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Ukraine and Success Criteria for the Software Exports Industry

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Abstract

The need to reduce the costs associated with software development and the subsequent shift to offshore locations, where labor rates are lower, is nothing new. Due to the success of such countries as Ireland, Israel and India, many other nations are looking to also capitalize on their low-cost, highly educated human resources. Using the success criteria developed by Heeks and Nicholson (2002), with its adaptation by Carmel (2003), this paper analyzes one such country, Ukraine. As part of the examination, direct observation, structured interviews and document review were used. Having the strengths of its human capital and an embedded research and development structure, the paper defines areas where Ukraine needs to improve. Areas discussed are: technological infrastructure (specifically data connectivity), financial infrastructure weaknesses, and the lack of a comprehensive national vision and strategy. Recommendations are given for activities Ukraine can undertake to develop its software exports industry, as well as suggestions for the Ukrainian firms competing in this industry. The paper is not intended to correlate how Ukraine's current software exports position affects the success or failure of individual IT services projects or the licensing of technology from Ukraine.

1. INTRODUCTION

Due to the success achieved by India in the software exports market, $8 billion for 2002 and an expected $10 billion for 2003 according to Sibabrata Das (2003), many countries are interested in grabbing a piece of the offshore outsourcing pie. According to the Ukrainian Association of Software Developers (UASWD, 2002), Ukraine's software exports market for 2002 will be approximately $65 -$70 million. That represents .8% of the entire offshore outsourcing market. In comparison to the big offshore powerhouse of India and more traditional locations such as Ireland and Israel, Ukraine is not even a blip on the screen.

This paper focuses on the broader term of the software exports market which refers to both the export of services (both IT services and IT enabled[1]) and products. The intent of this paper is to answer the question, why isn't Ukraine stronger in the software exports market? Ukraine is measured against an accepted model of success factors required for the development of a software exports industry. First an overview is presented of the success factors. Then Ukraine's current position in each factor is defined. The paper ends with conclusions on where Ukraine has been successful and suggestions for change.

2. BACKGROUND

2.1 Critical Success Factors in Software Exports

Heeks and Nicholson (2002) define success factors that a country must cultivate in order to grow their own software exports industry to a level similar to that of the Tier 1 countries. The benchmark for developing this set of criteria, was an analysis of the Tier 1 nations in software exports; India, Israel and Ireland. The success factors are listed in Table 1: Critical Success Factors in Software Exports.

[1] IT enabled services refers to call centers, data entry services, etc.

Demand
National Vision and Strategy
International Linkages and Trust
Software Industry Characteristics
Domestic Input Factors/Infrastructure People Technology Finance Research and Development Other (certification, etc.)

Table 1: Critical Success Factors in Software Exports

Heeks and Nicholson (2002) measure Tier 2 countries; Russia, China, and the Philippines, against this criteria. Carmel (2003) takes this a step further by using the same criteria to assess Tier 3 and Tier 4 nations. This assessment is done as a collective for all countries falling within those tiers. By definition, Ukraine would be a Tier 3 country which is defined as having significant software export industries ($20-$50 million range) and a small *cluster* of successful organizations.

2.2 Ukraine Overview

Roughly the size of Texas, but with more than twice the population at approximately 49 million, Ukraine is located in Eastern Europe. Poland, Slovakia, Romania, and Moldova border to the west, Belarus to the north, Russia to the east, and the Black Sea to the south. It has a 1-2 hour time difference with the rest of Europe and some 2-3 hours in air travel time to any major European city. It is the second largest country in Europe, by area, and the fifth largest by population.[2] According to the World Bank Group (2003), Ukraine has a 99.6% literacy rate as of 2001. The capital city is Kyiv, with a population of approximately 3 million people. Ukraine has several cities over or close to one million in population. As in many countries, the major tech centers are located around the centers of population and education; Kyiv, Kharkiv – in the east, Donetsk, Dnipropetrovsk and Zaporishnye in the southeast, Lviv in the west and Odessa in the south. High-tech companies, however, can be found anywhere that several programmers can gather. Beskyd, a company that virtually owns the front-end banking software market in Ukraine, is located in the Western Ukrainian town of Kalush. Located in the eastern Carpathians near Ivano-Frankivsk, Kalush has a population of approximately 50,000 people.

Since achieving Independence at the end of 1991, Ukraine has lost 3 million in population, a -0.05% population growth (Populations, 2003). Today's population is at the level of 1976. Population.com predicts that if this negative growth continues, the population will decrease to 39 million by 2050.

GDP growth in 2001 was 9.1%, but slowed to 4.1% in 2002, according to Zinets (2003). While this represents a significant reduction, it is still ahead of many developed nations for the same time period. At this time there are few large software development shops in Ukraine, AmCham (2002). The majority of companies have between 20 and 50 persons, with only a few firms having 250+ persons and many others that are five persons or less. Many companies started out as product companies on the domestic market, before moving into software exports at a later date. Perhaps once it was seen as an additional revenue stream

[2] This takes into account only those countries wholly located in Europe, excluding countries such as Russia and Turkey which are located in both Europe and Asia.

by the owners and investors. Unlike its eastern neighbor, Russia, which has attracted development centers for Intel, Sun Microsystems, etc., multi-national software development operations in Ukraine are limited at this time. Motorola, through its company, Information Software Systems (ISS), is a notable example (AmCham, 2002).

According to Kamins (2002), The Ukrainian Association of Software Developers (UASWD) estimates that there were 1,400 software development companies in Ukraine as of June 2002. The exact split between those working in the software exports market versus those working on the domestic market only and the split between those in services versus product is not tracked accurately today.

