

# Engineering Aspects of Offshore Outsourcing

And Public Policy Investigation

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August 6, 2004

Sponsors  
National Society of Professional Engineers  
Washington Internships for Students of Engineering  
National Science Foundation

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Key Terms: Offshore Outsourcing, Engineering Work, Public Policy, Trade Agreements,  
Mutually Recognized Agreements

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# **Executive Summary**

While offshore outsourcing has received a flurry of attention, the offshore outsourcing of engineering work has not been specifically addressed. This report investigates the trends behind offshore outsourcing including licensing, trade agreements and issues of quality. This report does not look at offshore outsourcing of information technology, software, or any other type of work besides engineering. Reported L-1 and H-1B Visa abuses are not examined and the benefits and drawbacks to offshore outsourcing are not discussed.

Through this analysis, it was determined that public policy regarding the offshore outsourcing of engineering work is not necessary at this time, but may be necessary in the future. In order to determine this need, various studies are recommended that would result in a better understanding of this trend. The background leading up to this recommendation will be briefly discussed.

The public outcry over the loss of service jobs is partially due to the fact that these jobs are seen as making up for the loss of manufacturing jobs in the 1990's. Over ten years, manufacturing jobs declined by 4.5% (Bureau of Labor Statistics). Service jobs attenuated these losses and grew by 4% in this same time period.

Key factors enable engineering work to be offshore outsourced. The first is increasing technological capability in developing countries. This stems from government initiatives and cheaper computers. The second factor is a salary differential that makes it appealing for companies to use cheaper offshore labor (as small as 1/5 the cost of an engineer in the United States). The third factor is the increasing educational base in developing countries. The number of engineering graduates in relevant countries (China, South Korea) is growing at a faster rate than that of the United States.

There is a strong market in the United States for engineering. The unemployment rate for engineers was less than the national average unemployment for all engineering disciplines except computer and electrical engineers in 2003. Salaries in aerospace, mechanical, and civil engineering grew faster than that of the average from 1995 to 2000. Salaries for electrical, chemical, and industrial grew slower than the national average. Additionally, there is a trade surplus in the United States for research and development. More R&D is brought into the United States from other countries than is outsourced from the United States to foreign countries.

To understand whether these jobs are at risk for offshore outsourcing, it is necessary to examine the nature of engineering work. Engineering work is generally not seen as a commodity. It is seen as an iterative process of design and reevaluation. There are many stages—planning, design, manufacturing or construction, and then finalization. Each step requires the skills and expertise of an engineer in different ways. The final step may require an engineer to actually operate, teach the operation, or sell the product.

While the entire engineering process does not seem conducive to offshore outsourcing, there are pieces that can be outsourced. Typically, a company outsources projects or engineering tasks to another company within the United States. However, some of this work is starting to go offshore.

Larger engineering companies would actually set up divisions abroad where they would hire foreign engineers to work for their company. For example, Boeing has a Russian division designing airplane components. General Electric employs over 6000 engineers and scientists in Israel, Hungary, India and China to research and develop imaging technologies.

Smaller companies or smaller projects are able to be offshore outsourced through consulting companies (U.S. or foreign owned) that facilitate the completion of engineering work. The case study given in the following report shows that mainly design, computer aided drafting, and manufacturing is being offshore outsourced.

It is not known how much work is offshore outsourced. However, as there is much work that is outsourced within the United States (data for percentage of work done within a company versus percent outsourced could not be found), this shows a potential for this work to be outsourced overseas. Therefore, looking at work currently outsourced domestically may be an indicator for work to be offshore outsourced. This is a method for predicting engineering job losses.

There are many processes that limit the amount and type of work that can be offshore outsourced: proximity needs, expertise, licensure, and quality of work. Construction or manufacturing engineering requires proximity to where the project is being undertaken. U.S. engineers possess expertise in specific areas, making it undesirable to use foreign engineers. Certain types of engineering work require the signature of a licensed engineer. Thus far, it is difficult for a foreigner to become licensed or for licensed engineers to sign off on work that is not done under their direct supervision. Finally, if offshore outsourcing results in diminished quality, insurance companies may take notice and charge higher premiums. This added expense would make offshore outsourcing less appealing.

Legislative limits have been proposed or enacted in the U.S. Congress and in over 30 states. The type of legislation usually takes one of four forms: limiting government procurement, preventing companies that offshore outsource from receiving government benefits, extending Trade Adjustment Assistance, privacy protection and reforming Visa procedures. The Thomas-Voinovich amendment has already been signed into law. The amendment acts as a temporary ban on government contracts being performed offshore. The Dodd amendment, which has already passed in the Senate and is waiting for a vote in the House, would make the ban more permanent and wide-spread. Legislation involving government procurement is limited due to trade agreements that have been signed by the U.S. According to the Government Procurement Agreement in the World Trade Organization (WTO), the U.S. government agrees to open procurement to 27 countries. The North American Free Trade Agreement opens procurement to Mexico and Canada. As the Dodd amendment makes an exception for WTO responsibilities, the amendment is much less encompassing than it may seem.

The remaining types of legislation have not been brought to fruition. The Boxer amendment, with provisions for most of these types of legislation, failed in the Senate. Furthermore, it is difficult to penalize companies that offshore outsource as there is currently no method for monitoring these companies, nor have federal agencies planned to study this. A representative from the Department of Commerce (DOC) said that the agency currently has no plans to track offshore outsourcing statistics. There is proposed legislation to allocate \$2 million to the DOC to study this trend.

Without statistics, it cannot be proven that there are large losses of engineering jobs. Currently, most engineering work that is outsourced goes to companies within the U.S. Based on these two observations, public policy regarding offshore outsourcing of engineering work is not necessary at this time (the issue of Visa reform may be necessary, but this was not examined). Legislation may be necessary in the future. Therefore, the conclusion reached is that two studies are necessary. The first is to monitor how many engineering jobs are lost due to offshore outsourcing. The second is to monitor the type and quality of work that is sent abroad. This is necessary to determine if the public welfare is in danger due to issues of quality or lack of professional engineering oversight. A final concern would be the security risks associated with the transfer of sensitive information relating to critical infrastructure.

# Definitions and Acronyms

## Definitions

### Offshoring

to set up an entire facet of a business operation overseas.

### Outsourcing

to hire someone outside of the company to perform work for the company

### Offshore outsourcing, overseas relocation, globalization services, or sourcing

To send work to a foreign country OR to send a job overseas by hiring an engineer in a foreign country to do the job

## Acronyms

ABET	Accreditation Board for Engineering and Technology
AIChE	American Institute of Chemical Engineers
APEC	Asian-Pacific Economic Cooperation
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
BLS	Bureau of Labor Statistics
DOC	Department of Commerce
DOL	Department of Labor
FTA	Free trade agreement
FTAA	Free Trade Agreement of the Americas
IEEE	formerly the Institute of Electrical and Electronics Engineers
ISO	International Standards Organization
MRA	Mutual recognition agreement
NAFTA	North American Free Trade Agreement
NCEES	National Council of Examineers for Engineering and Surveying
NSPE	National Society of Professional Engineers
QBS	Quality based selection
TEP	Trans-Atlantic Economic Partnership
U.S.	United States
USTR	United States Trade Representative

# Introduction

An Indiana automotive manufacturing company wanted to add a new component to their plastic molding process last spring. They looked for different options in the U.S. and finally decided to outsource the design and manufacture of the tool to a U.S. consulting company. The company quoted them a price and a contract was drawn up. The consulting company emailed the specifications to a companion company in India. Indian engineers designed and drew up the plans for the tool, which they sent back to the U.S. via the internet. Next, the U.S. consulting company sent these plans to an affiliated company in China. Chinese engineers manufactured the tool and sent it back to the U.S.

This is one example of the offshore outsourcing of engineering work. Onshore outsourcing plays a large role in the engineering industry—from government procurement to private businesses' method for dealing with fluctuations in demand. Outsourcing has been common for at least 20 to 30 years. What has changed is illustrated by the previous anecdote. Engineering services, especially in design, can easily be exchanged offshore.

This trend to offshore outsource has manifested itself in the I.T. industry and through call centers doted on by the press. The trends in these areas may be a prediction of what is to come for the engineering industry. Engineering services are unique in that the type of work affects consumers in a very physical manner from cars that are driven to buildings that are resided in. Multiple issues come into play such as quality, standards, and ethics.

The significance of this issue is very high. There has been much press attention and fear regarding the loss of American jobs. This fear cannot be allayed by statistics as tangible data on job losses related to offshore outsourcing do not exist. Thus there has been a huge public outcry that has resulted in about 30 proposed bills in the U.S. Congress and proposed legislation in 37 states legislators.<sup>1, 2</sup>

One reason for the outcry is that service jobs are seen as the solution to the loss of low-wage manufacturing jobs, but now service jobs are also being offshore outsourced. As the type of jobs being outsourced climb up the wage and skill ladder, more people are becoming concerned—including engineers. Some have reacted emotionally and demanded protectionist measures by the federal government. Others have stood by laissez faire economics—saying that the market will fix the problem. In the long run, nobody really understands how this phenomenon will affect the country as relatively few engineering jobs are being outsourced compared to future predictions.

In this paper, it will first be determined if legislation is necessary, and then what is the appropriate legislation: be it protectionist, enhancement, or regulatory. The need for legislation is governed by a few ideas: market failures caused by externalities, need to provide a public goods, and monopolies.<sup>3</sup>

Market failures can be caused by externalities, which includes costs or benefits not accounted for by an economic decision-maker. This relates to offshore outsourcing in the context of how the labor market is changed. If offshore outsourcing leads to increased market productivity, job losses will at least equal job creation and there is no externality. If this phenomenon results in extreme job losses that are not made up for in job creation, government intervention in the form of federal legislation is needed. A second externality may be the state control of international trade. Engineering licensure rules and regulations are made at the state level. As these rules vary, they may end up determining how engineering services can be traded across borders. International trade is under the jurisdiction of the federal government. It must be seen if the procurement of

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<sup>1</sup> National Congress of State Legislators. Offshore Outsourcing and Related Legislation: Current Federal Action. 20 April 2004. Online: <http://www.ncsl.org/standcomm/scecon/04offshorefed.htm>.

<sup>2</sup> National Foundation for American Policy. Summary List of States with New Laws and Proposed Legislation Restricting Outsourcing. 2004. Online: <http://www.nfap.net/researchactivities/globalsourcing/summary/summaryList.pdf>.

<sup>3</sup> Trumbull, William. [www.be.wvu.edu/divecon/econ/trumbull/china/econroles.ppt](http://www.be.wvu.edu/divecon/econ/trumbull/china/econroles.ppt) prof at west va uni

engineering services is seen as trade by the federal government and if they consider this issue under their jurisdiction.

Public goods are items that the citizens cannot provide for themselves such as national security. Public goods are also common goods that the government would regulate so that it is available for all; examples of this include clean air and clean water. This applies to offshore outsourcing in the issue of national security and safety. National security applies in the sense that sending drawings and plans overseas might increase the risk of such plans being given to the wrong people. This might put the nation's critical infrastructure at further risk. The second issue is safety. The training and work of engineers abroad may not be at the same standards of those of the engineers in the U.S. This could result in bad work, something that is remedied in the U.S. by licensure or industrial oversight. The final public good is the base of technology infrastructure. If outsourcing results in the offshoring of research and development centers, the technological base in the U.S. may begin to erode. The U.S. may find that skilled scientists are moving abroad to follow the jobs.

The third circumstance, monopolies, does not directly apply to the offshore outsourcing of engineering work. The one thing that could happen along these lines is that the cost reduction experienced by large corporations puts smaller businesses at an unfair disadvantage. This may cause the smaller companies to go out of business.

In order to determine if any of the following conditions exist for the offshore outsourcing of engineering work, many aspects of the trend will be looked at. This paper will examine the multiple aspects that guide the offshore outsourcing of engineering work: trade agreements, quality, and legislation. Trade agreements will be looked at to determine how they mandate international trade in engineering services. Quality will be looked at in terms of two standards. One will look at how licensure affects engineering work and what role licensure plays in the international arena. The second standard examined will be the education and ability of engineers to do engineering work. The final aspect explored will be how current legislation affects the offshore outsourcing and what future legislation is being considered.

Examination of these aspects could be used to determine legislation or forecast future trends in the offshore outsourcing of engineering work. This report is written to explore the various facets of offshore outsourcing and gain a better understanding of how engineering work plays a role in this.

# Engineering Services

In order to understand offshore outsourcing of engineering work, it is first necessary to understand what engineering work consists of and the role that licensing plays in its application.

