

Assessing The Epic Framework: Guatemala

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ABSTRACT

The EPIC framework was developed by Srinivasan, Stank, Dornier, and Peterson (2014) to assess supply chain readiness from Economic, Political, Infrastructural and Competence perspectives and was applied to 55 countries, a monumental undertaking. However, the framework needs further validation by applying it to other countries and using other raters. This research does both. Guatemala, for example, was not included in the 2014 EPIC ratings yet Guatemala is ideal for studying supply chain readiness given their participation and an anticipative role in CAFTA-DR (Dominican Republic-Central America Free Trade Agreement). Using Guatemala as a case, professionals in teams of three to six individuals in Germany and the United States applied the EPIC framework to judge supply chain readiness. The findings may serve as a model for businesses entering these sometimes operationally challenging markets. Areas for future research are included.

Key words: *EPIC framework, supply chain readiness, Guatemala, economic, politics, infrastructure, competence*

1. INTRODUCTION

Governments sign free trade agreements and in doing so, assign their countries a role or roles in multiple supply chains such as markets, as sources of natural resources, as sources of labor, as sources of technology, or as sources of financing. Developing nations usually serve as sources of labor and natural resources, while developed nations provide technology and finance. Both may serve as markets, although the benefits to developing nations may be small. Before leaping at the opportunities trade agreements offer, perhaps even before signing the agreements, government officials and business leaders should assess the readiness of each country in the agreement for its role or roles in supply chains. One way to assess readiness is by use of the EPIC framework (Srinivasan, Stank, Dornier, and Peterson, 2014). The EPIC framework was designed to assess supply chain readiness from Economic, Political, Infrastructural and Competence perspectives.

The EPIC framework chosen for this research has been fully applied to 55 countries and specifically addresses supply chain readiness. In this research, the authors apply the EPIC framework to Guatemala in a replication to determine if we can produce qualitatively similar results through Srinivasan et al.'s (2014) methods using different data. This is in keeping with recommendation by Peng, 2011 and Boylan et al., 2015; Ioannidis, 2015). Bettis, Helfat, and Shaver (2016) note that a replication uses as a reference point, a particular prior study and we followed this methodology replicating the procedures followed Srinivasan et al. (2014). We test the robustness of the original EPIC model in the context of an additional country with another set of raters. Guatemala was a recent signatory to the Central American Free Trade Agreement-Dominican Republic (CAFTA-DR), because the implementation of CAFTA-DR has been problematic in Guatemala, and because Guatemala was not included in the original EPIC research.

Bettis et al. (2016) term this methodology a "quasi-replication" and note its importance for assessing generalizability as well as robustness of a model. Using Tsang and Kwan's (1999) taxonomy of the dimensions of replication, this research used the same design but with a different population and a different context. The goal is to determine how the EPIC model generalizes to new subjects and raters (Tsang and Kwan, 1999).

Business researchers have recently called for more replication and more application to validate frameworks (Krause, 2016) and he notes, "(P)romoting research for reproducibility requires a change from the status quo and represents an educational issue (p. 1). McCullough (2009), Crick et al., 20145; and Feigenbaum and Levy (1993) all suggest a cornerstone of research is verification through research and note it is an outright requirement of appropriate scientific practice. Reproducibility is a fundamental tenet of research and the authors all note that good science must be reproducible.

This research extended the original EPIC approach in several ways. First, one of the researchers has spent more than two years in the country, interviewing a variety of stakeholders in both formal and informal settings. This offers

a more qualitative context for the systematic research that replicates the original EPIC research as closely as possible. Second, this research used nine teams of young professionals in MBA classes in Germany and the United States(US) to assess the country. Third, these were consolidated into final assessments of Guatemala's supply chain readiness.

This research suggests that many of the social and political problems associated with the implementation of CAFTA-DR could certainly have been identified and might have been avoided if officials and business leaders had applied the results of the EPIC approach to assess Guatemalain reaching their decisions. Obviously, there is no way to know this for certain, but the results are potentially indicative. This research focused on answering two research questions:

- 1) *How readily can the EPIC framework be applied by business professionals who are not necessarily experts in supply chain management?*
- 2) *Do teams produce consistent results when applying the EPIC framework to the same country?*

The next sections of the paper briefly summarize the EPIC framework, describe Guatemala in terms of the EPIC framework analysis, and describe the methodology in greater detail. The final sections of the paper report the results of the research as answers to the two questions, draw conclusions about the value of the EPIC framework, and outline a path for future research. This analysis contributes to the literature by applying the EPIC approach to a new country and by using it in a classroom setting. This analysis becomes increasingly important as supply chains become more regional and as organizations recognize the problems associated with factor market rivalry (Ellram, Tate and Petersen, 2013; Ellram, Tate, and Feitzinger, 2013) and it also has implications for supply chains as other countries implement multi-national trade agreements. Recent research has also called for more pedagogical examples to enrich classroom discussions and improve students' comprehension of supply chains. This research answers that call (Xu, 2016; Helms et al., 2016).

2. BACKGROUND LITERATURE

2.1 Guatemala and CAFTA-DR

Many supply chain specialists agree there will be a move away from highly fragmented supply chains that span the globe in the future. It is suggested supply chains will move towards a greater reliance on regional production networks (Srinivasan, Stank, Dornier, and Peterson, 2014; Ellram, Tate and Feitzinger, 2013). The governments that crafted the Central American Free Trade Agreement-Dominican Republic (CAFTA-DR) intended that Guatemala play two keys roles in that agreement. First, they identified Guatemala as a potential market for agricultural equipment and technology, especially seed technology (Reeves, 2014). Second, they saw the northern mountains of Guatemala as a potential source of hydroelectric power (Lakhani, 2014). Guatemala has not adapted easily to either of these roles and since 2014 has seen major protests against Monsanto and against the hydroelectric development (Reeves, 2014; "Guatemala defies....," 2014; Lakhani, 2014).

Developing nations often have conflicts between improvement projects and indigenous cultures (Lewis, 2011). Some international agreements identify culture, indigenous culture in particular, as a right (Vadi, 2008), but also not a right (Fulmer, Godoy, & Neff, 2008). In short, there is a complex relationship between the rules that govern the rights of the governments, organizations, and companies that promote economic projects and the rules that govern the rights of indigenous cultures; and the rules are so complex and multilateral that no one knows which rules apply and the application has become subjective (Fulmer et al., 2008).

By population, Guatemala is the largest country in Central America and has the potential to play a significant role in the supply chains supporting CAFTA-DR activity and development. Recent events suggest the corporations, government officials, and individuals who want to implement CAFTA-DR failed to do the essential background research, providing a better strategic approach. The EPIC model (Srinivasan et al., 2015) would likely reveal information essential to successful and likely peaceful implementations of these programs.

This research considers Guatemalan roles in CAFTA-DR as key to the success of CAFTA-DR, and also as an example of failing to do the essential groundwork associated with developing supply chains in a way that integrates indigenous supply chains and indigenous cultures. In this research, we show ways that the government officials and multinational managers could avoid conflicts along these essential supply chains and develop strong, supportive relationships with indigenous cultures. Using Guatemala as a laboratory, we applied the EPIC model (Srinivasan, et al., 2014) and ethnographic research to show how this analysis would better support less contentious approaches to development.