3. METHODOLOGY

This paper uses analysis of company case studies and interviews with educational resources drawn from direct fieldwork and writings on Ukraine, and from secondary sources. Interviews at the educational institutions were conducted between December 2001 and September 2002. Interviews with Vimas Technologies were conducted on site in Ukraine in September 2002 and December 2002, with additional questions asked and information provided via email over the following several months. Interviews with Beskyd were conducted in June 2002. Interviews with Raytown Corporation were conducted in January 2003. Phone conversations and email exchanges were conducted with the Ukrainian Association of Software Developers, the Foreign Commercial office of the US Embassy in Ukraine and ANCOR, an HR and search firm in Kyiv. Where appropriate, exactly how statistics were calculated is defined.

4. UKRAINE AND THE CRITICAL SUCCESS FACTORS

4.1 Demand

Demand, as defined by Heeks and Nicholson (2002), refers to both domestic demand and international demand for the industry's products and services. According to Heeks and Nicholson, the presence of strong international demand can be considered a given for all countries, irregardless of tier. This is a result of the double-digit growth of the global IT services industry. A report issued in February 2003, by Giga Information Group, states that outsourcing to India will grow by 25% this year because of what Giga calls the "incomparable quality and cost benefits" offered by the country, McDougall (2003). Almost every major outsourcing deal struck this year between businesses and service providers such as IBM Global Services and EDS will involve an offshore component, Giga's report states. International demand for Ukraine's products and services or its software exports market is estimated to be $70 million for 2002, with an estimated growth rate of 15%-20% annually. Some experts estimate that annual revenues generated by this industry may be as high as $100 million (Companion 2002). The difference in the estimates can be explained by the fact that many producers work mostly alone or in small groups on outsourced project. These projects are ordered from abroad and the money is then transferred abroad.

Ukrainian domestic demand for 2002, is estimated to be $70 million, up from $40 million in 2001. According to Carmel (2003), most Tier 3 and Tier 4 nations have little domestic demand. If the domestic demand is too strong, the country will not have enough resources to pursue the external market and if it is too weak, the resources will not be qualified to fulfill the external market demand. Certainly the size of the Ukrainian domestic market reflects a low-level of demand. However, demand within specific industries for IT services and products is gaining momentum. The wholesale and retail industries are growing fast with demand for both product and IT services. According to Igor Guryanov, Technical Director of Vimas Technologies, many of the clients in these industries have foreign

investors.[3] Working with multi-national enterprises (MNE) in the domestic market assists local companies in developing their process and technical skills to meet multi-national requirements. On the one hand, skill development may be tempered by the reduced requirements a MNE may have in an emerging market and/or the client's use of local managers to implement these projects. On the other hand, working with MNEs and even with local clients, who may not have extremely sophisticated knowledge of the use of IT applications, can put local IT services companies in the position of fulfilling work over the entire value-chain for their clients. As opposed to being limited to coding only, as is sometimes the case with international outsourcing projects, MNE projects additionally provide experience in the procurement process as well as integration and implementation of international packages (SAP, Oracle applications, MFG/PRO, etc.). Invaluable experience can also be gained in working with companies which have some foreign capital but have limited foreign management or local management only. In this case, for those IT services companies which are ready, they can step up and gain be a valuable partner for their clients.

It is thought that domestic demand takes capacity away from international demand. If it is too high, it will absorb all of the annual graduates in order to satisfy that demand. In Ukraine's case it is a question as to whether or not internal demand can swallow up all of the qualified graduates. At this point it cannot. Unofficial estimates indicate that the software exports market employs between 10,000-15,000 people. As will be discussed below under 'human capital', Ukraine produces an estimated 7000+ software development capable graduates, annually.

4.2 National Vision and Strategy

National Vision and Strategy looks at the government's role in developing its software exports industry. Does the government see the industry as important? Has it developed the legal and regulatory environment in support of the industry? Are education and the infrastructure being supported? The question is: where is there evidence that the Ukrainian government has been encouraging the development of the software exports market? The IT services market, for example, represents significantly less than 1% of Ukraine's GDP, which can explain the current limited push for software related industries. However, the government is undertaking several steps which can be viewed as examples of their support: Fostering scientific development; push for WTO accession; IPR initiatives and raising awareness of intellectual property; development and support of Investment activities.

The Ukrainian government has shown and expressed its concern about the drain of talent from the country. Since the breakup of the Soviet Union, money has not flowed into the many research and development centers as it once used to. In support of R&D, the government does still make it a point to budget money to be made available to those engaging in R&D efforts, albeit a small part of the budget. For example, in 2001, the Complex Systems Modeling department at Schevchenko University in Kyiv, won several grants to develop such products as:

- Computer Image Creation, which involves taking a picture of a person and then animating it. Similar software does exist, but their goal is compression optimization of the sound and images, while still maintaining quality.
- Video Image Recognition to recognize images of people and any other determined objects by classifications. An example is enabling recognition of a person's face after it has been scanned. An application the Ukrainian government may use this in is a

[3] Interview with author. December 10, 2002.

videophone. Instead of transferring a video image, the phone will transfer several data packets that will be reproduced on the screen as a speaking face.

- Synthesizing the Ukrainian Language (Software which enables the voice synthesizing of the Ukrainian language). Currently programs exist to synthesize email written in English or text messages (Short message service – SMS) sent in English, or even Russian, however, no program exists yet to synthesize the Ukrainian language.

At the forefront now in Ukraine is accession to the WTO, a process which has been in the works for the last nine years. As of late February 2003, Ukraine is in discussions with the WTO on its accession plan. In order to accede to the WTO, a certain level of Intellectual Property Rights (IPR) protection is needed, this is known as TRIPS (Trade related aspects of Intellectual Property rights). The US has pushed Ukraine to enforce its IPR laws specifically related to the printing of CDs and unauthorized copying of copyrighted material. To force the issue, the US imposed sanctions and cut back on aid. Other government activities related to IPR have included: the creation of a registry of all independent software vendors and distributors in Ukraine. The registry enables buyers, including the government, to know who is authorized to sell products in Ukraine. It also includes educational resources on intellectual property. The government engages in raising public awareness about intellectual property issues. An example of this would be the very public shutting down of internet cafes in Kyiv, for not having licensed software on their workstations. Companies such as Microsoft, Intel, Lucent and Oracle continually engage in discussions with the government and assist with ways to improve IPR laws and their enforcement.