## What is Engineering Work

Priscilla Nelson, senior advisor for the Directorate for Engineering at the National Science Foundation, defines an engineer as a professional who uses scientific methods and discoveries to create utility.<sup>4</sup> The International Technology Education Association defines engineering as involving “the knowledge of the mathematical and natural sciences (biological and physical) gained by study, experience, and practice that are applied with judgment and creativity to develop ways to utilize the materials and forces of nature for the benefit of mankind.”<sup>5</sup>

Engineering work is unique in the sense that it is generally not considered a commodity; rather it is considered a value-added service. It is not something that can be automated as there are always different factors and emerging technologies. Figure 1 best illustrates the process of engineering. The flowchart models how the engineering process is interconnected. The engineer is in contact with the client at all steps. The user may also be brought in the process. This is an iterative process. Constant reevaluation of the process and the progress is required. This leads to modifications. Upon completion, the engineer may be involved in the operation, the sales, or may teach the use of the product.

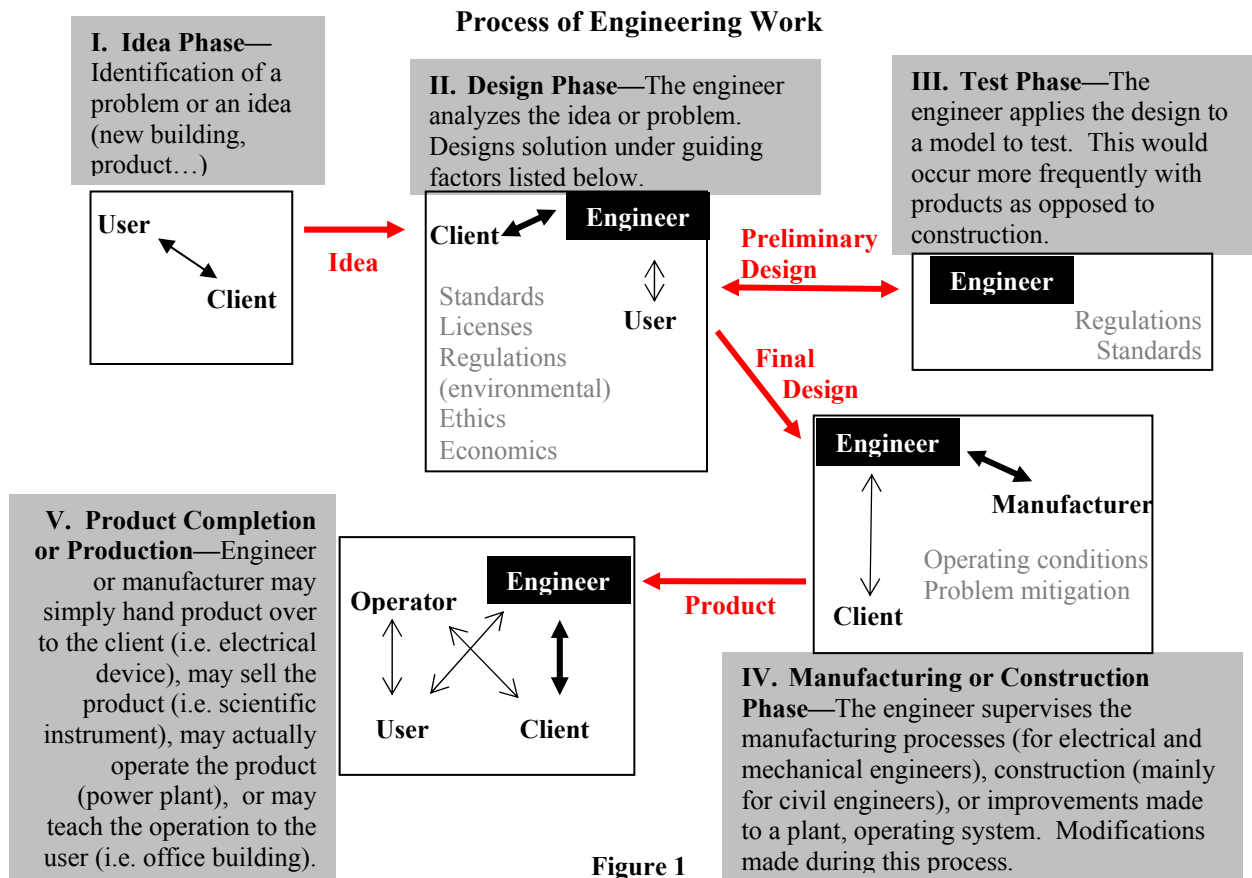


Figure 1

<sup>4</sup> Nelson, Priscilla, Senior Advisor for the Directorate for Engineering, National Science Foundation.. Personal Interview. 23 June 2004.

<sup>5</sup> “Definitions.” International Technology Education Association. Online: <http://www.iteawww.org/TAA/Glossary.htm>.

There are many factors that unite engineering disciplines: a strong emphasis on ethics, safeguarding public health, standards, regulations, contracts, the economy, and an associated culture.

The importance of ethics in engineering manifests itself from the education, to licensing, and on to continued education. This emphasis is included in engineering education, the process to be licensed, and continued learning. Additionally, the organization that certifies university engineering programs, ABET, requires that “[e]ngineering programs must demonstrate that their graduates have...an understanding of professional and ethical responsibility”.<sup>6</sup> The National Society of Professional Engineers (NSPE) has the following code of ethics<sup>7</sup>:

#### I. Fundamental Canons

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health and welfare of the public.
2. Perform services only in areas of their competence.
3. Issue public statements only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

As far as professional advancement, the NSPE’s website includes sample case studies in ethical considerations and judgments so that its members can heighten their awareness.

The engineering profession places a strong emphasis on safeguarding life, health, property and public welfare. California’s Professional Engineers Act states that “protection of the public shall be the highest priority for the Board of Professional Engineers and Land Surveyors in exercising its licensing, regulatory, and disciplinary functions.”<sup>8</sup>

Standards play a large role in engineering work as much of engineering results in the design of products. Standards serve to facilitate the reproduction and ensure compatibility between products. This could be in the form of standard software formats to guidelines for fitting screws or pipes. The United States has two standards making bodies: the National Institute of Standards and Technology (NIST) and the American National Standards Institute (ANSI). Both organizations create voluntary standards. The main difference is that NIST is a non-regulatory agency within the Department of Commerce and ANSI is a private, non-profit organization that coordinates many voluntary standards. There also exists the International Standards Organization (ISO) that develops global standards.

Regulations state the rules that govern a project. Regulations are how the government regulatory agencies interpret legislation enacted by legislative bodies or rulings by the court system.

Contracts are used for one-time projects such as construction of a building or the manufacture of parts. Its purpose is it to outline the terms of agreement for the work process as well as costs. There are two types of contracts used: low bid and quality based selection (QBS). Low bid was the standard for the federal government until 1972 when the Brooks Act (Public Law 92-582) was passed to amend the Federal Property and Administrative Services Act of 1949.<sup>9</sup>

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<sup>6</sup> Engineering Accreditation Commission. “Criteria for Accrediting Engineering Programs.” Accreditation Board for Engineering and Technology. 01 November 2003. Online: [www.abet.org](http://www.abet.org).

<sup>7</sup> National Society of Professional Engineers. “NSPE Code of Ethics for Engineers.” (July 2004). Online: [www.nspe.org](http://www.nspe.org).

<sup>8</sup> “2004 Professional Engineers Act.” California's Board for Professional Engineers and Land Surveyors. 01 January 2004. Online: [http://www.dca.ca.gov/pels/2004\\_pe\\_act.pdf](http://www.dca.ca.gov/pels/2004_pe_act.pdf).

<sup>9</sup> “The Brooks Act: Federal Government Selection of Architects and Engineers.” Government Services Agency. (July 2004). Online: [http://pbs.sunbelt.gsa.gov/idiq/documents/brooksAct\\_92-582.pdf](http://pbs.sunbelt.gsa.gov/idiq/documents/brooksAct_92-582.pdf).

This law sets the process that must be used for all federal government procurement of engineering and architecture work. The first step requires that the government advertise for companies. The government shall then “evaluate current statements of qualifications and performance data on file with the agency”, ranking the top three candidates. At this point, a contract and prices are negotiated with the first ranked firm. If a contract cannot be negotiated “at a price he determines to be fair and reasonable to the Government”, then negotiations are begun with the second-ranked firm and potentially on to the third-ranked firm. NPSE supports this structure saying that “Consultants will not be under pressure to minimize their efforts by devoting less time to project details, by considering fewer alternatives, or reducing the amount of checking. This means the project will be safer, more efficient, cheaper to build and more economical to operate over its life cycle...[to ensure a fair price] there is a wide spectrum of documentation on fee scales available to the client.”<sup>10</sup>

Licensure is a professional standard that allows licensed engineers to sign and seal drawings. Usually a license is required for construction projects such as buildings. It is a method for holding someone responsible for his/her work. State laws vary for what type of work requires the signature of a licensed engineer. This report divides engineering work into two categories: licensure activities and non-licensure activities. These are unique in that an activity that requires licensure (meaning that the work must be undertaken under the auspices of a licensed professional engineer or P.E.) is regulated by additional laws and rules that do not apply to activities not requiring the seal of a P.E. Licensure will be looked at more closely in the following section.

Additionally, the current state of the economy controls engineering work. During a robust economy, there are more construction projects and a higher demand for engineering services. Economic issues also drive the decisions taken: this may mean looking for cheaper products or methods. Engineers try to secure the lowest price for their client while staying within the range of their ethical obligation to public health, safety, and welfare. Obtaining the best price may require using offshore labor.

There are many aspects of engineering that relate to its culture. Understanding what an engineer does is important in understanding whether such jobs can be offshore outsourced. Ms. Nelson (mentioned above) believes that engineering has an associated culture. She believes that this is a culture of trust that is brought through constant contact with the client. As a longtime practicing engineer, she states that a handshake and a meeting are crucial to the role of an engineer. She sees the job of an engineer as involving the planning, the work, the monitoring, and the completion, which all require the physical presence of an engineer at a site. Thus this type of work is an iterative process that requires continuous cooperation.

Ms. Nelson does say that some of the repetitive tasks that do not require a high skill level, but which are associated with engineering, could be outsourced. These components are code-based designs, computer aided drafting (CAD) drawings, and business processes. Additionally, she believes that while most large engineering processes are not suited for outsourcing, some processes are adaptable. These include major transportation routes and building complexes. These both require repetitive work, which is able to be outsourced.

## Engineering Disciplines

The main areas of engineering that will be looked at here are civil, mechanical, and electrical engineering. These different disciplines do varying types of work while using science to create utility.

California’s Professional Engineers Act (Business and Professions Code §§ 6700—6799) is the state legislative bill that oversees engineering related work.<sup>11</sup> It states that civil engineering work includes

- The economics of, the use and design of, materials of construction and the determination of their physical qualities.
- The supervision of the construction of engineering structures.
- The investigation of the laws, phenomena and forces of nature.

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<sup>10</sup> International Federation of National Associations of Independent Consulting Engineers (FIDIC). “Quality-Based Selection.” (July 2004). Online: <http://www1.fidic.org/resources/selection/qbs/qbsdef-4.htm>.

<sup>11</sup> “2004 Professional Engineers Act.” California's Board for Professional Engineers and Land Surveyors. Previously cited.

- Appraisals or valuations.
- The preparation or submission of designs, plans and specifications and engineering reports.
- Coordination of the work of professional, technical, or special consultants.
- Creation, preparation, or modification of electronic or computerized data in the performance of the activities described [above].

The act states that electrical engineering work:

embraces studies or activities relating to the generation, transmission, and utilization of electrical energy, including the design of electrical, electronic, and magnetic circuits, and the technical control of their operation and of the design of electrical gear. It is concerned with the research, organizational, and economic aspects of the above.

The act states that mechanical engineering work:

deals with engineering problems relating to generation, transmission, and utilization of energy in the thermal or mechanical form and also with engineering problems relating to the production of tools, machinery, and their products, and to heating, ventilation, refrigeration, and plumbing. It is concerned with the research, design, production, operational, organizational, and economic aspects of the above.

This is a broad overview of engineering work. The specific types of work done will be looked at in the section titled 'Logistics of Offshore Outsourcing'. First, one specific type of governance, licensure, will be looked at in order to later understand what role this plays in international treaties.

## Engineering Licensure

Licensure is a process whereby engineers receive a license enabling them to supervise specific engineering work outlined by state governments. Subsequently, they are given the title 'Professional Engineer' (P.E.). The licensure process consists of four steps. The first step is to receive a degree from a university accredited by the Accreditation Board for Engineering and Technology (ABET). The second step is to pass the fundamentals of engineering exam administered by the National Council of Examiners for Engineering and Surveying (NCEES). The third step is gaining work experience. The final step is to pass the Principles and Practice Exam as given by the NCEES. These steps are controlled by the two bodies: ABET and NCEES. The actual rules regarding the number of years of experience required, citizenship requirements, and other such logistics are controlled by each state's engineering board. The logistics of the board are determined by the state legislators. The National Society of Professional Engineers (NSPE) is an advocacy group for licensed engineers.