2.2 The EPIC Framework

The EPIC framework was developed as a way to evaluate global regions on their supply chain readiness by assessing four key areas (Economic, Political, Infrastructural and Competence) (Srinivasan, et al., 2014). In their original research, Srinivasan, et al. (2014) used a combination of publicly available secondary data and personal visits to the countries to make their EPIC assessments. This research follows a similar approach to assessing Guatemala, but with four major changes. First, we have researchers living in Guatemala adding an ethnographic element to the research. Second, as Srinivasan, et al. (2014) developed the method for 55 countries, we focused on only one country. Third, we used outside raters to complete the assessment, and fourth, we added Guatemala to the list of countries originally assessed with the EPIC approach.

In the EPIC Framework (Srinivasan, et al, 2014), *Economy* is the wealth and resources in terms of production and consumption of goods and services targeted to a country or a specific geographic region. This category often includes gross domestic product (GDP), GDP growth rate, population, foreign direct investment (FDI), exchange rate stability, inflation, and balance of trade. The next category, *Politics*, includes state policy formation and enforcement and encompasses the ease of doing business, bureaucracy, corruption, corporate tax rates, tariff barriers, political risk, intellectual property rights, as well as the legal and

regulatory framework. The third category, *Infrastructure*, is the physical and organizational structures for a society or enterprise and the services and facilities needed for a functioning economy such as the condition of highways, rail, air, sea, and inland transportation as well as energy. *Competency* is the supplier availability, access to technology and skilled labor and considers labor productivity, labor relations, education literacy, logistics competence, customs and security. These four EPIC categories provide an overview of a nation's or region's supply chains.

2.3 EPIC Data for Assessing Guatemala

This section provides an overview of Guatemala and specifically presents the indices and data for grading the supply chain readiness of the country. This follows the original methodology of Srinivasan, et al. (2014).

The ethnic population of Guatemala as a whole is Mestizo and European 59.4%, K'iche 9.1%, Kaqchikel 8.4%, Mam 7.9%, Q'eqchi 6.3%, other Mayan 8.6%, indigenous non-Mayan 0.2%, other 0.1% (*CIA World Factbook*, 2015). Mestizo is mixed Amerindian-Spanish and in local Spanish called "Ladino."

Srinivasan et al. (2014), in their development of the EPIC framework, used information from in-depth studies conducted by respected and well-established organizations

like the World Bank, the US Central Intelligence Agency (CIA), the World Trade Organization, *The Economist*, the United Nations Conference on Trade and Development (UNCTAD), and the World Economic Forum. To the extent data were available, the authors replicated the approach in this study using eight teams of international business professionals, replicating the EPIC framework prior to adding the ethnographic information. This approach provides invaluable insight and a solid foundation for this research. With the quantitative data, we have included data from the US and other countries to better position Guatemala's status in the context of key macro-environmental measures. We summarize our discussion of Guatemala by comparing our assessment of the country to Srinivasan et al.'s (2014) assessment of Central and South America. **Table 1** identifies the EPIC variables and their data sources from Srinivasan et al.'s (2014) study. The next section of the research examines each EPIC variable for Guatemala and replicates as closely as possible the EPIC assessment methodology. Each variable is discussed in the context of the authors' extensive interviews during the on-going three-year time period spent in Guatemala.

Table 1. EPIC Variables and Sources

Dimension	Variable	Data Source
Economy	<ul style="list-style-type: none"> • GDP and GDP Growth Rate • Population Size • Foreign Direct Investment • Exchange Rate Stability and Consumer Price Index • Balance of Trade 	<ul style="list-style-type: none"> • CIA World Factbook and WTO • CIA World Factbook • UNCTAD FDI Attraction/Potential Index • CIA World Factbook • World Trade Organization
Politics	<ul style="list-style-type: none"> • Ease of Doing Business • Legal and Regulatory Framework • Risk of Political Stability • Intellectual Property Rights 	<ul style="list-style-type: none"> • World Bank EDBI and WGI • World Bank WGI • Economist Political Stability Index • International Property Rights Index
Infrastructure	<ul style="list-style-type: none"> • Transportation Infrastructure • Utility Infrastructure • Telecommunications and Connectivity 	<ul style="list-style-type: none"> • World Economic Forum GCI • World Economic Forum GCI • CIA World Factbook
Competence	<ul style="list-style-type: none"> • Labor Relations • Education Level • Logistics Competence • Customs and Security 	<ul style="list-style-type: none"> • World Economic Forum GCI • World Economic Forum GCI • World Bank Logistics Performance Index • World Bank Logistics Performance Index

Source: Srinivasan, Mandyam; Theodore Stank, Phillipe-Pierre Dornier, and Kenneth Peterson, (2014) *Global Supply Chains: Evaluating Regions on an EPIC Framework – Economy, Politics, Infrastructure, and Competence*. New York: McGraw Hill.

2.4 Economy: Guatemala

With a population of 16.66 million (<http://countrymeters.info/en/Guatemala>), Guatemala is the largest country in Central America. Its Gross Domestic Product (GDP) reached \$63.91 billion in 2015 based on the most current *CIA World Factbook* (2015) data and continues to grow at a rate of 4.1%. GDP per capita is \$7,700 (PPP), ranking Guatemala 141st of the 228 countries ranked in the *CIA World Factbook* (2015). UNCTAD uses its Foreign Direct Investment (FDI) index to compare potential foreign investments to actual foreign investments. On this basis, Guatemala fell slightly below expectations. Guatemala falls into a category of FDI inflows between \$1 billion and \$4.9 billion. In 2011, FDI was less than 0.11% of GDP, or \$985

million. This figure rose to slightly above \$1 billion in 2012 and 2013, the most recent data available.

In 2013, the Guatemalan economy was comprised of 62.7% services, 23.8% manufacturing, and 13.5% agriculture. Agricultural growth is limited by the dependence of the economy on water resources. Given the country's lack of infrastructure for irrigation, recent droughts have restricted investment in agriculture. Guatemala imports \$16.7 billion in goods, primarily fuel, machinery, and transportation equipment and exports \$10.3 billion, primarily commodities. Guatemala's largest trading partner for both imports and exports, by far, is the United States, although Guatemala imports some goods from China, but exports nothing to China.

Inflation has ranged from 3.8% and 4.4% over the last three years. Exchange rates with the US dollar have ranged between 7.6 and 8.2 Guatemalan quetzals per dollar. Recently the exchange rate stabilized at 7.8 Guatemalan quetzals per US dollar. While the currency is stable, a lower inflation rate would aid in attracting more international investors.

Estimates of unemployment hover around 4%, but these figures can be deceptive. Many areas have children and adults of all ages selling artisanal goods or participating in low-entry cost entrepreneurial ventures such as offering shoe shines on street corners. It is open to debate whether the people participating in these micro-enterprises are considered employed and whether the employment is considered full- or part-time.

According to official figures, 54% of Guatemala's people live below the poverty line. A typical Guatemalan worker makes less than minimum wage and indigenous workers make even less. Over 60% of workers in Guatemala earn less than the published minimum wage (*Guatemala Times*, November 11, 2011). The minimum wage worker earns approximately \$3,000 a year, but the average salary in the private sector is about 8% less at \$2,784 (National Institute of Statistics of Guatemala, 2011). For indigenous workers, it is even lower at \$1,938, about 23% less than the national average (National Institute of Statistics of Guatemala, 2011). These figures vary with the exchange rates, and inconsistencies appear to be inevitable.