Improvement of the investment climate in Ukraine has been discussed at the government's own accord and at the urging of foreign governments. In July 2001, Ukrainian President Kuchma signed a decree, "Program on Development of Investment Activity in Ukraine in 2002-2010". It states the government's intent to further improve the investment climate in Ukraine. Part of this decree included improvements to attract investment for the development of techno-parks and business incubators. According to Kamins (2002), high levels of emigration among qualified programmers as well as controversial Ukrainian legislation and oppressive taxes have delayed development of legitimate software techno-parks in Ukraine.

A final related national vision question has to be asked: do firms working in Ukraine feel that government assistance is needed? The answer may be demonstrated by the number of companies which actually belong to and support organizations which want to assist them and the development of the high-tech industry. The U.S.-Ukraine Digital Alliance (USUDA) is a newer organization established in June of 2002 at the First Annual U.S.-Ukraine IT Conference which took place at the Ukrainian embassy in Washington. USUDA currently has six members. Among its tenets includes working with both Ukrainian and American legislators to remove existing barriers hindering Hi-Tech industry development and cooperation. USUDA has established contacts with the Congressional Ukrainian Caucus, and members of the Verkhovna Rada's (Parliament's) subcommittees, that are involved in legislation affecting the IT industry. The Alliance is committed to assuring that the voice of the IT community is heard by the policy makers in both countries. Another organization supporting the high-tech industry is the Ukrainian Association of Software Developers (UASWD) which currently has ten member companies. UASWD is focused on promoting policies and conducting programs to enhance technology and market growth for its members as well as for the entire industry. Over the last few years, UASWD has been the link between the developer community and the Ukrainian government, using its membership and wide reach to gain feedback on proposed government initiatives. As mentioned earlier, UASWD tracks 1400 companies competing in the software development industry. Two organizations

with six and ten members respectively, albeit the largest and most influential companies, is not representative of the market.

Culture may also be a factor to consider. Under the Soviet Union, there was all encompassing government involvement and control in all aspects of business. Now there is a desire, by business persons, to go 180 degrees in the opposite direction towards wanting no government involvement in business.

Attempts have been made over the last 2-3 years, by groups within the government, to push for changes and support the high-tech industry. Each time, company participation and assistance has been requested, and each time the efforts have fallen apart. Approximately two years ago, a group of 19 Ukrainian deputies, who called themselves the New Society, were focused on reducing the brain drain and on developing the high-tech industry. They focused on such issues as: reduction in profit taxes and a reduction in payroll taxes, which the government has been vocally opposed to in the past. However the efforts of the group fell apart when some of the deputies did not get reelected in the last Parliamentary elections (March 2002). More recently another government request for assistance has been received by companies participating in the industry. The result of this latest effort, and the level of participation that can be garnered from companies, remains to be seen.

National Branding is missing in Ukraine and there is a concern that Ukraine will continue to lose out to its more well-known neighbor, Russia and other Eastern European countries which are seen as more stable. Slogans cannot make up for a stable environment or for a national vision for the future of the software exports market; however, attempts have been made to unite behind a slogan, in an attempt to "brand" the country. A national slogan was developed by the IT committee of the American Chamber of Commerce; it was first used at a presentation given by the IT committee at the EnterEx exhibition held in Kyiv in February 2002: "The Breadbasket of Technology". The slogan is a play on words from the time that Ukraine was considered the Breadbasket of the Soviet Union, known for agricultural output. It is an attempt to have Ukraine thought of in a different manner and put its high-tech capabilities to the forefront. Any type of slogan or promotion of Ukraine would have to be more widespread and get more backing behind it. It should also be in conjunction with the focus or specialization of the country.

4.3 International Linkages and Trust:

Heeks and Nicholson (2002) describe the necessity of linkages for the sale of exports. The linkages give the necessary access to markets and therefore customers and sales. The Tier 1 players have demonstrated that the diaspora has played a vital role[4]. Lane (2002) also mentions the role the diaspora has played in establishing linkages and providing those first sales. Ukrainian firms also take advantage of diaspora contacts to gain initial sales contacts and to act as representatives of the firm abroad. Everyone in Ukraine knows a family member and/or fellow student or colleague who has moved to the US, Canada or to a Western European country and those contacts remain strong. Initially these contacts may work as agents, either full or part-time. Some may provide on-site liaison work as well, and others only lead generation and a western-front for the organization. The exact number of software vendors and IT services companies which involve the Ukrainian diaspora is not tracked at this time.

Diaspora have played a role in establishing companies in Ukraine. The CEO of Telesens, a European billing solutions provider, was originally from Ukraine. Using his contacts he established an entity to initially support internal software development operations for his company. The VP of engineering of RightFreight, originally from Ukraine,

[4] Diaspora being defined as: dispersion of a people from their original homeland. This refers to both those who were born in Ukraine and left and those whose parents left a generation ago and were born in another country; Ukrainian-Canadians, Ukrainian-Americans, etc.

championed the opening of an operations center in Kyiv. Since successfully opening development operations in Ukraine, both companies have formed new entities to pursue the IT services market beyond their own firms.

According to Carmel (2003), diaspora contacts are not likely to play a major role in the development of Tier 3 countries, instead other types of linkages will occur. Ukrainian firms have certainly tried to take advantage of their diaspora network. But as is the case in any highly competitive industry, a well-established marketing and sales organization is needed, which goes beyond the typical diaspora network.