Licensure is the method for engineers to demonstrate skills in their respective disciplines. Obtaining a license is not necessary for all types of engineering jobs. The California Professional Engineers Act defines a professional engineer as<sup>12</sup>:

[a] person engaged in the professional practice of rendering service or creative work requiring education, training and experience in engineering sciences and the application of special knowledge of the mathematical, physical and engineering sciences in such professional or creative work as consultation, investigation, evaluation, planning or design of public or private utilities, structures, machines, processes, circuits, buildings, equipment or projects, and supervision of construction for the purpose of securing compliance with specifications and design for any such work.

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<sup>12</sup> "2004 Professional Engineers Act." California's Board for Professional Engineers and Land Surveyors. Previously cited.

Thus the difference between a licensed and a non-licensed engineer is that the licensed engineer has gone through a process to prove aptitude in a specific skill set.

The reason that engineers obtain a license is that some engineering work requires the signature and seal of a professional engineer. The vast majority of this work falls under the engineering of structures such as bridges, roads and buildings. This work is different from other types of engineering work for a variety of reasons. To begin with, each project is unique. This is due to the design, the materials, and the location upon which it is being built. Outside conditions vary also, such as the climate, the soil type, the season, and the setting. These nuances call for additional scrutiny.

This differs from manufacturing jobs where one product is made multiple times. More research and development will go into the making of a manufactured product as it will be reproduced. If there is a problem, it is easier to hold the manufacturer directly liable.

In construction projects, the engineer has to watch out for the public good, not just that of the customer. This is very important for products that are expected to last even longer than the life of the designer. When a licensed engineer seals a drawing, that person assumes responsible charge. This signifies that this person is legally bound to the quality of the work. Such a person could be held liable for damages resulting from the work. The engineer is responsible for all work performed: be it their own work or the work of a subordinate.

All regulations concerning engineering licensure are governed by the 50 states and five territories. Independent licensing boards administer and enforce the laws in all 55 regions. The boards are charged with developing the eligibility requirements and the guidelines for licensure. They also define when it is necessary that a licensed engineer sign and seal work. They state when work may be performed by a subordinate. These rules vary from state to state.

One example of state legislation is the Texas Engineering Practice Act.<sup>13</sup> This governs “all engineering work which is defined by the need for engineering education, training, and experience in applying special knowledge or judgment of the mathematical, physical, or engineering sciences to that services or creative work.” It states that for public works “the engineering plans, specifications, and estimates have been prepared by an engineer and the engineering construction is to be performed under the direct supervision of an engineer.” Texas offers exemptions to the rule for smaller projects such as when “the contemplated expense is \$8,000 or less... a public work that does not involve electrical or mechanical engineering if the contemplated expense is \$20,000 or less...road maintenance...construction or repair of certain buildings”.

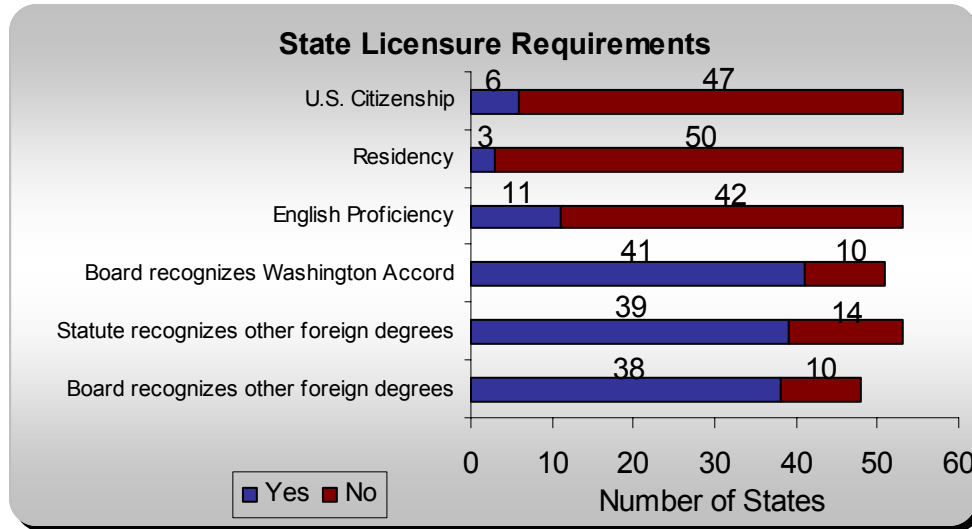
There are different rules for signing a drawing. Some states say that the drafter has to be in the physical presence of the P.E. for the P.E. to sign off on a drawing. Other states do not have this rule. Therefore companies located in certain states may be able to offshore outsource their drawings, while those in other states may not. In this sense, it may be ascertained that the states are regulating international trade, which traditionally is the role of the federal government. (To determine this issue of control over trade, it is first necessary to look at how engineering design services are defined. Do they fall under the definition of trade? This will be looked at in the section titled Trade.)

Additionally, states have different rules for obtaining an engineering license. Figure 2 (on following page) shows the different licensing requirements for 50 states and 5 territories.<sup>14</sup> (Some categories do not have answers from all regions and thus do not add up to 55.)

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<sup>13</sup> The Texas Board of Professional Engineers. “Extracts from: The Texas Engineering Practice Act (Chapter 1001, Texas Occupations Code)”. 21 May 2004. Online: [www.tbpe.state.tx.us/downloads/Diagrammatic.pdf](http://www.tbpe.state.tx.us/downloads/Diagrammatic.pdf).

<sup>14</sup> National Society of Professional Engineers. “Table I: Requirements for Licensure.” NSPE Summary Professional Engineer Licensure Laws. 2004.



**Figure 2**

The degree of the differences in regulations also depends on the states' agreements with other countries. (The Washington Accord deals with this issue. It will be discussed in the section titled 'Trade Agreements'.) For example, Texas has a reciprocity agreement with Canada and Mexico. While a P.E. in Texas could not go to Oklahoma and sign drawings, he could lead construction projects in Mexico.

Lestor Wurfel, Director of Business Development for CDI Business Solutions, does design work for facilities across the U.S. This requires CDI to employ professional engineers licensed in different states, with some licensed in multiple states.<sup>15</sup> He believes that the lack of state reciprocity of licensing is a protectionist measure. It allows the states to maintain a high level of standards for its engineers, while also creating work for the engineers from that particular state.

Will the differences in licensing rules be streamlined across state borders? Art Schwartz, Deputy Executive Director of NSPE, says that there is strong support for streamlining the rules.<sup>16</sup> He states that while NSPE supports the states' ability to license, NSPE would like states to adopt agreements to more easily recognize other states' licenses. One driving force for the states may be becoming part of a global or regional engineering reciprocity network. (This is further discussed in the section titled 'Engineering Agreements'.)

<sup>15</sup> Wurfel, Lestor, Director of Business Development, Life Sciences division, CDI Business Solutions. Personal Interview. 25 June 2004.

<sup>16</sup> Schwartz, Art, Deputy Executive Director, National Society of Professional Engineers. Personal Interview. 21 June 2004.

# What is offshore outsourcing

In order to understand the translocation of engineering work, it is first necessary to understand the offshore outsourcing trend in the United States. This section will be used to gauge the significance of this trend to Americans. First a historical perspective will be given by exploring what started this trend in the U.S. Next existing data will be looked at as an attempt to define the present impact of this trend. Then the benefits and drawbacks will be evaluated. Finally the future implications will be discussed.

## History

Much of the difficulty involved in explaining the historical impetus for offshore outsourcing is resolving whether this trend was born out of necessity or for want of profits. The answer lies somewhere in the middle, yet the justifications and actual need differs by companies.

To begin with, this type of job relocation is not new to the U.S. There have been periodic waves of job migration. One such wave occurred in the national economy that emerged after World War II. Many manufacturing jobs transferred from the Northeast and Midwest to the South and West. This was driven by cheaper labor in these regions. The resulting loss of jobs was attenuated through the creation of jobs dealing in higher value-added goods and services<sup>17</sup>.

A second wave of job migration occurred in the 1990s due to trade liberalizations such as the North American Free Trade Agreement. (NAFTA was signed into law in 1992). Following its enactment, companies moved entire manufacturing centers abroad and thus offshoring the manufacturing jobs. NAFTA allowed U.S. companies to easily relocate to Mexico. The loss of manufacturing jobs is shown in Bureau of Labor Statistics data in table 1.<sup>18</sup> The effects of this round of job losses were once again attenuated with the advent of increasing numbers of service jobs.

Year	Total Jobs	Manufacturing Jobs		Service Jobs		% Unemployment
		Absolute	% of total	Absolute	% of total	
1991	108,374,000	17,068,000	15.7%	85,787,000	79.2%	6.8%
1992	108,726,000	16,799,000	15.5%	86,631,000	79.7%	7.5%
1993	110,844,000	16,774,000	15.1%	88,625,000	80.0%	6.9%
1994	114,291,000	17,021,000	14.9%	91,517,000	80.1%	6.1%
1995	117,298,000	17,241,000	14.7%	94,142,000	80.3%	5.6%
1996	119,708,000	17,237,000	14.4%	96,299,000	80.4%	5.4%
1997	122,776,000	17,419,000	14.2%	98,890,000	80.5%	4.9%
1998	125,930,000	17,560,000	13.9%	101,576,000	80.7%	4.5%
1999	128,993,000	17,322,000	13.4%	104,528,000	81.0%	4.2%
2000	131,785,000	17,263,000	13.1%	107,136,000	81.3%	4.0%
2001	131,826,000	16,441,000	12.5%	107,952,000	81.9%	4.7%
2002	130,341,000	15,259,000	11.7%	107,784,000	82.7%	5.8%
2003	129,931,000	14,525,000	11.2%	108,114,000	83.2%	6.0%

Table 1

<sup>17</sup> Atkinson, Robert D. 'Understanding the Offshoring Challenge'. Progressive Policy Institute. May 2004. pg. 18.

<sup>18</sup> Bureau of Labor Statistics. 'B-1. Employees on nonfarm payrolls by major industry sector, historical.' U.S. Department of Labor. (July 2004.) Online: <ftp://ftp.bls.gov/pub/suppl/empsit.ceseeb1.txt>.

Notice how the percent of service jobs increased as the percent of manufacturing jobs decreased. Service jobs were not part of this first round of offshoring. Offshore outsourcing is different than offshoring in the nature of the work. Rather than relocate the physical structure and entire process offshore, only components of the operation are moved to a foreign country when offshore outsourcing. In the case of information technology (I.T.) and other engineering service work, the initial work is done in the United States, the idea is sent to a location abroad for the labor to be performed, and the results are returned for marketing and/or utilization in the U.S. There are no physical goods being exchanged. The results of the service are sent over the Internet in the form of electronic information or data.

## Precedent

The Internet is one reason for the plausibility of (but not necessarily the driving force behind) offshore outsourcing of service jobs. There are many other factors that contributed to the advent of offshore outsourcing. One major example is the trade liberalizations in developing countries. Other examples include a large, educated labor pool and the development of critical infrastructure in developing countries. Existing international partnerships have facilitated its initial logistical structure.

These characteristics make outsourcing possible. There is a separate list that consists of the driving forces behind the trend: There is a decline in the number of engineering students in the U.S. Different time zones have allowed for increased work. Work sent to foreign countries may produce a higher quality product faster by utilizing more employees to actually do the research and design.

The opening of foreign markets has facilitated offshore outsourcing. The markets were opened in different countries due to different forces. Trade liberalizations and a greater interest in commercialism has occurred in China. Other Asian markets have developed the technology infrastructure to facilitate technical work.

The internet has played the largest role in information exchange. Instantaneous telecommunications capacity and affordable high speed computers have enabled digital documents and work to be exchanged instantaneously. Large CAD (computer aided drafting) drawings can be sent through e-mail. Increased phone lines make it possible to hold teleconferences with individuals around the globe.

## Foreign Labor Market

A second factor that contributed to the plausibility of offshore outsourcing is the labor market abroad. (A driving force can be seen in the labor market here.) Foreign labor in certain markets has always been cheaper, which drove the offshoring of manufacturing jobs. (Offshoring becomes more efficient with service jobs as there is no product to ship.) Figure 3 shows typical salaries of an engineer earning \$70,000 in the United States.<sup>19</sup> (While the salaries are significantly different, the savings are not as high due to additional costs including the installation of infrastructure, hiring processes, sending employees abroad to supervise the installation, and negative reactions from the consumer.)

Country	Purchasing Power Parity	Salary
U.S.	1.0 * \$70k	\$70,000
Hungary	0.367 * \$70k	\$25,690
China	0.216 * \$70k	\$15,120
Russia	0.206 * \$70k	\$14,420
India	0.194 * \$70k	\$13,580

Figure 3

<sup>19</sup> Hira, Ron. "Offshore Outsourcing & Off-shoring of Technology Jobs Impacts & Policy Dialogue." IEEE. 23 April 2004. Presentation to AAAS S&T Policy Forum. Online: <http://www.aaas.org/spp/rd/hira404.pdf>. This graph assumes an engineering salary of \$70,000 and adjusts other countries' salaries based on purchasing power parity.