The Guatemalan minimum wage distinguishes between garment workers and others. For garment workers the minimum wage is \$7.61 a day; for everyone else it is \$8.16 a day. But neither wage would have a significant impact on the national poverty rate, officially 54%. The United States Department of State's *2011 Country Report on Human Rights Practices* found if an employee in Guatemala worked 365 days a year, they would earn approximately \$2,978 per year, but this would not cover a minimal food, housing, and health care budget. The Human RightReport estimated the cost for a minimal standard of living in Guatemala to be \$6,840, more than twice the stated minimum wage. If both parents worked 365 days a year at minimum wage, they still would not earn this amount according to the US Department of State (2015).

Spanish is the official language of Guatemala, but the government recognizes 23 indigenous languages. About 60% of the population speaks Spanish, but many Guatemalans in rural areas speak only indigenous languages, so they remain outside the mainstream of Guatemala and the global economy.

2.5 Politics: Guatemala

Guatemala rose substantially in the ranking for ease of doing business, moving from 93rd in 2013 to 79th in 2014. The *Ease of Doing Business Index* measures variables such as ease of starting a business, ease of paying taxes, and ease of obtaining construction and other permits. Guatemala improved on all three areas, primarily by moving the process on-line and allowing registration with multiple government agencies simultaneously. Guatemala ranks high on obtaining credit, registering property, and securing electricity, but resolving conflicts, protecting investors, resolving insolvency, improve trading across borders, and

actually starting a business remain problematic. Most of the problems stem from the country's slow, bureaucratic processes. For example, it takes 1,402 days (about 3.84 years) to enforce a contract and costs 26.5% of the claim to do so. The OECD average is 529 days and 21% of the claim. Guatemala's slow process is almost double the time for contract enforcement in Latin America and the Caribbean, although the cost of enforcement is lower (World Bank, 2015).

Guatemala ranks about average for all countries on the quality of its regulations, but well below average on the rule of law, control of corruption, and government effectiveness. Guatemala ranked 61st on *The Economist's* Political Stability Index. In this index, the higher the overall score, the better; Guatemala's score of 6.6 was based on an underlying vulnerability score of 6.3 and an economic distress score of 7.0. For perspective, Russia had a score of 6.5, with underlying vulnerability at 5.0 and economic distress at 8.0. These scores were from 2009 to 2010, so the economic distress scores reflect the Great Recession. At this point, the US ranked 110th because of the economic distress score, at 8.0, but with an underlying vulnerability score of 2.5 (The Political Instability Index, 2009-2010).

Guatemala's overall score on the property rights index was poor, but the scores come from mixed circumstances. In registering property, Guatemala scored 9.1 (24th out of the 130 countries ranked), but on copyright protection, the country scored 2.1 (ranking 82nd of the 130 countries). Guatemala's scores averaged 6.3 on patent protection and intellectual property rights, but lower on judicial independence, rule of law, political stability, and control of corruption. Overall, the country ranked 90th of 130 in the world (World Economic Forum, 2015).

Members of the World Trade Organization (WTO) in formulating or amending their laws and regulations, may adopt measures necessary to protect public health and nutrition and to promote the public interest in sectors of vital importance to their socio-economic and technological development, provided that such measures are consistent with the provisions of this Agreement (TRIPS, 2009 at https://www.wto.org/english/tratop_e/trips_e/t_agm2_e.htm). The Trade-Related Aspects of Intellectual Property Rights (or TRIPS), under the World Trade Organization, permits all members, including those with great sectoral disparities, to "carefully tailor the country's protection to local needs" (TRIPS, 2009). In Guatemala, this is meaningful because of the hydroelectric dam planned under the auspices of CAFTA-DR. The dam is intended to supply hydroelectric power to Guatemala and other countries in Central America, however, not everyone in the area favors the development of this dam, and under TRIPS, individual governments are not necessarily obligated to adopt every provision of the agreement (World Trade Organization, 2015).

Emilia Xico, age 37, a mother of seven and member of the Margaritas ancestral committee, said: "For us, development means respecting and protecting Mother Earth, so that our children will always have food and water. This dam is not development for us. We are conscious of the things we don't have and, of course, I want better education for my children – that is our right – but we won't trade our territory and sacred natural resources. That's all we have." ("Guatemala's Indigenous Community..., 2014).

2.6 Infrastructure: Guatemala

Guatemala infrastructure concentrates around its ports and large cities, particularly Guatemala City. Infrastructure in other regions of the country is limited. Guatemala has a 12,795 kilometer (3,519 mile) highway network, albeit in poor condition. The country has low electricity and telephone density, yet the use of cell phones is growing rapidly and privatized electricity distribution has helped to increase availability. Concentration of television stations and newspapers are also in Guatemala City. Ports of Champerico, Puerto Barrios, and San Jose manage most of the country's exports. La Aurora Airport is the only national airport with capacity for both freight and passengers ("Guatemala – Infrastructure...", n.d.). For practical purposes, Guatemala has no functioning railroad (Allen, n.d.).

In October 1996, the Congress of Guatemala voted to reform the electric power market, allowing the private sector to participate in a number of projects. The reforms gave private companies unrestricted access to the power grid, distributors, and wholesale customers, and provided for a general unbundling of generation, transmission, and distribution. Privatization of state-owned electric companies has begun with the selling of the state distribution company, Empresa Electrica de Guatemala (EEGSA), and the primary generating company, Instituto Nacional de Electrificación (INDE). On July 30, 1998, 80% of EEGSA, which provides power to more than 500,000 customers in Guatemala City and two neighboring provinces, was sold for \$520 million, far higher than had been expected by Guatemalan officials, to a consortium of Spain's Iberdrola Energia (49% share), US-based Teco Energy (30%), and Portugal's Eletricidade de Portugal (21%). Overall, EEGSA (now called DECASA) distributes 70% of Guatemala's power, with INDE and 14 smaller municipal distribution companies (plus a few private generation facilities partially owned by US companies Enron, Teco, and Constellation Energy) accounting for the remaining 30%. Immediately following the successful sale of EEGSA/DECASA, Guatemala kicked off the sale of INDE as well. In October 1997, INDE was divided into three separate companies, with INDE becoming a holding company (World Bank, 2003).

Guatemala has challenges with fixed-line telecommunications infrastructure. The fixed-line density is one of the lowest in the region. This means that barcoding and other form of basic data-capture for IT-enabled supply chains is available in major metropolitan areas like Guatemala City but also non-existent in other areas of the country (Guatemala – Telecoms..., n.d.).

2.7 Competence: Guatemala

Logistics competence covers four principal areas: (1) labor relations, (2) education level, (3) logistics competence, and (4) customs and security (Srinivansan, et al., 2014). Guatemala does well in labor relations, but earns mixed scores through the rest of the categories. This section compares Guatemala to the US, Mexico, Costa Rica, and Panama. The US is included to provide a broader perspective, while Panama and Costa Rica, nearby countries, are covered in the original EPIC analysis.