Ukraine could exploit its proximity to Western European nations, as a possible linkage, i.e. a form of near shore outsourcing (cf. Abbott and Jones, 2002). Locations are considered to be in close proximity if they can rely on the use of short-haul flights[5] and if the locations have the same or near time zones. Lane (2002) also refers to the possibility for near shore outsourcing between countries of Eastern Europe and Western Europe. In Ukraine, the majority of software development firms today are located in Kyiv, which is approximately 2 to 3.5 hours from the major Western European capitals with flights arriving daily. Daily and multi-weekly flights are also available to other Ukrainian cities such as: Lviv, Dnipropetrovsk, and Kharkiv. Austrian Airlines has more than 20 flights a week from Vienna to several Ukrainian cities. For Western European companies this means a near shore relationship with software developers in Ukraine. Table 2 illustrates the time difference and travel times between Kyiv and various Western European cities and for comparison, to the US.

Location	Time difference to Ukraine	Travel time
Copenhagen	+1	2.5
Vienna	+1	2
Frankfurt	+1	2.5
London	+2	3.5
Paris	+1	3
New York	+7	13

Table 2: Time Difference between Ukraine and other Locations[6]

Ukrainian firms are anxious to exploit this proximity; which can be illustrated by the number of firms exhibiting at CeBIT[7] in Hanover, Germany. One Ukrainian firm, Vimas Technologies, has exhibited for the past seven years at CeBIT. During the first years, they were the only Ukrainian firm, now they are joined by several of their Ukrainian colleagues. CeBIT is generally a product show with participants from all over the world coming to exhibit their own products. It is also a place where many Ukrainian firms can begin to establish contacts that later lead to sales of services, partnerships and to the licensing of their technology. To date many firms have done just that, establishing partnerships with Danish, German, Dutch, British and Norwegian companies.

Other countries are also looking to capitalize on Ukraine's proximity to Western Europe. Indian firms have begun to look at establishing operations in Ukraine to more easily serve their Western European clients. Ukraine is also a near-shore destination for a few Polish IT services companies which are supplying the Western European market. Ukraine is

[5] Short-haul flights: Flights of two hours or less.
[6] Compiled by Softjourn. September 2002.
[7] Considered the world's largest Information and Communications Technology exhibition, taking place annually in March. Hanover, Germany.

considered Poland's poor cousin, with corresponding lower wages. The magnitude of these relationships is probably small at the time of writing.

4.4 Software Industry Characteristics

Within the Software Industry Characteristics factor, Heeks and Nicholson (2002) identify three elements that are present within all of the Tier 1 countries: competition, clustering and collaboration. As with the Tier 1 countries, Ukraine is dominated by private firms, many with foreign capital. The competition element states that the majority of firms should be medium sized; between 50 and 500 persons, and freely competing with each other. In Ukraine, the majority of firms competing in this market would be considered small or boutique sized, under 50 persons; 10-16 is more common[8]. For companies that have developed products and then chosen to pursue IT services, there is a tendency to pursue industries that are similar to those which would buy their product/s. However, there is currently a thought pattern of being open to whatever buyer comes along and ramping up to meet that buyers need. It should be noted that the number of small or boutique sized firms does lend itself to consolidation within the industry, either in the form of merger or acquisition. Alternatively if a company has not built up a steady client base or a specific skill set, teams can and most likely will simply be absorbed.

Clustering is the second element that needs to be present within the software industry. As was mentioned, the major tech centers in Ukraine are centered in the major cities. Companies have also clustered around the universities and R&D centers for easy access to student resources. Having multiple companies share facilities and infrastructure has occurred on a limited basis to date and usually only in the cases where a partnership has formed between companies. An example is the partnership between Kvazar-Micro and Telesens Ukraine and the formation of their new company, KMTC.

Carmel (2003) looks at industry collaboration at two levels. The first one is the cohesiveness of the national industry within the country. How are countries and companies differentiating themselves? How are they specializing? If India is known as the place to go to for IT services and Israel for its products and according to Lane (2002), Russia is becoming known as the place to go for highly skilled scientific resources and products, what is Ukraine known for? At this point Ukraine is not yet focusing on one specific area and neither are many of the companies.

The second level of collaboration is collaborating around national associations or consortia. This has already been discussed, namely with the USUDA and UASWD. Collaboration can also take place on a marketing level. To date, in Ukraine this occurs in a limited manner. Regional marketing consortia have appeared such as Hartron, which represents several IT services firms from Kharkiv in Eastern Ukraine. Part of the lack of collaboration, can be explained by the lack of industry focus by many firms. As is stated in AmCham (2002), given the depth of IT resources available in the market, smaller firms can ramp up quickly by tapping the available pool of talent. Partnerships and collaboration among firms' works best if the partners have complementary skills, not the same skills. How can a firm collaborate with several other companies, when each company is willing to ramp up to have any skill, even if it is their partner's focus? A firm would be collaborating with its potential competitors.

[8] There are no accurate official figures of the number working in Ukraine, in the software exports market. The average firm size was calculated using the unofficial figures of 14,000 (stated earlier in the paper) and the figure of 23,000 registered Brainbench certified in Ukraine and then each was divided by the UAWSD estimate of 1400 firms, to reach the average firm size of between: 10-16.

4.5 Domestic Input Factors/Infrastructure

4.5.1 Human Capital

The human capital factor assesses the talent available in the market. This section will evaluate Ukraine's human capital on the following levels:

- Multi-generational skills;
- Managerial skills;
- English skills;
- Wages.

Ukraine possesses considerable intellectual potential with its Ukrainian National Academy of Sciences, numerous scientific and technological institutes, universities and R&D companies. Ukrainian scientists have achieved world-class results in such fields as mathematics, physics, computer sciences, biology, electric welding, new materials and space sciences. The traditions of the mathematical schools are also very strong in Ukraine. Kyiv had always been the leading center of computing technologies in the former USSR: the second computer in the world was developed in Kyiv as well as one of the largest schools of cybernetics established – the Glushkov Research Institute.