The people behind these salaries are important. Offshore outsourcing requires markets with large pools of skilled labor. For engineering work, this requires a quality education, knowledge in computers and experience in engineering. It requires additional training in the codes and methods of the country to which the work is being outsourced. Developing countries have responded by emphasizing engineering education. Figure 4 shows how the number of engineering degrees received by select countries has changed.<sup>20</sup>

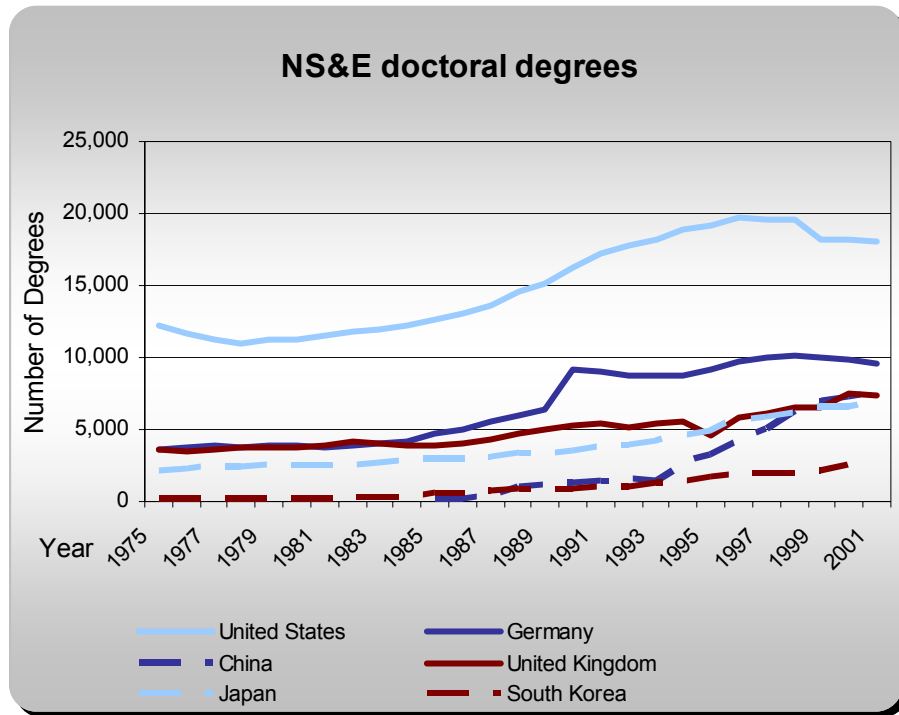


Figure 4

Figure 4 shows the drastic increase China has had in the number of engineering Ph.D.s given out. This shows that the educated workforce in China is increasing at a faster rate than in the other developed countries shown.

### Domestic Labor Market

The educated labor abroad facilitates offshore outsourcing. The next question to ask is whether the decrease in domestic engineering degrees made it necessary for firms to look to foreign labor markets. This would depend on the supply of engineers and the demand for engineers. There are multiple ways to determine this. There are contrasting viewpoints from the National Science Foundation (NSF) and the Department of Commerce (DOC). These viewpoints will be looked at following an examination of the engineering supply.

<sup>20</sup> National Science Board. "Figure 2-37. NS&E doctoral degrees, by selected countries: 1975–2001." *Science and Engineering Indicators 2004*. National Science Foundation. May 2004. Online: <http://www.nsf.gov/sbe/srs/seind04/toc.htm>.

To first determine the rate of supply, the number of engineering graduates will be looked at. Figure 5 below shows how the number of engineering bachelor's degrees has decreased in the U.S. since the late 1980's.<sup>21</sup>

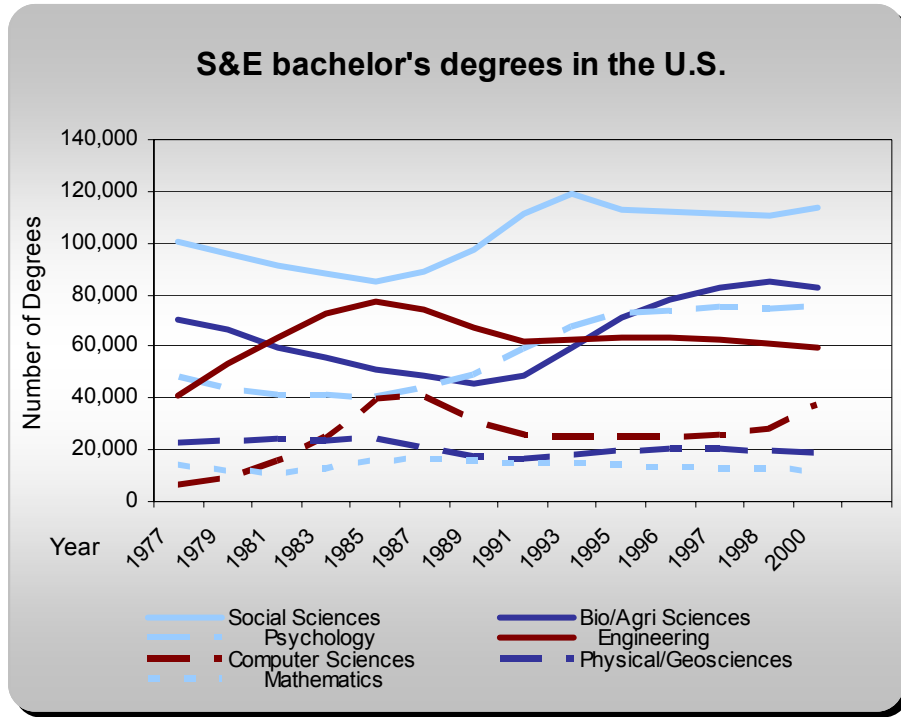


Figure 5

This shows that the supply of graduating engineers has decreased. Further decreases have occurred as a result of recent legislation that has made it more difficult for foreign students to study in the U.S. The decreasing number of foreign engineering students is actually seen as a detriment to the United States. (The U.S. has gained considerable advantage by attracting the top students from around the world; many of whom will stay and add to the innovation infrastructure of the United States.)

<sup>21</sup> National Science Board. "Figure 2-11. S&E bachelor's degrees, by field: Selected years, 1977-2002." Previously Cited.

Figure 6 below shows the intentions of foreign students to stay in the U.S. following the completion of their degrees.<sup>22</sup>

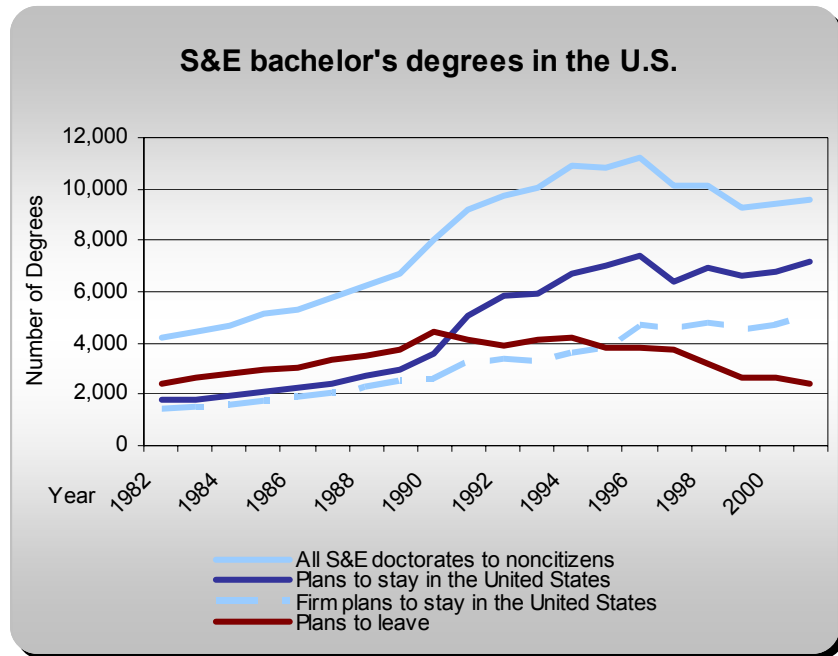


Figure 6

In the 2004 Science and Engineering Indicators, the NSF states their concern regarding the decreasing number of engineers and scientists in the U.S. They claim it is important to work to reverse this trend. The NSF says the decreasing number of engineers affects the overall competitiveness of the U.S. in the increasingly global marketplace. “The U.S. S&E workforce is entering a period of rising retirements, particularly among (but not limited to) doctorate holders. If present degree trends, retirement behavior, and international migration patterns persist, S&E workforce growth will slow considerably, potentially affecting the relative technological position of the U.S. economy.”<sup>23</sup> This implies that there is a demand for more engineering graduates.

However, there are many dissenting views claiming there is not an increased demand. Richard Weingardt, CEO of a Denver-based structural engineering firm, believes there is not a large demand for engineers. He said there "are thousands of jobs that have been lost and it's not tied into our [official] unemployment rates...I think that there is a big corporate lie that there is a shortage".<sup>24</sup>

John Sargent, senior policy analyst at the Department of Commerce, has concluded that there is not a shortage of engineers in the U.S.<sup>25</sup> He points to data collected. Figure 7 (on the following page) shows the employment growth for various engineering disciplines.<sup>26</sup> Many areas experienced a net loss in jobs—this would suggest that there is not a shortage of engineers. Electrical and civil engineers had large employment growth, suggesting

<sup>22</sup> National Science Board. “Figure O-22. Foreign student plans after receipt of U.S. S&E doctorate: 1982-2001.” Previously Cited.

<sup>23</sup> National Science Board. “Overview: The United States in a Changing World.” Previously cited.

<sup>24</sup> Boykin, Danielle. “Offshore Outsourcing Stirs National Debate”. *Engineering Times*. National Society of Professional Engineers. March 2004. Online: [www.nspe.org](http://www.nspe.org).

<sup>25</sup> Sargent, John. Senior Policy Analyst, Office of Technology Policy, Technology Administration, Department of Commerce. Personal Interview. 14 July 2004.

<sup>26</sup> Sargent, John. “Recent Trends in Engineering Employment, Salaries and Unemployment & Engineering Employment Projections”. Engineering Dean’s Council of the American Society for Engineering Education. July 2004. Data source: U.S. Department of Commerce analysis of Department of Labor Current Population Survey data.

there is demand for these engineers. (The data in this chart concludes in 2001 and does not take into account the slump in the economy that followed.)

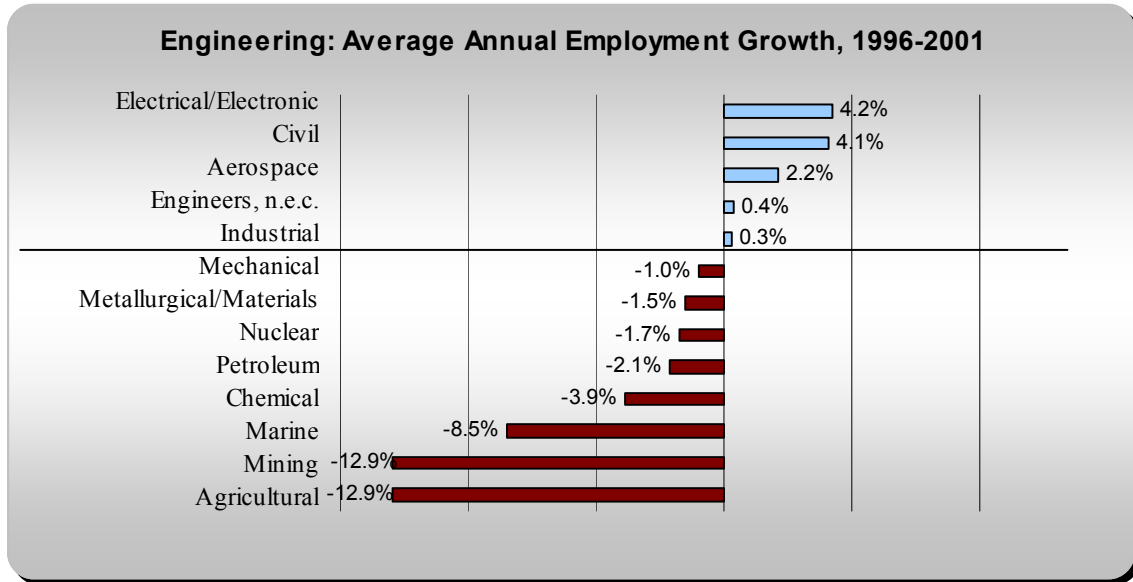


Figure 7

Furthermore, Mr. Sargent supposed that if there were a shortage of engineers, wages would increase significantly. A greater demand would translate into higher wages for engineers. He did not find this to be absolutely true. Figure 8 shows the average annual salary increases before 2001 (once again not containing the effects of the economic downturn.)<sup>27</sup> This data shows that mechanical and civil engineers' salary increased slightly more than the average. This change is not significant enough to show an increased demand.