2.7.1 Labor: Availability, Productivity, and Relations

Guatemala boasts a young workforce, younger by far than its neighbors to the North, the US and Mexico. The median age in Guatemala is 21, compared to 37.6 for the US and 28 for Panama, 30 for Costa Rica, and 27.3 for Mexico (CIA Worldfactbook.com). This youth appears to be simultaneously an advantage and a disadvantage for the workforce. It means that there are a large number of people moving into the workforce, but it also means that their skill level is relatively low; they are still untrained and unskilled.

Primary school enrollment is low relative to the rest of the world, still 92.8%, but the quality of education at this level is seen as low. Secondary education enrollment is 65.1%, also among the lowest in the world (World Economic Forum *Global Competitiveness Index*, 2015). Illiteracy remains a problem, but more in the rural areas than in the economic centers like Guatemala City. Enrollments and education quality are also higher in urban areas.

Guatemalan high schools have three major tracks: general education, bilingual secretary, and bookkeeping/accounting. Few enroll in the general education track, which would be considered the curriculum for a typical high school diploma. Most males who enter universities have high school diplomas in accounting, while many working women have diplomas as bilingual secretaries. This may help to explain the relatively high quality of the management schools (World Economic Forum *Global Competitiveness Index*, 2015).

Guatemala ranks in the top third of the world in the quality of management schools, the quality of staff training, and the local availability of specialized research and training (World Economic Forum *Global Competitiveness Index*, 2015). Guatemala also has one of the lowest net migration rates in world at minus two (-2), ranking it at 166th. That means that twice as many people leave the country as come in, although this does not reflect the major presence of foreign aid workers in some areas of the country.

Wages tend to be low, with an official minimum wage in Guatemala at about \$10 USD a day, but that wage requirement is often violated, especially in rural areas. Wages for agricultural workers are officially about 10% lower than for other workers, but in practice they are even lower. Also, Guatemala has a high rate of child employment. The official unemployment rate is 4.1% (CIA Worldfactbook.com, 2015); people are counted as employed if they worked for pay at least one hour during the prior week (Guatemalan Central Bank, 2015).

Guatemala ranks high in labor relations. Guatemala ranks in the top 25 in the world for a low rate of unionization, a high ranking on wage flexibility, and a high ranking of cooperation between labor and employers. Guatemala also has a good record for retaining talent and relatively high ranking (46th) on pay and productivity (World Economic Forum *Global Competitiveness Index* 2015).

2.7.2 Education Level

The average Guatemalan male finishes 11 years of school, the average female, 10 years. Only 18% of Guatemalans are enrolled in colleges and universities; still fewer graduate. Again, the percentages are higher in urban than in rural areas. The quality of education is high in some disciplines, including management, but weak in areas of

engineering and technology (World Economic Forum *Global Competitiveness Index*, 2015).

In many instances, businesses depend on in-house training programs and on-the-job experience for operating level employees. In Guatemala, it is difficult to find formal training for fork truck drivers, machine operators, and other jobs of this nature. That is in part due to the low level of industrialization and lack of infrastructure (World Economic Forum *Global Competitiveness Index*, 2015).

2.7.3 Logistics Competence

On the Logistics Performance Index (LPI), Guatemala stands midrange among developing countries, ahead of Costa Rica, but behind Mexico and Panama. Its strongest attribute is timeliness, its weakest, infrastructure. On the specific measure of logistics competence, it is the weakest of the five countries in this review, though not far behind Panama and Costa Rica (lpi.worldbank.org, 2016). This means that transportation providers and third parties are competent, but not at the same level as their counterparts in the developed world.

Specific training programs for supply-chain education are limited and those available are only in Guatemala City. Training for supply chain jobs is largely informal via on-the-job experience. This includes operational jobs including lift-truck drivers and warehouse personnel. The original researchers found similar circumstances in developing countries for supply-chain related jobs (Srinivasan et al., 2014). Consequently, statistics related to education, graduation rates, and other proxy measures were used. Student teams followed the same protocol in this replication.

2.7.4 Customs and Security Competence

Guatemala's biggest problem in this arena is the business cost of organized crime. According to the *World Economic Forum*, Guatemala ranks last, or 144th of 144, on this element of their competitive index with a score of 2.5. The major problem stems from drug cartels, who seem to operate with near impunity, especially in the northern regions of the country, near the Mexican border. For perspective, the US ranks 73rd with a score of 4.7, while the United Arab Emirates rank 1st with a score of 6.8. In an obviously related measure, Guatemala also ranks 142 of 144 on the business costs of violence and crime with a score of 2.1. The US ranks 85th with a score of 4.2, Qatar, 1st with 6.5. On the reliability of police, Guatemala ranks 124th with a score of 2.9, the US 22nd with a 5.7. Finland ranks 1st with a 6.7. Guatemala fares better on the business costs of terrorism, ranking 88th with a score of 4.9, while the US ranks 118th with a score of 4.2. Finland again ranks 1st with a score of 6.7 (World Economic Forum *Global Competitiveness Index*, 2015).

In Guatemala, customer procedures rank 88th with a score of 3.7, while the US ranks 33 with a score of 4.8. Singapore ranks 1st with a score of 6.1. But Guatemala's ranking must also be put in the context of corruption, especially bribes related to imports and exports. Former President Perez Molina was driven from office in 2015 in a scandal based on taking bribes in exchange for lower tariffs for companies seeking to import goods into Guatemala (Romo, 2015). In still another scandal, Molina and others are accused of taking a 'commission' of \$24.5 million to allow a

Spanish company, Grup TCB, to obtain a port contract (FoxNews.com/Latino, 2016). Given this background information on Guatemala, this research asked business professionals to assign a grade to each of the four EPIC variables for the country..

3. RESEARCH METHODOLOGY

The methodology used in this research involved a seven-step process as described below. First teams of master's level business students read Srinivasan, et al. (2014)'s EPIC framework as detailed in the book, *Global Supply Chains: Evaluating Regions on an EPIC Framework – Economy, Politics, Infrastructure, and Competence*. They also participated in several interactive lectures by one of the researchers on the EPIC framework in their MBA Marketing Management Class. Second, the MBA students were introduced in detail to the sources used by Srinivasan et al. (2014) to evaluate the supply chain readiness of 55 countries. Third, the students were given tables that included the region for Guatemala. Fourth, the students were divided into teams of three to six individuals and given the assignment of 'grading' Guatemala using the same processes and data sources used by the original researchers (Srinivasan et al., 2014). Fifth, the students completed their assessments and defended their evaluations of Guatemala in an oral team presentation to the class. Sixth, the researchers compiled the results from all the groups along with background information gathered from on-site interviews with Guatemalan NGOs and governmental officials. Finally, results between teams and countries represented by the student raters were compared. The steps in this process are discussed in greater detail in the sections that follow.

3.1 EPIC Analysis by Teams of Business Professionals

The methodology included an EPIC analysis of Guatemala by teams of business professionals combined with ethnographic interviews with businesses, NGOs, and governmental officials by three additional researchers, one based in Guatemala for more than two years.

The business professionals were early-to-mid career professional completing an MBA degree. There were two cohorts, one based in Manheim, Germany and the other in Pensacola, Florida. All students were completing a face-to-face Marketing Management course as a required MBA course in their respective countries. The rating assignment was a major part of the course requirement to study supply chains in a marketing context. The Manheim-based students included three individuals from Switzerland, one from Ireland, one from Moldova, and the remaining 13 from Germany. The US sample of 22 students were all based in Northern Florida.

