France, and Canada all have had successful software (and computer hardware) industries over many decades. Italy, by comparison, has never had a strong software sector for an economy of its size. Several other advanced industrialized economies have been successful in software: The Netherlands, Sweden and Finland, in particular, have strong software export sectors. Other advanced economies' industries have also had moderate success: Australia, Spain, Belgium, and the other Nordic countries.

The new member nations of Tier 1 are the celebrated cases of the three "T's": Israel (Kaplan, 1998), India (Moitra, 2001), and Ireland (Borrell, 2002). Each of these nations has established itself, in very different form, as a major software exporting nation: India in offshore programming, Israel as an incubator of software products, and Ireland in programming services & localization services.

Tier 2 nations are the *Transition Software Exporting Nations* which include two particular cases – China (Ju, 2001), and Russia (American Chamber of Commerce report, 2001; Terekhov, 2001). These large, rapidly maturing national industries are likely to export

⁴ Several other nations are likely to be in Tier 3: Estonia, Latvia, Lithuania, Slovenia, Chile, Argentina, Thailand, South Africa.

⁵ Another 10-20 nations are likely to be in this tier though data are not available.

⁶ Non-competing nations in software exports include many of the least developed nations. These include most African nations (e.g., Gambia, Nigeria, Mozambique) and many of the least developed nations in America (e.g., Bolivia, Paraguay) and Asia (e.g., Syria, Afghanistan, Laos).

\$1 billion in software by 2010 and move into Tier 1. The most recent software export estimates are \$350 million for Russia in 2002 (Makarov, 2003) and somewhere between \$400 million to \$600 million for China in 2001-2002 (Joseph, 2002). The missing factors for these industries are maturity and size. Embedded in the notion of maturity are the weakness in these nations firms relative to those in Tier 1 nations: in software management, quality management, and marketing.

Tier 3 nations are the *Emerging Software Exporting Nations*. These nations already have significant software export industries (most are in the \$25-\$200 million range). They also have one or more small geographic *clusters* of successful enterprises SMEs (small and medium-sized enterprises), with a few large enterprises in a limited number of Tier 3 nations. These enterprises of various sizes may be software subsidiaries of multinational enterprises, or home-grown, independent software firms.

Many Tier 3 nations are unlikely to move to Tier 2 because of their small size (which restricts their ability to grow large industries) and other unfavorable conditions (political instability, stage of economic development, etc.). At the same time the larger Tier 3 nations, such as Brazil, Mexico, Korea, and the Philippines, may break away to create a new second tier by 2010. (It is premature to define thresholds for a 2010 taxonomy at this time of writing). These are the larger nations that possess the wealth and base of educated human capital that is needed for growth (success factors are discussed in Carmel, 2003b, this volume). Mexico currently exports only software services and has not positioned itself as a major destination with the exception of some activity by IBM, GE, and several others (Dedrick et al., 2001). Brazil has a more substantial software sector and exports a mix of services and packages estimated in 1998 at \$40 million (Tigre and Botelho, 2001), and probably much larger today.

Tier 4 nations are *Infant Stage Software Exporting Nations*. These nations have little impact on the global market in software. While there is some foreign investment in a number of these nations' firms, it is rare. Much of the software industry in these nations is still a cottage industry: firms are small, managerial processes are informal, and marketing is immature. Most Tier 4 nations are unlikely to move to Tier 3 because of their small size (which restricts their ability to grow large industries) and other unfavorable conditions (political instability, stage of economic development, etc.). However, many Tier 4 national industries have benefited from some recent governmental attention focused, specifically, on the software exporting sector.

Finally, most of the 200 nations of the world are *Non-competing nations*. These nations have *few to no* software exporting firms to speak of.

3. ASSESSING THE FUTURE FOR NEW SOFTWARE EXPORTING NATIONS

The software export industries in the 3rd and 4th tiers face a difficult challenge. Most of these national industries are selling commodity skills in programming (e.g., experience with platform X or programming language Y) with little national specialization and differentiation. Most of these nations currently compete in global markets predominately based on their relatively low wages. Finally, many of these nations are competing in the services market on project-based contracts which can easily shift to other nations. Yet, it is quite possible that a few firms from these 3rd and 4th tier nations will catapult to join the select group of the first tier of global software firms, e.g., SAP (Germany), Microsoft (USA), and Tata Consultancy Services (India). At this time of writing, the remarkably successful Indian software export industry represents just 2% of the global software services industry. There is still much possibility for growth.

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