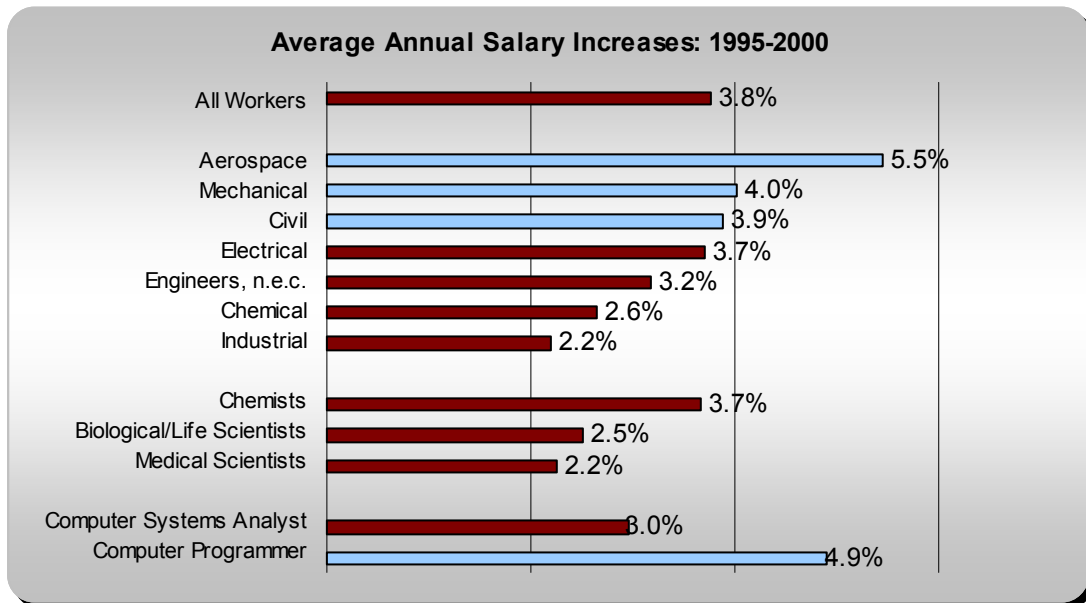


Figure 8

<sup>27</sup> Sargent, John. "Recent Trends in Engineering Employment, Salaries and Unemployment & Engineering Employment Projections". Previously Cited. Data source: Department of Commerce analysis of U.S. Department of Labor, Current Population Survey (Annual Averages) data.

A third method to measure whether the demand for engineers has increased is to look at the money spent on engineering services. If there is more money spent, this could signify more personnel needed. Thus an increasing monetary output signifies increased demand while a shrinking monetary output signifies a decreased demand for engineers.

More money spent could also signify other things. Higher productivity is neglected as this is money spent on a service that is difficult to automate. This could also signify higher costs due to inflation or other outside economic tendencies. This would tend to discount any moderate increases. Figure 9 (following page) shows the percentage change in estimated revenue for employer and non-employer firms (see appendix A for data).<sup>28</sup>

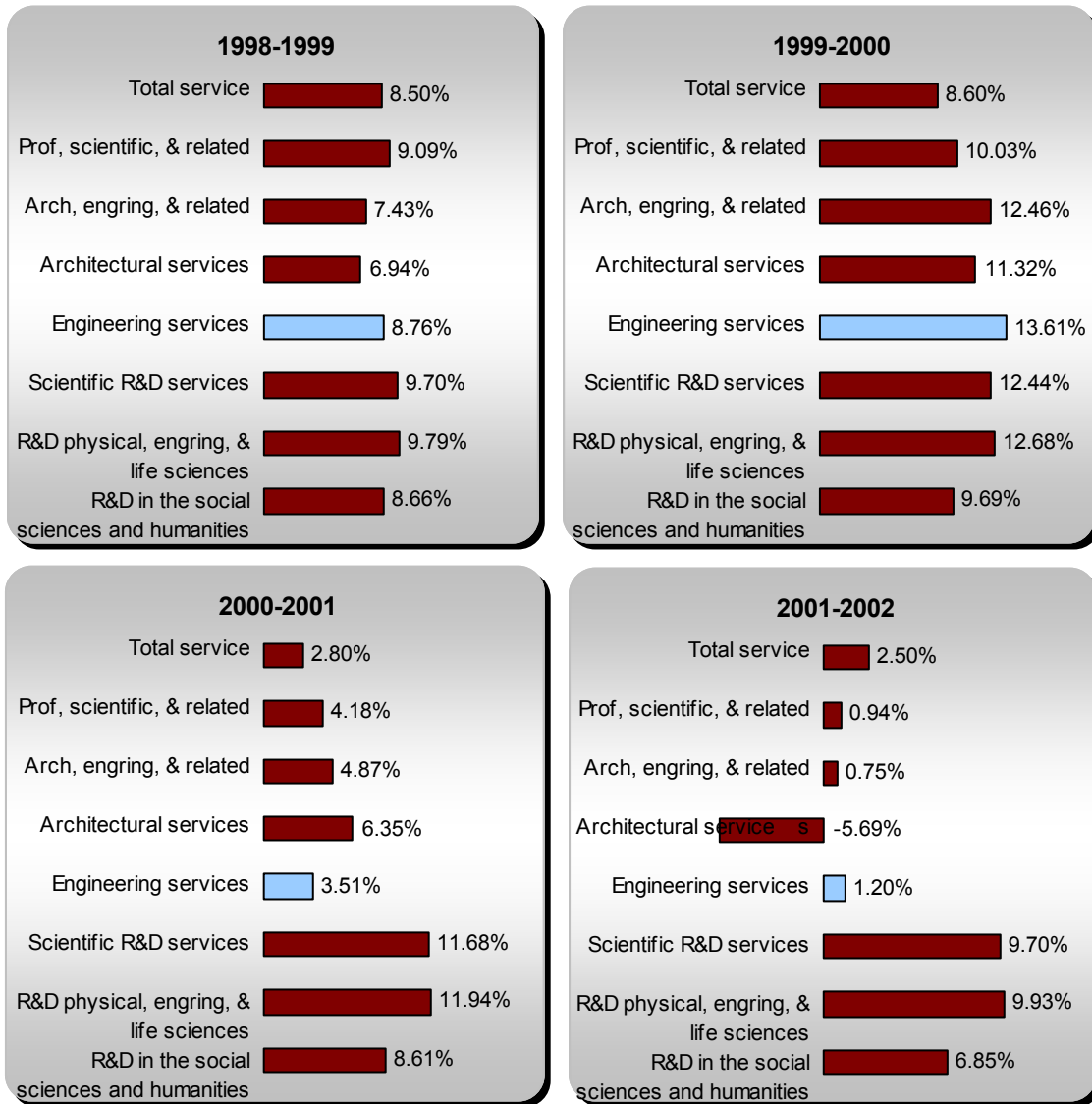
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<sup>28</sup> U.S. Census Bureau. "Table 6.1. Professional, Scientific, and Technical Services (except Notaries and Landscape Architectural Services) (NAICS 54)—Estimated Revenue for Employer and Nonemployer Firms: 1998 Through 2002." 2002. Department of Commerce. Online: <http://www.census.gov/svsd/www/sas54-1.pdf>.

*"We develop the estimates in this report using data from mailed survey questionnaires and administrative records. The survey questionnaires are mailed to a probability sample of firms located in the United States and having paid employees. The sample includes firms of all sizes and covers both taxable firms and firms exempt from Federal income taxes. Administrative records data or imputed values are used to account for firms without paid employees.*

*All dollar values presented in this report are expressed in current dollars; that is, the estimates are not adjusted to a constant dollar series. Consequently, when comparing estimates to prior years, users also should consider price level changes."*

### Percentage Change in Estimated Revenue for Employer and Non-Employer Firms



**Figure 9**

These charts show that the total spent on engineering services generally increased more than that for all services. However, the most recent data (2001-2002) shows that engineering services are growing slower than total services and slower than the rate of inflation (2%). When inflation is taken into account, the numbers suggest a loss in engineering services: 1.2% growth minus 2% inflation equals 0.8% loss. This loss suggests less demand for that time period. However, the previous years did experience positive growth

The final method for determining engineering demand is through unemployment statistics. The current unemployment rate for electrical engineers is higher than that for the general population. The Bureau of Labor Statistics places the unemployment rate for 2003 at 6%.<sup>4</sup>

EC&M magazine, an electrical engineering publication, gave the unemployment statistics found below in table 2 for various engineering disciplines.<sup>29</sup>

	1 <sup>st</sup> Qtr	2 <sup>nd</sup> Qtr	3 <sup>rd</sup> Qtr
Civil engineers	2.2%	3.9%	3.9%
Electrical engineers	7.0%	6.4%	6.7%
Mechanical engineers	3.0%	3.1%	3.3%
Industrial engineers	4.9%	5.9%	5.9%
Aerospace engineers	8.7%	1.7%	4.0%
Computer hardware engineers	6.5%	5.7%	6.9%

**Table 2**

The unemployment rate was higher for electrical engineers than for total unemployment (6%). This suggests that it is easier for an electrical engineer to receive a non-engineering job than an engineering job: implying that there is not a demand for electrical engineers. On the other hand, the very low unemployment statistics for civil and mechanical engineering do suggest a demand for these types of engineers.

To summarize, the data show that the supply of engineering graduates has decreased within the last 10 years. The data is not conclusive concerning the demand for engineering graduates. Engineering employment has grown in some areas and decreased in others. Salary levels have increased faster in some engineering disciplines and slower in others in comparison to salary levels of all workers. The amount spent on engineering services has grown quickly in some years and was shown to not grow at all in one time period. Unemployment data shows a higher demand for mechanical and civil engineers than for electrical engineers.

### Infrastructure Offshore

Many countries already have the infrastructure in place for information transfer and high-tech work. Countries have installed broadband networks, improved power grids and improved transportation routes. Telecommunications capacity between India or China and the U.S. grew from 0 to 11,000 Gb/S between 1999 and 2001<sup>30</sup>. India has constructed special districts with fiber optic and power wiring. The Indian government grants special permission to foreign firms in avoiding a time-consuming government approvals process. China's Ministry of Science and Technology offers funding and guaranteed communication and power connections for development in specific high technology areas. Taiwan offers two years of free rent, followed by four years of reduced rent for foreign companies to establish research and development (R&D) centers in designated industrial centers.

Despite such improvements, problems still remain in the consistent operation of such critical infrastructure in these developing countries. This is not of concern in more developed and more expensive countries such as Israel and Ireland. Service jobs were first outsourced to Ireland in the late 1980s and 1990s.<sup>31</sup> However, growth in this market has stilled as the high wages cannot compete with those of developing countries.

Companies are attracted to financial benefits offered in foreign countries. The Philippines exempts certain foreign companies from government fees, licenses, and export taxes. Software companies in China do not pay taxes for their first five years: followed by five years of 50% tax breaks. Semiconductor companies receive a

<sup>29</sup> EC&M Magazine. "Employment and Unemployment Statistics for Engineering Disciplines in 2003." (July 2004.) Online: <http://www.ecmweb.com/images/archive/401ecm19fig1.gif>.

<sup>30</sup> NSF, S&EI 2002, pg 4-7.

<sup>31</sup> Atkinson, Robert D. 'Understanding the Offshoring Challenge'. Progressive Policy Institute. May 2004. pg. 3.

14% rebate on value added tax to semiconductor chips in China<sup>32</sup>. (These methods serve to entice foreign investment, but may also violate the rules of the World Trade Organization. Trade agreements under the WTO will be looked at in the section titled 'Trade agreements'.)

Additional driving forces exist. An extended 24-hour workday is possible using workers in a different time zone to complete work overnight. There is also increased international collaboration in areas specifically involving research and development. Figure 10 shows the increase in co-authored articles from 1988 to 2001<sup>33</sup>. The graph shows that U.S. scientists have more collaboration with foreign scientists. At the same time, the reliance on U.S. engineers by foreign engineers has decreased.

An increase in coauthored papers by U.S. scientists leads to coalitions and partnerships that can later be used to facilitate the process of offshore outsourcing. It is a way of building relationships and trust among colleagues.

The aspects discussed in this section have facilitated and even driven the trend. The next section will examine aspects of the current trend.