Students first read the book *Global Supply Chains: Evaluating Regions on an EPIC Framework–Economy, Politics, Infrastructure, and Competence: "EPIC" Structure–Economy, Politics, Infrastructure, and Competence*. (Srinivasan, et al., 2014) and completed an in-course essay examination of the materials. Next, students were instructed to replicate the book's methodology while working in teams of three to six individuals. The teams were self-selected. They were told to replicate the process to the extent possible and consulting the same sources for

Guatemala (as shown in **Table 1**). They used the same framework and weightings, as shown in **Table 2**, to assign letter grades, including pluses and minuses for each of the EPIC framework categories, along with an overall country grade for Guatemala. Students were familiar with the A+ to F- grading scheme as it is also the scheme used to evaluate their own work in their MBA courses. Students were given the entire term to complete the project, but the Florida teams

were on a 15-week schedule while the German teams were on an 8-week Executive-MBA schedule. The eight teams' (four in Germany and four in the US) findings were compiled in a single table with both subcategory and overall country grades. None of the students had ever visited or lived in Guatemala.

Table 2. Weightings of the EPIC Variables

Economy	Economic Output and Growth	Population Size	FDI	Exchange Rate and Stability/ CPI	Trade Imbalance
30% of total EPIC score	35%	25%	20%	15%	5%
Politics	Ease of Doing Business	Legal Framework	Political Stability	Intellectual Rights	
20% of total EPIC score	30%	30%	25%	15%	
Infrastructure	Physical Infrastructure	Energy Infrastructure		Connectivity	
30% of total EPIC score	50%	25%		25%	
Competence	Labor Relations	Education Levels	Logistics Competence	Customs and Security	
20% of total EPIC score	25%	25%	40%	10%	

Source: Srinivasan, Mandyam; Theodore Stank, Phillipe-Pierre Dornier, and Kenneth Peterson, (2014) *Global Supply Chains: Evaluating Regions on an EPIC Framework – Economy, Politics, Infrastructure, and Competence*. New York: McGraw Hill.

The students received the tables shown in Appendix 1. These tables were taken directly from the EPIC book, *Global Supply Chains: Evaluating Regions on an EPIC Framework–Economy, Politics, Infrastructure, and Competence: “EPIC” Structure–Economy, Politics, Infrastructure, and Competence* (Srinivasan, et al., 2014), except in these tables the scores for Canada were removed and Guatemala was added in the country column of the tables and blank spaces were included for each of the sub-variables. Scores for other countries in the region were left untouched from the original content (Srinivasan et al., 2014). This detail

is important because of the possibility of an anchoring effect which is discussed later.

Students presented their findings in-class and turned in tables that included both their scores and the justifications for their scores. This is again in keeping with the process followed by Srinivasan et al. (2014). Students also presented tables that justified their grades in each broad category. An example of the justifications is shown in **Table 3**. Space limitations prevent the inclusion of multiple tables of this nature.

Table 3. Example of German Team Submissions Justifying Assigned Grades: Strengths and Weaknesses Summary

Grade	Strengths	Weaknesses
USA: B+	Absolute volume of GDP; global percent of GDP; absolute amount of exports; consumer price inflation low; stable exchange rates; large FDI; diversification of economic sectors; population and workforce growth (mainly due to immigration from Mexico).	High costs of taxes, land, labor, and capital; GDP growth low; negative balance of trade; negative budget surplus could cause instability; again population.
Guatemala: B	<ul style="list-style-type: none"> ● Stable exchange rate (GTQ-USD: 10-year horizon: very small fluctuations between 0,1245 - 0,13 USD per 1 GTQ) ● Guatemala has a higher GDP growth rate than 66% of the surveyed countries of CIA world fact book ● Highest population growth rate in Latin America, almost half of Guatemala's population is under age 19, making it the youngest population in Latin America ● Low-moderate inflation rate (~3%, global rank 70) ● Great improvements for starting a business & paying taxes ● Ease of doing business (it is harder to do business with 61% of surveyed countries) ● Distanceto Frontier improved and is relatively high 65 	<ul style="list-style-type: none"> ● GDP per capita \$7500 / year, which is roughly one-half that of the average for Latin America and the Caribbean ● More than half of the population is below the national poverty line ● 13% of the population lives in extreme poverty, distribution of income highly unequal, ● Only 82% can read & write, ● Imports exceeds exports by 70% ● High fluctuation in FDI – up to 400%
Mexico: B+	Real GDP growth; export volume; proximity, economic, and regulatory ties to the United States; low cost of living; low unit labor costs; low cost of capital; raw commodity energy reserves; relatively stable business environment and regulations for FDI.	High consumer price inflation; unstable exchange rate; low and risky capital markets; low FDI; high poverty and poor distribution of wealth; poor tax collection rates; strong “black market” economy; regional variation if high, with the south poor, underdeveloped, and educated, poor education system.
Costa Rica: C+	Trade ties within and beyond the Western Hemisphere; economic activity to expand long term; recent history of location of large electronic firms.	Economic growth tied to the United States; fiscal account deficit to continue based on needed expenditures on security and infrastructure.

Table 3. Example of German Team Submissions Justifying Assigned Grades: Strengths and Weaknesses Summary

Grade	Strengths	Weaknesses
Panama: B	One of the world's fastest growing economies; dollarized economy that removed exchange rate risk; Panama Canal and Colón free trade zone; privatization of the power generation system and telecoms, and the relative flexibility of the labor market; FTA with USA and other Central American nations, awaiting passage with Canada; commitment to fiscal prudence.	Poor income distribution; economy linked to health of USA and EU based on volume of freight traversing Panama Canal; fiscal debt.

3.2 Formal Interviews with Businesses, NGOs, and Governmental Officials

To supplement the analysis by the business professionals, one of the Guatemalan-based researchers conducted more than fifty interviews with business professional, governmental officials and leaders of non-governmental organizations (NGOs) located in Guatemala, and primarily in the cities of Antigua, Guatemala City, and Quetzaltenango. The interviews were unstructured yet oriented around the EPIC framework variables. The Guatemalan researcher, fluent in Spanish, also worked with local interpreters and translators to ensure the quality of the interpretation of the interviews. The purpose of the interviews was to support the quantitative analysis and add a

qualitative context to the findings. The results of these processes are discussed below.

4. RESULTS

The eight teams assigned overall grades that ranged from C to B- as shown in **Table 4**. The German teams assigned overall grades one-half grade higher than the US teams. The US teams assigned three C's and a C+ while the German teams assigned three C+'s and a B-. Not surprisingly, the grades for each of the four EPIC sub-categories (Economy, Politics, Infrastructure, and Competence) were also similarly closely clustered.