An estimated 7000+ students graduate annually in disciplines which enable them to become software professionals[9]. This figure includes not only those graduating with Management Information Systems and Computer Science degrees, but also those graduating with degrees in mathematics and engineering which contained a significant IT component. UASWD predicts that students graduating in IT disciplines will reach between 11,000 and 14,000 by the year 2005.

After the break up of the Soviet Union, educational institutes have gone through difficult times and have had to adapt. For many institutes, the end of the Soviet Union forced them to institute tuition charges, since less money was coming in from the government. Mr. Vadim Tixonov, Vice Director of the Enterprise Management Systems department at Kyiv Politechnic Institute (KPI[10]), looks on the decrease in funding as a positive. One of the pluses is reflected in the student body. Approximately 50-60% of the students of any class have their US$1500-$2000/year tuition paid for by the government. Those receiving government paid tuition, reflect the best and the brightest of their high school graduating class. The remaining 40-50% of the students pay their tuition on their own, reflecting their strong desire to be in the program and willingness to work hard. While the percentages vary from institute to institute, the numbers are similar. Mr. Tixonov cites another advantage to the decrease in state paid tuition: each department can now use the tuition for the direct betterment of their individual department. KPI, for example, lists Motorola, Hewlett-Packard, Dell, Oracle, Microsoft, Cisco, among other MNEs, as their partners. With the tuition funding, KPI is able to put together training labs with the latest equipment and licensed software where the students can practice their skills. For Motorola, as an example, this means a steady supply of students trained in Digital Signal Processing.

A 2002 report by Brainbench[11] can be used as a measurement of the success of Ukraine's human capital as well. As of the end of 2001, Ukraine was 4th in the world in the number of certified IT professionals with 23,349. Ukraine follows behind the US-194,000, India-145,000 and Russia – 68,000. Since there is not an overly active push to support this

[9] Given that statistics are hard to come by in Ukraine right now, this is the author's conservative estimate of the annual graduates calculated as follows: All educational institutes, all relevant degree programs, times 25 students per program. A conservative estimate of 25 per program was used, even though those university departments interviewed stated enrollment has been increasing by 10-15%.

[10] Officially Kyiv Politechnic Institute has changed its name to the National Technical University.

[11] Brainbench is an online testing service which enables the testing of: from operating systems to computer languages to packages. In total, more than 400 skills can be tested.

industry by the government and given the size of the market, this number shows a high level of initiative among individual participants in the industry and a willingness to prove their skills. It also disproves many unofficial estimates of the number participating today in the industry, which are usually lower.

Project management skills are an area in need of improvement in Ukraine. There is a lack of people who can mange the timeline/budget of a project, as well as those who can accurately inform about the status of a project, and its issues, in time for action to be taken. Organizations such as the UASWD have formed linkages with project management organizations in order to develop these skills and the classes needed. Since the best skill development comes from actually managing large-scale projects, i.e. practical experience, it will take a while to develop these skills.

Today English is required from the second grade on, which ensures that the next generation of Ukrainians will have the necessary base of English skills. The current generation of IT professionals is not totally lacking in English skills either, specifically in the area of reading comprehension. For years most technical documentation was only available in English. Internet usage continues to ensure that reading comprehension will remain high; as well it assists with the practice of English writing skills. Many of the professionals who have graduated in the last few years have completed internships in Europe where English was the common language among their working groups. This enables them to obtain much needed practice in speaking and oral comprehension. The technical educational institutes recognize that this is an issue for the global economy and are working on ways to ensure that their students can develop their language skills. Speaking skills are always the hardest to develop though and this is an issue in Ukraine and one recognized by many companies. To combat this, many companies conduct in-house English language classes.

The number one reason given by companies for wanting to engage in offshore software development was the cost savings (Softjourn, 2001). According to Lane (2002), cost savings is still the number one value proposition. Table 3 illustrates labor rates in Ukraine. The rates are specifically for professionals working in Kyiv. Outside of Kyiv and the major cities, rates can be expected to be lower.

Position	**Monthly Salary in USD (after Taxes)**		
	Min	**Average**	**Max**
Systems/Information Manager	290	819	1,894
Systems Analyst	320	929	1,272
Network Administrator	150	490	1,110
Software Development Manager	545	743	917
Software Administrator	300	466	773
Customer Support Engineer	200	621	1,000
Service Engineer	481	481	481
Software Engineer	100	414	569
Programmer Analyst	800	978	1,156

Table 3: Salaries for Ukrainian IT Professionals.[12]

[12] As of November 2001: (Salaries for IT specialists are growing at approximately 10% annually). Source ANCOR

The wide spread between minimum and maximum salary can be explained by the differences between rates paid by Ukrainian firms and western firms. Western firms will tend towards the higher rates and the employees will expect higher pay if working at a western company. Outside of Kyiv, for example in Western Ukraine, average salaries for software engineers are around $200. Table 3 is from November 2001. According to ANCOR, labor rates for IT professionals have risen by 10% annually. For 2002, it is expected however, that wages increased by more than 10%, (Konyaeva 2003). Beginning in September of 2002 a jump was seen in wages which corresponded to a jump in the economy.

4.5.2 Technological Infrastructure

When working with an offshore location, telephone conversations and telephone conference calls are necessary. For voice communications (not voice over IP-VOIP), it is possible to pay as low as $.18 cents for a call from Ukraine to the US and even less; $.13 from the US to Ukraine. It is also now very easy and inexpensive to have several services engaged at one time (for contingency purposes) to ensure constant communications at reasonable costs. If a company is looking at having multiple offices within Ukraine, intercity communications continue to improve greatly. This is largely due to the laying of fiber optic cable which has been done via foreign investment. Where it was once very difficult to make calls between cities, now in 2002 several optical lines have been installed between the major cities. Getting a land line through the national telephone company, Ukrtelecom, for an office in Ukraine may take some time. However, it is possible to buy lines and service through other third party telecom providers such as Golden Telecom, especially in Kyiv. The cost is higher for initial installation and monthly fees, but lines can be installed very quickly and the quality is excellent.