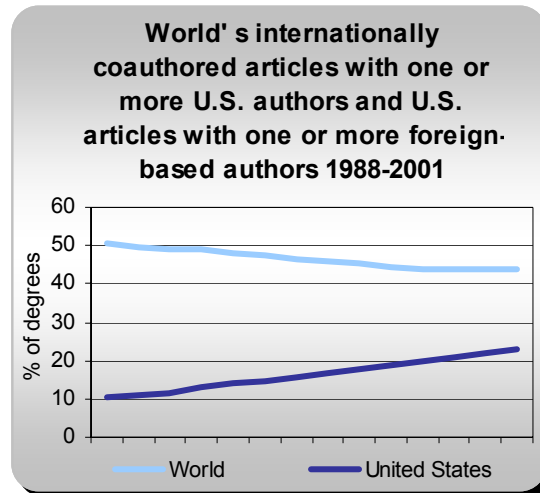


Figure 10

## Current Situation

International trade in all services has increased globally. The Organisation for Economic Co-operation and Development states that “[s]ervice exports in 2002 accounted for some 21.9% of total exports of goods and services... OECD service imports in 2002 accounted for 20.5% of total goods and services imports... OECD service exports have been growing at 3.3% per year on average since 1997 and imports 4.1% per year.”<sup>34</sup> OECD data show that the fastest growing service export is computer and information services at 17% between 1997 and 2002. Construction service exports decreased by 8% for the same time period.

Similar statistics are not available for the U.S. Rather than use the data on the amount of engineering services that are offshore outsourced, other data will be examined. The jobs lost, the total spending, and the location will be described.

<sup>32</sup> Office of Senator Joseph I. Lieberman. “Offshore Outsourcing and America’s Competitive Edge: Losing Out in the High Technology R&D and Services Sector.” Pg. 18-19.

<sup>33</sup> National Science Board. “World’s internationally coauthored articles with one or more U.S. authors and U.S. articles with one or more foreign-based authors 1988-2.” Previously cited.

<sup>34</sup> Organisation for Economic Co-operation and Development. “Structure and Trends in International Trade in Services.” (July 2004). Online:

[http://www.oecd.org/document/28/0,2340,en\\_2825\\_495663\\_2510108\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/28/0,2340,en_2825_495663_2510108_1_1_1_1,00.html).

*These statistics apply to the 22 members of the OECD.*

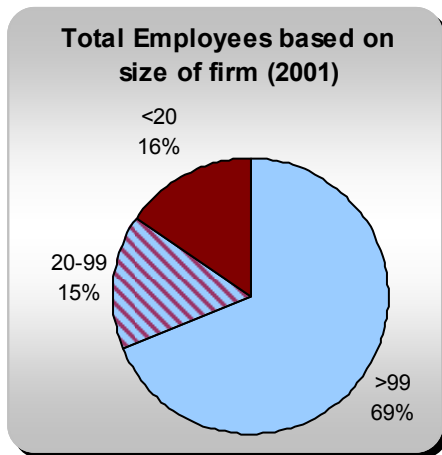
## Jobs Lost

A few different studies have estimated the number of displaced workers in the past years. As there is no concise way of determining these numbers, the studies have varied—often quite significantly. Two studies will be looked at below, keeping in mind that the Bureau of Labor Statistics states that in 2003 the workforce of the United States included about 130 million people.<sup>4</sup>

Study	Time Period	Layoffs due to Overseas Relocation	Jobs moved offshore
Bureau of Labor Statistics	1 <sup>st</sup> quarter 2004	4,633 (1.9%)	
Forrester	2003		315,000

**Table 3**

A study done by the Department of Labor estimates that 1.9% of job losses were due to offshore outsourcing in the first quarter of 2004.<sup>35</sup> This statistic was found using the 239,361 people who filed for unemployment insurance (non-farm) for the first quarter of 2004. Of this number, 4,633 respondents claimed that their job was lost due to overseas relocation. Using these numbers, 1.9% of all layoffs were due to offshore outsourcing. The actual number of jobs lost may be larger than that reported by the BLS. The BLS data represents the self-reporting of displaced employees: the employees would have to have known that their jobs were being sent overseas. Furthermore, the data only reflects job losses at companies employing at least 50 workers where at least 50 people filed for unemployment. This number does not account for new offshore outsourcing jobs created. (This report stated that the largest reasons for job loss were seasonal work, contract completion, and reorganization within the company at 24%, 22%, and 11.3% respectively.)



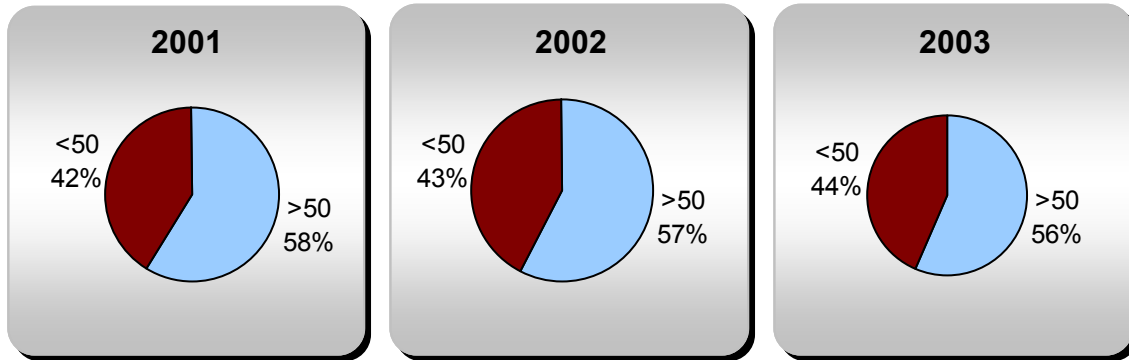
**Figure 11**

To understand the significance of the previous data, the number of firms with over 50 employees will be looked. Two sources keep this data. First, the Census Bureau collects data on number of employees based on the size of the establishment.<sup>36</sup> However, it only breaks the data down into categories of less than 20, 20 to 99, and greater than 99 employees per firm. Figure 11 gives an initial idea of how many employees would have been included in the BLS study above. This shows that the percent of U.S. employees that would have been excluded in the BLS study is somewhere between 16% and 31%.

<sup>35</sup> Bureau of Labor Statistics. "Extended Mass Layoffs Associated with Domestic and Overseas Relocations, First Quarter 2004". U.S. Department of Labor. 10 June 2004. Online: <http://www.bls.gov/news.release/pdf/reloc.pdf>.

<sup>36</sup> U.S. Census Bureau. "Number of Firms, Number of Establishments, Employment, and Annual Payroll by Employment Size of the Enterprise for the United States and States, Totals - 2001." U.S. Department of Commerce. 2001. Online: <http://www.census.gov/epcd/susb/2001/us/US--.HTM>.

Secondly, the Bureau of Labor Statistics keeps data on the percent of employees that work at different sized establishments. The BLS does have categories to show establishments of more or less than 50 employees. The drawback is that the data shown only represent private companies and do not include government employees. Figure 12 shows that around 57% of employees work for establishments with more than 50 employees.<sup>37</sup>



**Figure 12**

The numbers in the two studies vary quite significantly: the Census Bureau says that at least 70% and the BLS shows that around 57% of U.S. employees work in establishments with more than 50 employees. The difference results from the fact that the government—the largest employer in the United States—is not included in the BLS study. Government workers would most likely be considered in the category for employers with more than 50 employees. This would significantly increase the percentage in this category—enough to approach the value given by the Census Bureau.

This shows that there is a significant number of displaced employees that might not have been accounted for in the original BLS study that predicted the number of .

Under the same conditions as the BLS layoff study (people who filed for unemployment insurance from firms larger than 50 workers with at least 50 workers displaced), the Bureau of Labor Statistics has historical data for layoffs. Table 4 shows the number of layoffs due to overseas relocation.<sup>38</sup> The data for 2004 represent only the preliminary data for the first quarter of 2004.

Year	Total Layoffs	Service Layoffs	Percent of Service Layoffs
2004*	239,361	4,633	1.94%
2003	1,452,427	13,013	0.90%
2002	1,218,143	17,075	1.40%
2001	1,457,512	15,693	1.08%
2000	915,962	9,549	1.04%

**Table 4**

<sup>37</sup> Bureau of Labor Statistics. “Quarterly Census of Employees and Wages.” U.S. Department of Labor. (July 2004). Online <http://data.bls.gov/labjava/outside.jsp?survey=en>. This is data taken for January of each year. It only includes private firms, excluding government establishments. Data for 2003 is preliminary.

<sup>38</sup> Bureau of Labor Statistics. “Archived News Releases for Extended Mass Layoffs.” U.S. Department of Labor. (July 2004). Online [http://www.bls.gov/schedule/archives/mslo\\_nr.htm#2004](http://www.bls.gov/schedule/archives/mslo_nr.htm#2004).

A separate study, done by Forrester Research, estimates that 315,000 total jobs were shifted offshore by the end of 2003.<sup>39</sup> (This estimate is based on 2002 data from the Bureau of Labor Statistics and surveys of business and IT leaders.) Forrester's estimate is much higher than that of the BLS. It postulates that companies are trying to disguise overseas relocation of jobs by not telling their employees and not reporting it to the Bureau of Labor.

The Progressive Policy Institute (PPI) states that the conclusions in the Forrester report are reasonable, due to inequities in the data being reported to the government.<sup>40</sup> The PPI gave examples to illustrate the discrepancies in government statistics. For example the U.S. Department of Commerce reported that \$209 million was paid for business services to unaffiliated companies in India in 1992. Business Week published that five large Indian companies alone reported sales of \$2.4 billion (it is unknown how much of that is for business services). In 1992, the Bureau of Economic Analysis reported \$76 million in software imported from India. The India-based National Association of Software and Services Companies (NASSCOM), reported that Indian companies had exported \$2.8 billion worth of software to the US in that same year.<sup>41</sup>

NASSCOM stated that offshored business process employment increased from 106,000 jobs in 2002 to 171,500 in 2003. This is an increase of 65,500 jobs in one area in 2002.<sup>42</sup> However, these jobs were created by companies from a variety of countries: not just the US. Furthermore, jobs created by foreign companies may not represent jobs relocated from overseas. Thus, it is not unknown how many of these jobs were the result of offshore outsourcing of US jobs.

## Spending

The amount that an individual company spends on offshore outsourcing varies widely. No information could be found that broke down the amount spent on outsourced engineering work versus in-house engineering work. Much less was data found on the amount spent on the offshore outsourcing of engineering services. There is data for the total revenue of engineering services in the United States. Table 5 shows total revenue in billions of dollars in 2002.<sup>43</sup>

**Total Revenue for Select Industries in Billions of Dollars (2002)**

Total for selected services	\$4,596.0
Engineering services	\$129.3
R&D in the physical, engineering, and life sciences	\$58.3
Construction	\$1,141.2
Manufacturing	\$3,831.3

**Table 5**

<sup>39</sup> "Near-Term Growth of Offshoring Accelerating." Forrester Research, Inc. 14 May 2004.

<sup>40</sup> Atkinson, Robert D. 'Understanding the Offshoring Challenge'. Previously cited.

<sup>41</sup> Atkinson, Robert D. 'Understanding the Offshoring Challenge'. Progressive Policy Institute. May 2004. pg. 5. Online: [http://www.ppionline.org/ppi\\_ci.cfm?knlAreaID=107&subsecid=123&contentid=252655](http://www.ppionline.org/ppi_ci.cfm?knlAreaID=107&subsecid=123&contentid=252655).

<sup>42</sup> Rafiq Dossani and Martin Kenney, "Went for Cost, Stayed for Quality? Moving the Back Office to India." Berkeley Roundtable on the International Economy. 7 August 2003. Online: <http://aparc.stanford.edu/publications/20337/>.

<sup>43</sup> See footnote # 28. AND

U.S. Census Bureau. "2002 Economic Census: Table 1. Advance Summary Statistics for the United States 2002 NAICS Basis." Data released 29 March 2004. Department of Commerce. Online: <http://www.census.gov/econ/census02/advance/TABLE1.HTM>.

Forrester Research found that firms who do outsource IT work claim that they generally do not spend a significant proportion of their IT on offshore firms.<sup>39</sup> Figure 13 shows the results of a survey of 43 firms currently using offshore providers. This is shown as an example of one technical area. Such a survey could not be found for engineering firms.

### Location

India is generally considered to be the leader in dollar amount transferred. There is no data readily available to determine the proportion of offshore outsourcing going to distinctive countries. What is known is that specific countries are attractive for different reasons.

India is attractive due to the high level of individuals who speak English, which allows for direct consumer interaction as there is no language barrier. This makes India a prime destination for call centers. China does not have as strong of an English-language base, but China is growing in other areas such as software development. As far as engineering, due to such a strong increase in manufacturing, Chinese engineers are becoming proficient in process engineering. Malaysia, South Korea, and the Philippines are attractive countries in that they are developing at a fast pace. Russia's offshore outsource industry is growing as well as those of Taiwan, Singapore, Israel, Ireland, Poland, Hungary, and certain South American countries.