Table 4. EPIC Analysis by MBA Teams: Germany And The United States (Economy Dimension Grades)

	Economic Output and Growth	Population	Foreign Investment	Direct	Exchange Rate	Stability/CPI	Balance of Trade	Overall Economy
German 1	B	B	B-		A		C	B
German 2	B- or C+	B	C+		B		C+	B-
German 3	C+	B	C		B		B-	B-
German 4	B-/C+	B	C+		B		C+	B
US 1	B-	B	C		B-		B	B-
US 2	B-	B	C+		B+		C-	B
US 3	B-	B-	C-		C-		C+	C
UX 4	B	C+	C		B+		C	B-

Table 5. EPIC Analysis by MBA Teams: Germany And The United States (Politics Dimension Grades)

	Ease of Doing Business	Legal Framework	Political Stability	Intellectual Property Rights	Overall Politics
German 1	C	C	B-	D+	C+
German 2	C-	D+	B	B-	C-
German 3	B-	D	C-	D	C-
German 4	C+	D	B-	C	C
US 1	C	D+	F	D+	D+
US 2	C-	D+	C	D	D+
US 3	C-	D+	C-	C-	C-
US 4	D	D-	F+	D-	D-

Table 6. EPIC Analysis by MBA Teams: Germany And The United States (Infrastructure Dimension Grades)

	Transportation Infrastructure	Energy Infrastructure	Connectivity	Overall Infrastructure
German 1	C-	B-	B+	C+
German 2	C-	B	C	C+
German 3	C	B-	B+	C+
German 4	C	B-	B+	C+
US 1	D+	B-	B-	C
US 2	D+	C	C+	C
US 3	B-	B+	B-	B-
US 4	C-	C	C-	C-

Table 7. EPIC Analysis by MBA Teams: Germany And The United States (Competence Dimension Grades)

	Labor Relations	Education Levels	Logistics Competence	Customs and Security	Overall Competence
German 1	B+	C+	C	B-	C+
German 2	B-	C-	C+	C+	C+
German 3	B+	C+	C	B-	C+
German 4	B-/C+	C-	C+	C+	C+
US 1	B+	C+	C+	B-	B-
US 2	C-	C+	B-	C-	C+
US 3	B+	C+	C	C-	C
US 4	B+	C+	C	B-	C+

For example, Economy scores ranged from C to B- for all the teams, but in this case, the US teams assigned a C while all other teams assigned grades of B or B-. Politics received the lowest scores with a range of D- to C+. Again US teams assigned lower scores than their German-based counterparts. Three US teams assigned D- or D+ to Politics while all the German teams' grades ranged between C- and B+. On Infrastructure, the teams were again consistent with a grade range of C- to B-, but in this case there was only one B- and the remainder of the grades ranged from C- to C+. Finally, on the Competence sub-score, the grades ranged again from C to B-, but this time, six of the eight grades were C+. The pattern of differences in grades between the German and US-based teams remained consistent.

The overall grade on the Economy dimension ranged from C to B, with four B-'s, three B's and a C. The Economic Output and Growth were very consistent grades ranging from B-/C+ to B. Two of the Germany teams could not determine between B- and C+. Population scores ranged from C+ to B, with six B's assigned. Foreign and Direct Investment grades ranged from C- to B- with three C+s, three C's, one B-, and one C-. The score for Exchange Rate Stability and the Consumer Price Index ranged from C- to A with three Bs, two B+s, an A, and B-, and a C-. We found this variation in scores somewhat surprising given the long term stability of the Guatemalan quetzal currency against the US dollar. On Balance of Trade, grades ranged from C- to B with three C+s, two Cs, and a C-, a B- and a B.

Of the four EPIC dimensions, grades for Politics were the lowest. Overall the Politics grades ranged from a D- to a C+ with US teams consistently assigning lower scores. The US teams had two D+'s, a C- and a D-. The German teams had a C+, two C-s and a C. On Ease of Doing Business the grades ranged from D to B- with three C-s, two C's a C+ and a B- and a D. On Legal Framework, the grades ranged from D- to C with four D+'s, two D's a C and a D-. On Political Stability the grades varied widely. They ranged from F to B- with two B-s, two C-s, a C a B an F and an F+. The differences between the US teams and the German teams were most apparent on Political Stability. The US teams assigned the F grades and the F+ while the German teams assigned the B and the two B-s. The Political Stability grades may have been influenced by the fact that immigration from

Guatemala to the US was controversial at the time of the assignment (Orlinsky& Gordon, 2015). On Intellectual Property Rights scores ranged from D- to B-. Again scores from US teams were generally lower than for their German counterparts. In this instance one German team assigned a grade of B- that was an anomaly. There were two D's, two D+'s, a D-, a C-, a C, and a B-.

The overall grades for Infrastructure ranged from C- to B-. All four German teams' assigned grades of C+. The US teams assigned two Cs a C- and a B-. On Transportation Infrastructure the grades ranged from C- to B-. The US teams again assigned lower grades than the German teams. The German teams assigned two Cs and two C- grades, while the US team assigned two D+, a C- and a B-. On Energy Infrastructure the grades ranged from C to B+. Three of the German teams assigned B-, one assigned a B. Two US teams assigned C while one assigned a B- and the other a B+. On Connectivity the grades ranged from C- to B+. Three of the German teams assigned the B+s, while one assigned a C. Two US teams assigned B-s and one assigned a C- and the other a C+.

The overall grades for the Logistics Competence EPIC dimension ranged from C to B-. Six of the scores including all four of the German teams were C+. One US team assigned a B- and one a C. On Labor Relations the scores ranged from C- to B+. There were five B+s, a B-/C+ a B-, and a C-. For Education Levels, the grades ranged from C- to C+. All four US teams assigned grades of C+, while two German teams assigned C+ and the other two assigned C-grades. On Logistics Competence, the scores ranged from C to B-. Four teams assigned C's, three teams' assigned C+s, and one assigned a B-. On Customs and Security grades ranged from C- to B- with four B-s, two C+s and two C-s.

It is worthy to note that one US team was especially negative on the Politics dimension. This team assigned two D-s, a D, and an F+ to the four dimensions that comprised Politics in the EPIC framework. In their discussion of these grades, the one US team was especially concerned with the impact of the drug cartels and illegal drug trade in Guatemala. All teams submitted detailed tables to support their assigned EPIC grades. Examples in each category are shown in **Table 4**.

Table 8. EPIC Analysis by MBA Teams: Germany And The United States Overall Grade Summary

	Economy	Politics	Infrastructure	Competence	Overall Supply Chain Readiness
German 1	B	C+	C+	C+	B-
German 2	B-	C-	C	C+	C+
German 3	B-	C-	C+	C+	C+
German 4	B-	C	C+	C+	C+
US 1	B-	D+	C	B-	C+

Table 8. EPIC Analysis by MBA Teams: Germany And The United States Overall Grade Summary

	Economy	Politics	Infrastructure	Competence	Overall Supply Chain Readiness
US 2	B	D+	C	C+	C
US 3	C	C-	B-	C	C
US 4	B-	D-	C-	C+	C

5. DISCUSSION AND AREAS FOR FUTURE RESEARCH

This research has answered the two research questions introduced earlier. First in considering how readily the EPIC framework can be applied by business professionals who are not necessarily experts in supply chain management, it appears that the EPIC framework can be readily applied by business professionals and while it is time consuming in a team environment, it produces results that should be useful in making broad, strategic supply-chain decisions about locating operations in specific countries. In this regard it is similar to other structured approaches like checklists and other grid-based analyses. The EPIC framework add discipline to data gathering and informs judgment. The fact that it helps to combine both quantitative and qualitative material is a further advantage to using the EPIC framework. The EPIC framework is designed to examine elements of the business climate affecting supply chains, providing a complex context to specific measures including the Logistics Performance Index.