For data communications, which can also make VOIP possible, the cost differential is greater. There are several types of connections now available in Ukraine, such as: Digital Subscriber Line (DSL), cable and satellite. For comparison purposes Table 4 summarizes fees for one type of connection, SDSL (Symmetric Digital Subscriber Line[13]), among various countries.

As an example, in Ukraine a company can plan on paying 10 times as much for the same connection as they would in the US. If the data connection speed required is 1Mbps, up and down, in the US a connection with no cap on the amount of traffic (the 5th column), will cost $340 a month. The same type of connection in Ukraine, with no cap on traffic, will cost almost $4300. If a company is able to determine or control the amount of traffic, however, they could choose a cap limited connection and pay on each MB transferred above the cap. For example, the breakeven point on the amount of traffic is: $4274-$451 (limits the client to 2 GB of traffic a month) = $3823.00/ .05 (cost per additional MB) = 76,460 MB or 76 GB of transfer data. If the data transfer amount for that month is expected to be less than 76 GB, the company would be better off to go with the capped connection plan. However, if the connection will be used for VOIP, this will result in lower voice communication charges. This calculation should be taken in to consideration when determining the type of connection to use.

[13] SDSL: Digital subscriber line: a technology that allows a provider to use the excess bandwidth found in a copper line for the provision of data services. SDSL (symmetric digital subscriber line) is called symmetric because the upstream (customer premise to the network) speed is the same as the downstream (network to the customer premise) speed.

Business class Digital Subscriber Line (SDSL) in USD[14]

Country	Net Install	256/256 Kbps[15]	512/512 Kbps	1/1 Mbps[16]	2/2 Mbps	Router Rental	Traffic cap, GB[17]	Charge per 1 MB after cap
Australia	$250	$138	$146	$168	$225	$25	2	$0.085
China[18]	$240	$4,832	N/A	$12,205	$15009	N/A	Unlimited	N/A
India	$1010	$2210	$3656	$7500	$11241	$30	Unlimited	N/A
Pakistan	$3000	$2977	$4427	$6877	$10827	N/A	Unlimited	N/A
Ukraine	$300	$964	$2064	$4274	$8664	$39	Unlimited	N/A
USA	$450	$179	$270	$340	$410	$25	Unlimited	N/A

Table 4: Internet Connection Cost Comparison by Country[19]

There are two trends in Ukraine: the reduction in connection fees and improvement in connectivity capacity. In the last year, fees for certain types of connections have been halved. According to Kamins (2002), fixed line telephony is being bypassed for digital solutions provided through DSL, wireless, cable, and satellite networks. Hughes Network Systems has been revolutionary in Ukraine by offering satellite-based, two-way and one-way direct Internet and cable services. Infocom, a joint venture between the German firm Controlware and Ukrtelecom, has noted a growth in the establishment of Virtual Private Networks (VPN) by companies in country, in order to solve their communication needs. As an example, Reemstma Ukraine (German Tobacco firm) connects with more than 30 locations throughout Ukraine via VPN on the UkrPak network.

Given that the communications industry has received a high-level of foreign investment, it can be expected that the communication offerings will continue to increase while the corresponding fees will decrease with the competition.

4.5.3 Finance:

Through September of 2002, Foreign Direct Investment (FDI) into Ukraine was at $454 million according to Segura (2003). ICPS Newsletter (2002) is predicting that it will not exceed $500 million for 2003, and is further predicting that Ukraine will continue to lose out

[14] Fees listed in US dollars.

[15] Measure of bandwidth (the amount of data that can flow in a given time) on a data transmission medium: Kbps – Kilobits per second. The number above the line refers to the upload speed, the number below the line refers to the download speed. Thus 256/256 Kbps refers to 256 Kbps upload speed and 256 Kbps download speed.

[16] Mbps - megabits per second.

[17] GB – Gigabyte.

[18] According to ChinaNet, the largest ISP in China, SDSL is not available. Fees listed for DDN service. Digital data network (DDN) offers higher bandwidth and synchronous communications in end-to-end connectivity. It supports a wide range of protocols including V.35, RS-232, RS-449 and X.25. ChinaDDN supports a variety of applications, such as multimedia and high-speed internetworking.

[19] Sources:
Australia: OnmyWeb.net. www.onmyweb.net/products/pricing/broadband.htm
China: www.chinanex.com (ChinaNet was formed out of China Telecom as part of deregulation of the national owned telecom.
India: www.kelnetonline.net/corp_serv.htm.
Pakistan: Pakistan Telecommunications Company, Ltd. www.ptcl.com.pk.
Ukraine: LuckyNet. www.lucky.net.
USA: DSL Reports, www.dslreports.com.

to Russia which has maintained political stability and high growth rates. In the software exports sector, how many companies claim some foreign investment? The more prominent firms all have some form of foreign investment, usually in the form of founder's capital. Out of all firms working in the software exports sector, however, the figure may be closer to 10 – 15% which have some type of foreign investment. This figure is not accurately tracked at this time. According to Kamins (2002), foreign investment has been low partially due to political instability. The communications sector, however, commands the greatest share of foreign investment. The major areas of investment have been in to the mobile, satellite and broadband areas. The national telephone company, Ukrtelecom, has yet to be privatized, although it has been discussed for years. It is again being predicted that it will be privatized in 2003.

Investment to date specifically into IT companies has been low: the exceptions have been a few examples of software development firms receiving investments totaling around $1 million. Two examples are: Softline, and Tessart[20], which both received investment from US funds working in Ukraine, in 2000 and 2001 respectively. The investments were completed by US investment funds which focus on the Ukraine markets. Another exception, and a plus for the industry more recently, has been a 2002 loan of $15 million dollars made by the International Finance Corporation (IFC) to Kvazar-Micro, the largest Ukrainian hardware assembler, for the construction of a new assembly plant.