While these destinations are stereotyped for certain markets, companies generally have many more considerations to weigh. One is whether a country has an existing industry for overseas relocation such as found in many Indian companies that specialize in consulting work and arranging offshore outsourcing partnerships. A second criterion is the existence of critical infrastructure in the country such as transportation routes, telephone and broadband lines, consistent energy, and government support and transparency. Social and government infrastructure is important in the form of protection of intellectual property rights and national investment in

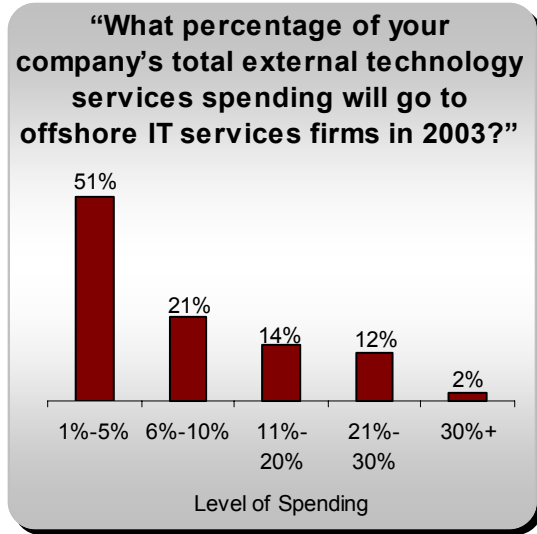


Figure 13

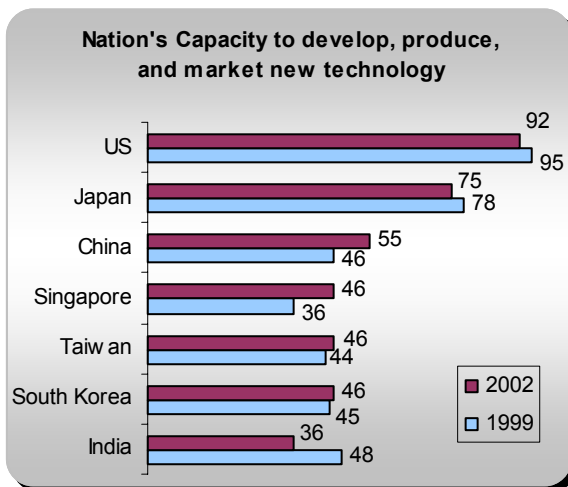


Figure 14

education which leads to the development of qualified scientists and engineers. China has disadvantaged itself due to nontransparent government processes. A stable political environment is also necessary. (This may have disadvantages for Israel, although it is difficult to tell as they seem to be doing quite well. A superficial evaluation reveals success in the number of patents received and product innovations.)

In order to weigh many of these aspects, the Georgia Institute of Technology (see figure 14) has developed a ranking system to determine the technological capacity of various countries.<sup>44</sup> It is based on the number of scientists and engineers, local universities, contribution to international science and technology, research-industry links, and computer purchases.

<sup>44</sup> A.L. Porter, et. Al. "Indicators of Technology-Based Competitiveness of 33 Nations: 2003 Summary Report." TPAC, Georgia Institute of Technology. April 2003. Online: [www.tpac.gatech.edu](http://www.tpac.gatech.edu).

As shown on the previous page, the most developed countries scored the highest. Countries that strongly emphasize engineering education and infrastructure are second. Recall the various financial incentives given by Asian countries. Interestingly enough, India has lost points despite its success in offshore outsourcing.

Similarly, the National Science Foundation has ranked the capacity of various countries to export high-technology products or services. Figure 11 ranks the existence of dynamic capital markets, upward trends in capital formation, rising levels of foreign investment, and national investments in education.<sup>45</sup>

This once again shows that the most developed countries have the largest capacity for technological competitiveness. Figure 15 is interesting because it once again shows how the lowest-scoring countries are the ones that have the largest reputation as service job outsourcers. This reinforces the correlation between low wages and low capacity for technology. (Without the technological capabilities, can outsourced engineering work retain the same quality? This will be look at in the section called 'Quality'.)

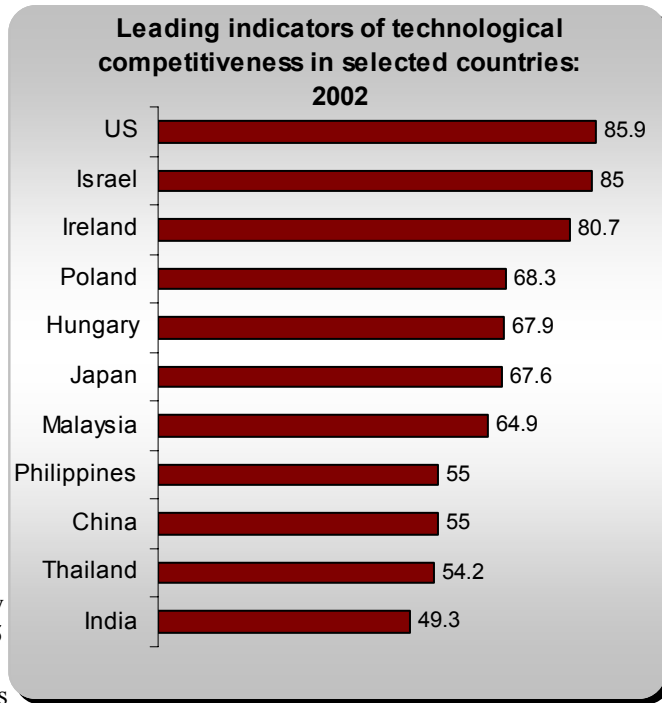


Figure 15

## Services

There are many types of international engineering service arrangements. The actual process of offshore outsourcing varies according to the need. Ebstrategy has developed a classification system for the types of operational models.<sup>46</sup>

Three main types of operational models exist:

- Captive processing centers: undertake business processing only for their own multinational businesses. Some examples include HSBC (Hyderabad), American Express (Delhi), British Airways (Mumbai), Citibank (Chennai), and Dell (Bangalore). [Starting a branch within the country.]
- Third-party providers: Third-party providers supply outsourcing services to other companies. They resemble Internet software service firms that complete IT systems setup projects for various companies. Some examples of these companies include Nipuna (a subsidiary of Satyam), Msource, 24/7, Spectramind, and Daksh. [Hiring a non-affiliated company.]
- Joint ventures: In a joint venture (JV), often called a build, operate, and transfer model, two entities own the operation. For instance, in December 1998, Satyam Computers entered into a joint venture with an affiliate of GE Industrial Systems. The joint venture company provided the GE affiliate with engineering design services, software development, and system maintenance services. In early 2003, Satyam sold its interest in this joint venture after an affiliate of GE exercised its option to purchase Satyam's interest for \$4 million.

<sup>45</sup> Georgia Technology Research Co. "High Tech Statistics, Preliminary Report." Atlanta, GA. 2003. Online: <http://www.nsf.gov/sbe/srs/seind04/append/c6/at06-05.pdf>.

<sup>46</sup> E-Business Strategies. "Offshoring - Frequently Asked Questions." (July 2004.) Online: <http://www.ebstrategy.com/Outsourcing/basics/faq.htm>.

Large engineering firms tend to have captive processing centers where the companies establish engineering branches in other countries. Smaller engineering firms tend to use third-party providers to facilitate the transfer of work.

Engineering services have not received as much attention as call centers and Information Technology (I.T.) firms. As a result, the information regarding the transfer of engineering service jobs is mostly anecdotal. Senator Joseph Lieberman (D-CT) has written a white paper on offshore outsourcing where he lists examples of engineering services sent abroad.<sup>47</sup>

Fluor Corporation employs thousands of engineers and draftsmen who work on architectural designs and blueprints in the Philippines, Poland, and India. General Electric, which employs 6,000 scientists and engineers in 10 foreign countries, integrates magnet, flat panel, and diagnostic imaging technologies from labs in China, India, Israel, Hungary, and France for various medical equipment. Engineers in Russia design parts of Boeing's airplanes. Researchers in Microsoft's Beijing lab conduct research on computer interface projects such as the digital ink that makes handwriting show up on tablet computers.

Scientists at Texas Instrument's research center in India design next generation mobile phone chips. Cisco outsources product R&D to Indian companies in addition to the work done by its own development center in Bangalore, India. HP designed, engineered, and assembled its Proliant server in Singapore, Taiwan, China, and India. The Chinese Academy of Sciences, China's top scientific research institution, and the US Veeco Instruments Inc. opened a nanometer technology center in Beijing in 2002. Motorola performs R&D in its Beijing location, and Caterpillar conducts R&D in Moscow.

Further examples are given by Denis Fred Simon, Dean of the Lally School of Management and Technology at Rensselaer Polytechnic Institute<sup>48</sup>:

Several GE divisions (GE Medical, Plastics & Industry Systems) have moved Asian HQs to Shanghai. In June 2000, GE established its Shanghai Research Center—which coordinates and communicates regularly with the GE Global Research Ctr in Niskayuna, NY—US\$12 million investment. The Shanghai Research Center conducts research in areas such as imaging technology, material science and technology, electronic and photonic systems and technology, and manufacturing technology. A total of 400 staff are expected to be working at the center by the end of 2003 and 1500 by 2005.

The majority of these examples fall under the model of the captive processing center. These large, well-known companies are actually setting up a division for research and/or design in another country. They are creating high-skilled jobs abroad within their own centers. An emerging trend is that of using third-party vendors. This would allow smaller companies to use foreign labor as well as allow the transfer or work (or individual projects) rather than an individual job. This will be examined more closely in the section titled 'Logistics of Offshore Outsourcing'.

## Summary

The number of jobs lost is not clear. The Forrester report only gives an estimate and the data from the Bureau of labor statistics is undervalued as many circumstances were not taken into account. Thus the data available are inconclusive and are not broken down into the type of services.

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<sup>47</sup> Office of Senator Joe Lieberman. "Offshore outsourcing and America's competitive edge: Losing out in the high technology R&D and services sectors." U.S. Senate. 11 May 2004. Online: <http://lieberman.senate.gov/newsroom/whitepapers/Offshoring.pdf>.

<sup>48</sup> Simon, Denis Fred. "Foreign R&D and the Impact of Globalization on China's Emerging Technological Trajectory." AAAS Forum on Science & Technology Policy. 23 April 2004. Online: <http://www.aaas.org/spp/rd/simon404.pdf>.

What is known is that the revenue for engineering services makes up 2.8% of revenue for all services. Engineering service jobs account for a small percent of total service jobs.

## Future Predictions

There exists a large variety of predictions for the future of offshore outsourcing. Multiple studies, models, and analyses have been performed with hopes of foreshadowing the effects of offshore outsourcing. The greatest difficulty in predicting future trends is that there is no current concrete data on which to base these trends. This was seen previously in the differences between the Forrester and BLS studies. No study is seen as being correct.

In order to develop future predictions, many assumptions have to be made: which current data to use as a base, whether this trend will increase to new service areas, and how the affected economies in developing countries will change the trend. Different assumptions have led to large discrepancies in forecasts. Additionally, the existing major studies have chosen different criteria to forecast, leading to incomparable predictions. The results of the largest studies are shown below in figure 16.<sup>49</sup>

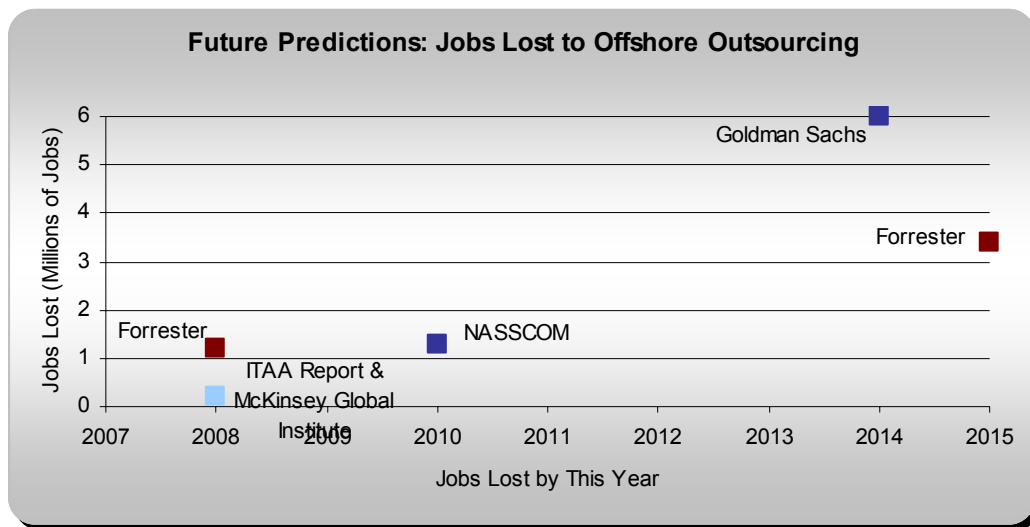


Figure 16

<sup>49</sup> “Near-Term Growth of Offshoring Accelerating.” Forrester Research, Inc. 14 May 2004.  
 NASSCOM (National Association of Software and Service Companies)-Evalueserve (India). “Impact of Global Sourcing on the US Economy, 2003-2010.” (July 2004.) Online: <http://www.nasscom.com>.  
 Porter, Eduardo. ‘Not Many Jobs Are Sent Abroad, U.S. Report Says’. New York Times. June 11, 2004.  
 Kirchhoff, Sue and Barbara Hagenbaugh. ‘Economy races ahead, leaving jobs in the dust’. USA Today. 10/1/2003.  
 Milutis, Michael. “Immigration Abuse Drives Offshoring.” Computer Aid, Inc. June 2004. Online: [http://www.aea.org/immigration\\_abuse\\_drives\\_offshoring.htm](http://www.aea.org/immigration_abuse_drives_offshoring.htm).  
 Bardhan, Ashok Deo and Cynthia Kroll. “The New Wave of Outsourcing.” Fisher Center for Real Estate & Urban Economics. Fisher Center Research Reports: Report #1103. 2 November 2003. Online: <http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1025&context=iber/fcreue>.  
 Zylstra, Steven G. “Offshoring is Fundamental.” Pittsburgh Technology Council. May 2004. Online: <http://news.pghtech.org/teq/teqstory.cfm?ID=1170>.  
 Additional resources offer predictions for specific sectors:  
 Gentle, Chris. “The Cusp of a Revolution: How offshoring will transform the financial services industry.” Deloitte Research (England). Exhibit 1.  
 Parry, Ed. ‘Gartner: Offshore outsourcing unstoppable, despite backlash’. Online: SearchCIO.com.