However, the process has some limitations. It was apparent that US-based teams had a slightly lower opinion of the supply chain readiness of Guatemala than did their German counterparts. This could be due in part to the media coverage received about Guatemala during the time of the research. The German students were not exposed to the same media coverage of Guatemala as the US students. This suggests that some attention should be paid to the availability effect and to the anchoring effect that might affect the grading process. Both anchoring effect and availability effect suggest directions for future research in the application of the EPIC Framework.

Because this research was not aimed at producing a single, comprehensive rating for the country of Guatemala, the authors did not address rater differences. However, in practical circumstances this might be essential. In that case, we would recommend discarding extreme ratings at the subcategory level, for example in "Labor Relations" under "Competence", before arriving at an average rating. In practice, the number of raters would be fewer than used in this research study.

For example, the students in this research were given blank tables showing the US and nearby countries. If teams were given completed tables with lower scores indicated for less developed countries (i.e., Africa), it could influence them to assign lower scores to the countries they were analyzing. In addition, it may be that short-term experimental designs can show the influence of availability of specific kinds of information or the effect of timing on score assignment.

Research question two is answered in part by the above discussion of question one. It is clear the EPIC Framework can be readily applied, however, it must be applied consistently. Does the methodology transfer across backgrounds? The results in this research show some

consistent pattern for the overall grades but somewhat less consistency in some of the detailed subcategories within the EPIC analysis. This suggests that for more consistent results, usage of the EPIC framework should carefully consider the media context in which scores are being developed. In addition, following the process in an iterative fashion and using another team not involved in the first analytical process to break the ties in scores or to assign different weightings to EPIC could be useful. While this study used the weightings shown in the original research (Srivinasan, et al., 2014), an organization might assign different weightings to individual criteria. Before we can draw a final conclusion on the answer to research questions as to whether teams produce consistent results when they apply the EPIC framework to the same country, replications of this research are needed both with and without modifications. It would also be useful to see how other teams evaluated some of the same countries from the original EPIC classification (Srivinasan, et al., 2014).

Clearly this EPIC framework depends on data that are made available by a wide range of organizations including the CIA, the World Bank and the World Economic Forum. The results, consequently, will depend on the accuracy and timeliness of data gathered by these organizations. As discussed under data on Guatemala, official employment differs greatly from the way unemployment is calculated and measured in other countries. For example, the unemployment rate in the US is not based on the idea of having worked only one hour in a prior week, however, some of the variations in the data that are available and the problems that those variations cause are overcome by the amount of data gathered by the developing framework.

Further studies should have researchers grade the same 55 locations as in the original EPIC study (Srivinasan, et al., 2014) and see how well it replicates and if there is bias toward an individual's own country or region. Individuals in this study benchmarked Guatemala with the Central and North American Region from the original EPIC study not including Canada. Further research should determine if the rankings (of anchor, peer countries) make a difference. For example, if Guatemala were ranked on forms that included data from less developed African countries, for example, would the framing/anchoring make a difference? Research on how managers using similar information make decisions is also needed to compare to the variables and weightings within the EPIC Framework for validation. It could be subjected to further assessment as a pedagogical tool. The framework does push students to understand a variety of factors that influence supply chain location decisions and supply chain performance. As a teaching pedagogy, it is useful to assess student satisfaction with applying this framework and compare its use to learning of supply chain concepts within a global context using other teaching methods.

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APPENDIX

Table 9. Scores for the Economy Dimension (30% EPIC Weight)

	Economic Output and Growth Rate	Population Size	Foreign Direct Investment	Exchange Rate Stability/CPI	Balance of Trade	Overall Grade
	35%	25%	20%	15%	5%	100%
USA	B-	A	B+	A	B	B+
Guatemala						
Mexico	B	A	B+	B	B+	B+
Costa Rica	B-	C	B-	B	D	C+
Panama	B+	C	B	A-	C+	B

Source: Srinivasan, Mandyam; Theodore Stank, Phillipe-Pierre Dornier, and Kenneth Peterson, (2014) *Global Supply Chains: Evaluating Regions on an EPIC Framework – Economy, Politics, Infrastructure, and Competence*. New York: McGraw Hill.

Table 10. Strengths and Weaknesses Summary: Economy Dimension

Grade	Strengths	Weaknesses
USA: B+	Absolute volume of GDP; global percent of GDP; absolute amount of exports; consumer price inflation low; stable exchange rates; large FDI; diversification of economic sectors; population and workforce growth (mainly due to immigration from Mexico).	High costs of taxes, land, labor, and capital; GDP growth low; negative balance of trade; negative budget surplus could cause instability; again population.
Guatemala:		
Mexico: B+	Real GDP growth; export volume; proximity, economic, and regulatory ties to the United States; low cost of living; low unit labor costs; low cost of capital; raw commodity energy reserves; relatively stable business environment and regulations for FDI.	High consumer price inflation; unstable exchange rate; low and risky capital markets; low FDI; high poverty and poor distribution of wealth; poor tax collection rates; strong “black market” economy; regional variation if high, with the south poor, underdeveloped, and educated, poor education system.
Costa Rica: C+	Trade ties within and beyond the Western Hemisphere; economic activity to expand long term; recent history of location of large electronic firms.	Economic growth tied to the United States; fiscal account deficit to continue based on needed expenditures on security and infrastructure.
Panama: B	One of the world’s fastest growing economics; dollarized economy that removed exchange rate risk; Panama Canal and Colón free trade zone; privatization of the power generation system and telecoms, and the relative flexibility of the labor market; FTA with USA and other Central American nations, awaiting passage with Canada; commitment to fiscal prudence.	Poor income distribution; economy linked to health of USA and EU based on volume of freight traversing Panama Canal; fiscal debt.

Source: Srinivasan, Mandyam; Theodore Stank, Phillipe-Pierre Dornier, and Kenneth Peterson, (2014) *Global Supply Chains: Evaluating Regions on an EPIC Framework – Economy, Politics, Infrastructure, and Competence*. New York: McGraw Hill.

Table 11. Scores for the Politics Dimension (20% EPIC Weight)

	Ease of Doing Business	Legal Framework	Political Stability	Intellectual Property Rights	Overall Grade
	30%	30%	25%	15%	100%
USA	A	A-	B-	A-	A-
Guatemala					
Mexico	B	C	C	C	C+
Costa Rica	C+	B-	A	B-	B
Panama	B-	B-	D	C+	C+

Source: Srinivasan, Mandyam; Theodore Stank, Phillipe-Pierre Dornier, and Kenneth Peterson, (2014) *Global Supply Chains: Evaluating Regions on an EPIC Framework – Economy, Politics, Infrastructure, and Competence*. New York: McGraw Hill.