4.5.4 Research and Development (R&D)

R&D refers to the discovery of new knowledge about products, processes, and services, and then applying that knowledge to create new and improved products, processes, and services that fill market needs[21]. Heeks and Nicholson (2002) intended this factor to refer to development in the software area only. Traditionally much of the R&D in Ukraine was for use in military applications. While some of the R&D is not strictly software, in order to support these types of applications, a significant amount of software R&D is required. The Paton Institute, for example, was responsible for the design of the Soviet version of the cruise missile, which required a very detailed preprogrammed model of the earth's surface. Now this technology is being adapted to the processing of spatial images in order to intelligently extract information from the imagery[22]. This form of computer recognition of land features is continually being developed and transformed in to commercial applications. For example, International Land Systems (ILS), a US/Ukrainian firm, has taken this concept for use in developing a land records processing application. This application has since been implemented for the State of Virginia.

R&D Centers can be found within the universities as well. The Complex Systems Modeling department, mentioned earlier under National vision and strategy, has been on the receiving end of grants and projects from the Government. In existence for more than thirty years, the department has awarded 100 PhD's[23], and 22 Doctors of Science[24]. Currently the research of the Complex Systems Modeling department is focused around creating new algorithms for data compression and image recognition.

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[20] The US fund which invested into Tessart, has since sold its portion of the company back to the Ukrainian owners.

[21] As defined by an investors portal, investorwords.com.

[22] The spatial side is defined using a variety of inputs such as topographic maps, satellite imagery, surveying and aerial photography and provides the ability to zoom in on the property. An important part of processing these spatial image data sets is the ability to intelligently extract information from the imagery. An image taken from space is translated in to pixels, which are squares of red/green/blue. Each pixel means something. When a human looks at the image he/she is able to determine what the objects represent. The key is to get a computer to recognize a cluster of pixels, in other words to do a feature extraction.

[23] Officially called a PhD candidate in Ukraine; however, in the US it is equivalent to a full PhD award.

[24] A Doctor of Science in Ukraine is a step above a PhD candidate.

A third area of software R&D has been developed within companies themselves. While enterprise resource planning applications, financial packages and front-end banking applications are available for the local market, companies are also developing and selling products geared for the worldwide market. Specific areas of development and successful sales include voice and data compression applications, and security applications such as intrusion detection software. The engineers working on continual development of the necessary algorithms for these applications are PhDs from the local universities and research institutes. Sales on both the local and international markets are enabling companies to fund their own R&D.

Because of relatively low demand in the domestic market for research and development in mathematics or physics, former researchers are looking to commercialize their talent and technology that they have been developing over the years. This provides a wealth of undiscovered talent and technology in Ukraine, which can be applied to the systems and applications being developed by U.S. companies. For example, Ukrainian scientists are now working on the Sea Launch[25] project, together with Boeing.

In order to compare Ukraine with several other offshore software development locations, table 5 has been compiled to show the number of people engaged in R&D activities by country.

Country	# in R&D/mil.	Population/mil.	Est. total # in R&D
Australia	3,319.8	19.4	64,404
China	459.1	1,271.9	583,802
India	157.9	1,033.4	163,173
Ireland	2,132.2	3.6	8,102
Pakistan	77.7	141.5	10,994
Philippines	156.0	77.0	12,012
Ukraine	2,120.6	49.1	104,121
Vietnam	274.0	79.5	21,783

Table 5: # Engaged in Research & Development.[26]

Compared to many countries, the number for Ukraine is significant. However, it should be noted that this number has decreased by a 1000 per million, since Ukrainian Independence was gained at the end of 1991. The decrease is a result of the brain drain that Ukraine has experienced as well as the decrease in government support for many research and development facilities.

4.5.5 Other

Both Heeks and Nicholson (2002) and Carmel (2003) define the "other" factor as certification or the level of Capability Maturity Model (CMM)[27] certification. Ukraine has several firms which have achieved ISO certification, which is equivalent to CMM level 3, however none have yet gone beyond level 3. Will CMM become prevalent in Ukraine or not? Perhaps this will be better answered based on the focus or national vision of the software exports market. If the vision is IT services then yes, CMM certification will be required to

[25] Sea Launch Co., LDC, is a multinational commercial satellite launching venture formed in 1995 by Boeing Commercial Space Co. of the United States with partners Kvaerner a.s. of Norway, RSC-Energia of Russia, and NPO-Yuzhnoye of Ukraine.

[26] Source: The World Bank Group (2002). www.worldbank.org .

[27] SW-CMM, or software CMM is no longer being furthered. As of January 2001, only CMMi or CMM integrated model will be developed and supported.

compete in this market. But if the focus will be elsewhere on product, for example, will CMM be as necessary?

4.6. Summary

Table 6 summarizes how Ukraine stacks up against the Software Export Success Factors Model.

Factor	Ukraine
Demand	High External demand; Weak, but growing domestic demand
National Vision and Strategy	Vision and Strategy absent; no real focus present
International Linkages and Trust	Diaspora links, lack of trust, lack of visibility, high level of piracy
Software Industry Characteristics	Some clustering and collaboration
Domestic Input Factors/ Infrastructure	Significant, low-cost technical human capital. Poor finance, marketing and telecoms; low-level of English skills/Project management skills

Table 6: Ukraine - Software Export Success Factors Model

5. CONCLUSIONS

Does Ukraine have the potential to be a premier location for software development? The strengths are there, mostly in the domestic input factors. The educational and R&D structure has been in place for years, which means it does not have to be developed from scratch. However, it has undergone several changes since the Soviet Union broke up. Even though, according to educational directors, these changes are positive, it will take years to see the actual affects. The turn around is just starting to be seen with an increase in enrollment, but they will have to deal with the decrease in state support; this will still affect them for the near term. The proximity for linkages, to Western European countries is a prime feature for Ukraine; however, it is not being exploited as well as it could be.

Heeks and Nicholson (2002) do not rate the success factors according to which are the most important; however, they do state that the role of government is seen as being crucial. This is an area where Ukraine is lacking. There is a lack of a national vision and strategy for this industry. Specific measures for supporting foreign investment, to fuel the industry have been lacking as well. The language issue is serious and is recognized by everyone in Ukraine; students, parents, educators, and business owners. Even with this realization, Ukraine will still lag behind other locations such as India and the Philippines, which conduct virtually all of their education and business activities in English, for some time to come. Data connectivity is one of the most serious weaknesses of Ukraine today. Even though there are continual improvements, the current costs will be prohibitive and stunt development for the near term. Due to the current economic environment in the US, buyers of custom software development services can demand that their vendors pay all costs for data communications. Given that Ukrainian companies are just breaking in to this market, they do not have the breadth of customers over which to spread these costs. This may limit the type of customers Ukraine can attract.

Heeks and Nicholson (2002) defined the software exports model as a dimensional model, which is used in Table 7, to outline Ukraine's current position.

Market Function	Software Exports Success Factors	Rating
Market Pull	Demand	Strong
Links	International Linkages and Trust	Weak to Avg.
Enablers	Software Industry Characteristics	Weak
Enablers	Domestic Input Factors/Infrastructure:	
	Human Capital	Avg. to Strong
	Technology	Weak
	Finance	Weak
	Research and Development	Avg. to Strong
	Other (certification, etc.)	Weak
Market Push	National Vision and Strategy	Weak to Avg.

Table 7: Ukraine - Software Exports Success Factors Market Dimensional Model

The push to develop the industry and support for the industry comes from the market push and from the activities of the government, which to date have existed but have been minor. Individual companies have been on their own to develop and many have been successful at it using and capitalizing on the linkages that they have. The strong demand has been able to propel them forward, supported by human capital.

Which one of these criteria is the most important? Can a country have all strong enablers and a weak national vision and strategy and still develop a strong software exports industry? Most likely the answer is no. All components need to exist together. In the case of Ukraine, a market push will not make up for weak enablers, but Ukraine has enough average to strong enablers that should propel the industry forward if the market push is there. The market push will also help to develop the links and trust that is necessary to obtain purchase orders. A strong finance sector also encourages foreign direct investment from which international linkages will result.

Heeks and Nicholson (2002) developed suggestions for the governments of nations which are interested in emulating what has been done by the Tier 1 countries. Modeling on their suggestions, Table 8 summarizes the most important and immediate suggested activities for Ukraine.

Criteria	Possible Intervention
Technology	Continued investment in telecommunications infrastructure. Encouraging continued foreign/private investment in telecommunications infrastructure. Reduction of tariff barriers on IT imports (clear support of temporary import). Support of the development of technology parks.
Money	Investment in and facilitation of venture and working capital funds. Encouragement and support of foreign investment.
Other	Investment in transportation and utilities. Reduction in bureaucracy. Tax relief.
Public Relations	Promotion of the country as a stable government and country. Promotion of the capabilities of the educated workforce. PR to differentiate from Russia.

Table 8: National Government Activities to support Software Exports Industry

Individual companies' can also take steps to improve trust and build up linkages.

Collaboration between Ukrainian firms:

- Promotion of Ukraine and its capabilities
- Market collaboration among complementary, but non-competing companies.

Other:

- Focus on product or service.
- Specialization along industry or product lines.
- Investment in the establishment of marketing and sales structures in the US and Western Europe.

6. AREAS FOR FUTURE RESEARCH

This paper looked at only one country, Ukraine, with reference to other countries limited to comparison in a few areas. The framework used here and the software exports model could be used to compare and contrast Ukraine with countries that are considered to be similar to Ukraine. This may include Central or Eastern European countries such as: Poland, Hungary, or the Czech Republic. The comparison could also include other countries of the Former Soviet Union such as: Belarus or Kazakhstan.

As was mentioned in this paper, the software exports market includes both services and product, and few countries can do well in both. Which one a country focuses on depends on its national strategy. Ukrainian companies competing in the software exports market could be examined to look at the following: a) Are they service or product oriented or both, b) What linkages are they using to establish market connections and obtain sales, c) How does this mix of companies affect the development of the software exports market in Ukraine. The examination can also answer the question, what should be Ukraine's national vision and strategy.

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Emmy B. Gengler has more than fifteen years of experience in information technology solution development. In 2001, along with a partner, she started Softjourn, an IT services company focused on assisting US companies to eliminate the typical difficulties that are encountered when working with offshore software developers. Through Softjourn's Assembly & Team Management (ATM.ua) service, teams are established and managed in Ukraine. Prior to founding Softjourn, Ms. Gengler spent four years as President & CEO of a venture-backed IT and business consulting company based in Kyiv (Kiev), Ukraine. During her tenure, partnership agreements were signed with such companies as Oracle, Scala and Vimas Technologies (Ukrainian software vendor). Implementation teams were established for Enterprise Resource Planning (ERP) systems in a very young IT consulting market. Prior to moving to Ukraine, Ms. Gengler lived in Irkutsk, Russia, and filled the role of project manager for a US independent software vendor who was developing a clearinghouse system for the Central Bank of Russia. The project included managing globally distributed software developers in Little Rock, Arkansas, USA and in Irkutsk, Russia, coordinating hardware and cryptography issues with IBM, the systems integrators on the project, Kapti, who provided the General Ledger application and Andrews which provided the VSAT solution. She also has software development experience, as an employee and a consultant at such companies as: Visa International, Johnson & Johnson, Pillsbury Corporation, Prudential Insurance and Bank One. Ms. Gengler holds a Bachelors degree in Management Information Systems from the University of Wisconsin and an MBA in International Business from the Monterey Institute of International Studies. Ms. Gengler began working in Russia in 1994 and has been working in the IT industry in Ukraine since 1996. (email: emmy.gengler@softjourn.com).