Table 12. Strengths and Weaknesses Summary: Politics Dimension

Grade	Strengths	Weaknesses
USA: A-	Stable, fair, pro-business legal and regulatory framework; low bureaucracy; low bribery and corruption; low tariff barriers; low risk of political instability; fair treatment for FDI; absolute tax rate pro-business; strong intellectual property rights; strong expenditures on education.	Uncertainty over recent political gridlock; complex tax code; tax code varies by state; high border security regulations; complex employment and labor laws; some political corruption.
Guatemala:		
Mexico: C	Stable political system; good Lawson books for tax, IP, but enforcement an issue; good regulations for trade zones to protect import and re-export (related to maquiladora).	Complex legal and regulatory framework; high levels of bureaucracy with “irregular payments” often the norm; high levels of bribery and corruption; complex tax code and reporting requirements; relatively high tariff and protection barriers; FDI rules are open but significant monopoly and oligopoly prevents fair application of rules; some industries (energy, telecommunications, freight, transportation) protected against FDI; good IP laws, but in practice much piracy and counterfeiting; stiff and complex labor laws.
Costa Rica: B	One of the most solid democracies in Latin America with peaceful and transparent election processes; pro-market and social policies; good security record; skilled labor force; legal regulations concerning business are generally straightforward; low levels of corruption; well-defined tax code.	Upsurge in drug trafficking and related violent crimes; struggling to come to terms with the country’s ailing financial situation; recent corruption scandals; regulatory environment can be complex for foreign ownership in industries with state-owned firms; bureaucratic inefficiency; IP rights a concern.
Panama: C+	Generally stable political environment; business-friendly president and legal system with pro-business agenda; modern procurement, business ownership, and consumer protection legislation; modern customs process; flexible labor laws in Canal Zone and FTZ.	High levels of corruption in judiciary; security issues and violence rising linked to drug organizations; pro-business agenda has stoked domestic tension, generating strong protests; lack of efficient protection of intellectual property, particularly when it comes to piracy and counterfeit items; restrictive labor laws limit hiring, compensation, firing, and flexibility.

Source: Srinivasan, Mandyam; Theodore Stank, Phillippe-Pierre Dornier, and Kenneth Peterson, (2014) *Global Supply Chains: Evaluating Regions on an EPIC Framework – Economy, Politics, Infrastructure, and Competence*. New York: McGraw Hill.

Table 13. Scores for the Infrastructure Dimension (30% of the EPIC Weight)

	Transportation Infrastructure	Energy Infrastructure	Connectivity	Overall Grade
	50%	25%	25%	100%
USA	A-	B+	B	B+
Guatemala				
Mexico	B-	C	C	C+
Costa Rica	D	B	C+	C-
Panama	A-	B	B	B+

Source: Srinivasan, Mandyam; Theodore Stank, Phillippe-Pierre Dornier, and Kenneth Peterson, (2014) *Global Supply Chains: Evaluating Regions on an EPIC Framework – Economy, Politics, Infrastructure, and Competence*. New York: McGraw Hill.

Table 14. Strengths and Weaknesses Summary: Infrastructure Dimension

Grade	Strengths	Weaknesses
USA: B+	Good access to commodities; improving energy picture with Canadian shale oil and natural gas; excellent road, rail, water, and airport system; internal river system best in the world although underutilized for domestic transport; good telecommunications capabilities, leading innovators; leader in e-commerce for Business-to-Business (B2B) and Business-to-Consumer (B2C).	Need for expanded capacity and investment in infrastructure a major challenge for coming years; air industry troubled, possibly in need of reregulation; power distribution extensive but outdated; high-speed telecommunications lags Europe and developed Asia; telecommunications industry fragmented.
Guatemala:		
Mexico: C+	One of the best infrastructures in LATAM, but not up to par with USA or Canada; air network particularly good; significant investment in ports and rail to connect to USA, especially Manzanillo, Lazaro Cardenas, (both Pacific coast) and Veracruz (Gulf); quality of road, rail, water, and air transport improving with privatization.	Road, rail, water, air transport, power distribution, and telecommunications still not at levels of industrialized world, with many challenges and barriers; availability and quality of infrastructure varies greatly across the country, being generally good in the central plain and north but poor in the south.
Costa Rica: C-	Strong air cargo system; Pacific and Caribbean/Atlantic port access; good power distribution, water access, and telecommunications.	Poor road and rail infrastructure; limited cargo capacity in seaports.
Panama: B+	Panama Canal; Colón Free Trade Zone; modern telecommunications and power distribution grid; sufficient road and rail connectivity between Pacific and Caribbean/Atlantic ports.	No continuous east-west highway to link North and South America.

Source: Srinivasan, Mandyam; Theodore Stank, Phillipe-Pierre Dornier, and Kenneth Peterson, (2014) *Global Supply Chains: Evaluating Regions on an EPIC Framework – Economy, Politics, Infrastructure, and Competence*. New York: McGraw Hill.

Table 15. Scores for the Competence Dimension (20% of the EPIC Weighting)

	Labor Relations	Education Levels	Logistics Competence	Customs and Security	Overall Grade
	25%	25%	40%	10%	100%
USA	A-	A-	A	A	A
Guatemala					
Mexico	C	C+	B	C+	B-
Costa Rica	B	B+	C	C	B-
Panama	C-	C-	B-	C+	C+

Source: Srinivasan, Mandyam; Theodore Stank, Phillipe-Pierre Dornier, and Kenneth Peterson, (2014) *Global Supply Chains: Evaluating Regions on an EPIC Framework – Economy, Politics, Infrastructure, and Competence*. New York: McGraw Hill.

Table 16. Strengths and Weaknesses Summary: Competence Dimension

Grade	Strengths	Weaknesses
USA: A	Workers are highly productive; working age population is growing due to Mexican immigration; education has its detractors, but in general fares well in education and training categories, both for labor and management; unions are weakening compared to other industrialized nations, although this varies by region; labor relations are good, logistics and transportation among the best in the world.	Overall skilled labor pool is shrinking; some big problems underlie the education system; training programs akin to apprentice programs in Europe are poor or nonexistent.
Guatemala:		
Mexico: B-	Productivity is improving (but still far below global standards); growing and young workforce; union membership in most industries low; government working to improve training and education.	Productivity lags global average; ensuring that workers show up has been a huge problem in the maquiladora industry; education, training, and managerial skills far below the global average; shortages of skilled workers in key industries; logistics industry lag industrial world.
Costa Rica: B-	Skilled labor is readily available; highly educated and literate; English commonly spoke; low levels of unionization and good labor relations; good productivity of labor and improving; overall logistics service industry satisfactory (but some issues).	Lack of integration in logistics service forces companies to deal with multiple parties, especially when utilizing seaports (lack of organization).
Panama: C+	Young and growing workforce; fairly well educated and skilled; Panama Canal zone employees cannot strike, significant presence of global third-party logistics firms making integrated logistics a strength; strong customer and international shipping capability.	Organized labor relatively strong; limited skilled workforce capacity.

Source: Srinivasan, Mandyam; Theodore Stank, Phillipe-Pierre Dornier, and Kenneth Peterson, (2014) *Global Supply Chains: Evaluating Regions on an EPIC Framework – Economy, Politics, Infrastructure, and Competence*. New York: McGraw Hill.

Table 17. Summary Assessment of EPIC Attractiveness of Key North and Central American Nations

	Economy	Politics	Infrastructure	Competence	Overall Grade
USA	B+	A-	B+	A	A-
Guatemala					
Mexico	B+	C+	C+	B-	B-
Costa Rica	C+	B	C-	B-	C+
Panama	B	C+	B+	C+	B-

Source: Srinivasan, Mandyam; Theodore Stank, Phillipe-Pierre Dornier, and Kenneth Peterson, (2014) *Global Supply Chains: Evaluating Regions on an EPIC Framework – Economy, Politics, Infrastructure, and Competence*. New York: McGraw Hill.