All studies agree that the number of jobs relocated overseas will increase. However, the number of jobs to increase varied significantly. This was because all studies used different criteria.

Forrester based their estimates on surveys (over 1,800) and interviews (over 100) completed with businesses and vendors. NASSCOM (National Association of Software and Service Companies) is an Indian consortium whose members are companies that receive work contracts from outside countries. Goldman Sachs is multinational company who focuses on investment banking, investment management, and securities services.<sup>50</sup> ITAA (Information Technology Association Of America) is a trade association representing the U.S. IT industry.

There were no specific estimates for engineering service jobs. This can be attributed to the fact that this is a newer phenomenon and has not yet started to accelerate.

How many of US firms want to outsource? Forrester Research found the following in figure 16 based on a survey of 139 North American firms.<sup>51</sup>

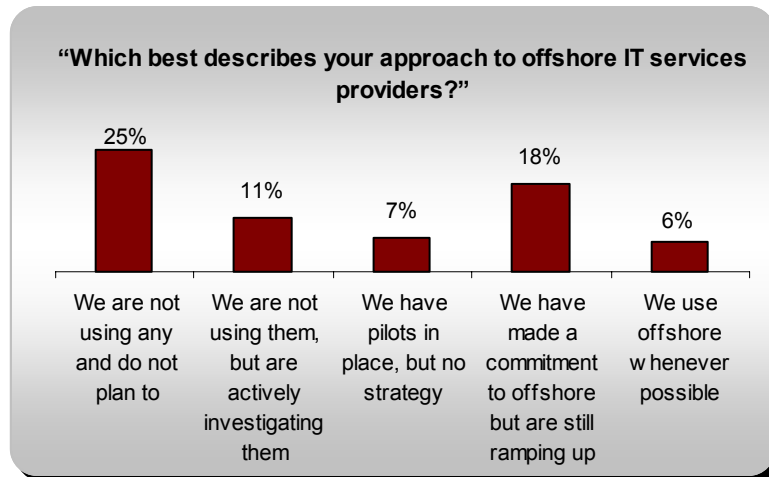


Figure 17

## Viewpoints

There are many facets in trying to analyze the benefits and detriments of offshore outsourcing of engineering work. There are multiple viewpoints. Various perspectives will be looked at in this section.

## Economic Perspective

There are many difficulties in performing an in-depth analysis of offshore outsourcing. There is not having enough data to fully understand the trend. It is not clear who are the responsible actors. Ron Hira, professor of engineering at Rochester Institute of Technology, said that there are “no villains in this story”.<sup>52</sup> He states that the companies are acting rationally by outsourcing in order to improve the company; the workers are acting rationally in order to protect their jobs.

William Poole, president of the Federal Reserve Bank of St. Louis, believes that historically, economics has shown that trade restrictions impose net costs on society.<sup>53</sup> He cites a study done by Gary Hufbauer and Kimberly Elliott in which they tried to quantitatively measure the effects of protectionism: “Because of the higher prices for apparel that consumers were forced to pay as a consequence of trade restrictions, the consumer loss per job saved in the apparel industry was \$139,000 and the net national loss per job saved was \$51,000. Thus, consumers were effectively paying an average of \$139,000 for each job protected in 1990 in the apparel industry, an industry in which the average wage of a production worker was less than \$15,000.”<sup>54</sup>

<sup>50</sup> The survey methodologies for NASSCOM and Goldman Sachs can be found online by purchasing the respective articles. The data used in this report was obtained through outside publications.

<sup>51</sup> “Near-Term Growth of Offshoring Accelerating.” Forrester Research, Inc. 14 May 2004.

<sup>52</sup> Hira, Ron. “Offshore Outsourcing & Off-shoring of Technology Jobs Impacts & Policy Dialogue.” Previously cited.

<sup>53</sup> Poole, William. “Trade, Wages and Employment.” Federal Reserve Bank of St. Louis. 25 March 2004. Online: [http://www.stlouisfed.org/news/speeches/2004/03\\_25\\_04.html](http://www.stlouisfed.org/news/speeches/2004/03_25_04.html).

<sup>54</sup> Hufbauer, Gary Clyde and Kimberly Ann Elliott. “Measuring the Costs of Protection in the United States.” Institute for International Economics. January 1994.

Most individuals interviewed for this paper agreed with the economists in that offshore outsourcing is an inevitable trait of globalization. A member of the staff of the United States Trade Representative argued that offshore outsourcing is beneficial as it removes inefficiencies in the market.<sup>55</sup> Protectionism against this trend may slow it down, but cannot stop it. This is due to the fact that as long as some companies find a financial advantage to outsourcing, others will follow suit. If not, the other companies could face bankruptcy which would displace more workers than actual outsourcing. Thus offshore outsourcing allows the firm to survive, which maintains a U.S. owned company.

## Response Perspective

If protectionism would not work and Americans continue to lose jobs, what can then be done? This is where the role of the National Science Foundation and legislation such as that proposed by Senator Liebermann manifests. Both say that the effects of offshore outsourcing have to be dealt with by improving the innovation capability of the country. The National Science Foundation believes that more money should be spent on research and development. Senator Lieberman believes that the federal government should encourage innovation through monetary investment, as well as promote improved science education.

Senator Lieberman advocates further mitigation through reeducation programs, something that is not applicable to well-educated engineers. To deal with this, Elka Koehler, science staffer at Senator Lieberman's office, suggests improved initial education.<sup>56</sup> She supports a more multi-disciplinary curriculum in engineering programs. By teaching a larger variety of skills to engineers, this will allow displaced engineers to seek out alternative forms of employment.

Lori Kletzer and Robert Litan advocate further mitigation legislation.<sup>57</sup> They say that wage insurance and subsidies for medical insurance is also necessary. The wage insurance would cover the difference in old and new salary. The medical insurance would provide care to displaced employees.

This method is similarly encouraged by William Poole of the Federal Reserve Bank of St. Louis.<sup>58</sup> He stated:

College can teach some job-specific skills, but no one should believe that those specific skills will last a lifetime. . . technological changes will alter how those jobs are done. The most important education college can offer is to provide the foundation that will allow students to learn and acquire new skills over time. College should instill in students a passion for life-long learning.

No skills are more important and more transferable to different jobs than logical thinking and good communication. Generating sound decisions involves a number of steps, such as acquiring data, assessing the usefulness of the information, understanding the role of risk and thinking through the immediate and long-term consequences of specific decisions. Communicating effectively entails speaking, listening and writing in both formal and informal settings.

## International Perspective

Offshore outsourcing is not common only to the United States. Friedrich Konig, First Secretary of the Economics Department at the German embassy, commented on how Germany has offshore outsourced engineering work for a longer time than the United States. He stated that many engineering service jobs were also lost to Eastern European countries. Germans realized that many lost jobs are attributed to non-trade factors, such as automation, structural changes of the economy, and changes in consumer demand. With the accession of the ten new member states, the EU has chosen to embrace this new potential for economic growth, rather than

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<sup>55</sup> Office of Services Trade Negotiations, Office of the United States Trade Representative. Executive Office of the President of the United States. Personal Interview. 8 July 2004.

<sup>56</sup> Koehler, Elka, Legislative Fellow, Office of Senator Joseph I. Lieberman. Personal interview. 7 July 2004.

<sup>57</sup> Kletzer, Lori G. and Robert E. Litan. "A Prescription to Relieve Worker Anxiety, Policy Brief 01-2." Institute for International Economics. February 2001. Online: <http://www.brookings.edu/comm/policybriefs/pb73.htm>.

<sup>58</sup> Poole, William. "Trade, Wages and Employment." Previously cited.

sealing itself off from unwanted competition by implementing protectionist measures. Germany has therefore turned to innovation, and plans to encourage greater enrollment in science and engineering as well as to increase government R&D investment. He said that this phenomenon was dealt with by Germany and it can similarly be dealt with by the United States.

Foreign students increase the total intellectual community in the U.S. and add talent to the workforce. There is a large advantage to having the workforce here as opposed to abroad since workers here pay into the social security and tax system, while those abroad do not. There are allegations that the foreign work system is being abused. Organizations such as the Institute of Electrical and Electronics Engineers (IEEE) and National Society of Professional Engineers (NSPE) have advocated for reform of visa programs.

## Engineering Societies' Perspectives

Engineering societies are charged with protecting the interests of their members. Many of these organizations have taken a stance on offshore outsourcing.

The membership of the National Society of Professional Engineers (NSPE) consists of licensed, professional engineers. Their stance states<sup>59</sup>:

- Outsourcing of engineering work should be done only when the talent cannot be found in the United States.
- If outsourcing of engineering work is done, it should be done using the same rules, regulations, laws, and ethical codes that employers and employees are subject to in the U.S.
- The engineering work should be performed without jeopardizing national security, and all parties should be made fully aware of the location and the conditions of where offshore work is being performed

This stance advocates some protectionism in order to preserve the jobs of their membership. Similarly, the society for electrical and electronic engineers, IEEE, has issued the following policy statement<sup>60</sup>:

- The federal government must collect and publish reliable statistics on the kinds and numbers of manufacturing and service jobs that are being moved offshore.
- Government procurement rules should favor work done in the United States and should restrict the offshoring of work in any instance where there is not a clear long-term economic benefit to the nation or where the work supports technologies that are critical to our national economic or military security.
- New U.S. workforce assistance programs should be created to help displaced high-tech workers regain productive employment and ensure that employed workers can acquire the knowledge and skills they need to remain competitive.
- The H-1B and L-1 visa programs should be reformed and new trade agreements should incorporate such reforms. These temporary admissions programs for skilled workers are often used to import lower cost labor and can result in displacement of U.S. professionals, exploitation of foreign workers and accelerated offshoring of engineering and other high tech jobs.
- A coordinated national strategy must be developed to sustain U.S. technological leadership and promote jobs creation in response to the concerted strategies being used by other countries to capture U.S. industries, jobs and markets.
- Federal investments and tax credits for research and development should be limited to work performed in the U.S. R&D that must, by its nature and content, be carried out offshore, is not covered by our recommendation.

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<sup>59</sup> National Society of Professional Engineers. "Offshore Outsourcing of Engineering Work." NSPE Issue Brief, Publication #4065. March 2004. Online: <http://www.nspe.org/govrel/gr2-4065.asp>.

<sup>60</sup> IEEE. "Offshore Outsourcing" IEEE-USA's Career and Workforce Policy Committee. March 2004. Online: <http://www.ieeeusa.org/forum/POSITIONS/offshoring.html>.

The other discipline-based engineering societies have not yet taken a stance, although the American Society of Civil Engineers does have a draft statement that has yet to be adopted by the Board of Direction. The American Society of Mechanical Engineers (ASME) does not currently take a stand on offshore outsourcing, but they did sponsor a forum on the topic on Capitol Hill. The American Institute of Chemical Engineers (AIChE) does not list offshore outsourcing as a public policy priority. The American Council of Engineering Companies (ACEC) similarly does not touch on this issue. The ACEC does strongly advocate that government outsource (not offshore) engineering work. (This point is relevant to offshore outsourcing proposed legislation.) The American Association of Engineering Societies (AAES) does not mention offshore outsourcing, but does talk about the need to reform research and development tax codes.

The opinions of these societies are relevant as some of the societies lobby Congress on behalf of their members. Their viewpoints show the concerns of individual members and engineers. The protectionist measures proposed indicate that their members have responded to these issues.

# **Offshore Outsourcing & Engineering**

Here the current methods used by companies to offshore outsource will be discussed. Additionally, processes that affect the offshore outsourcing of engineering work will be discussed as an introduction to the following sections.

## **Logistics of Offshore Outsourcing**

The process of offshore outsourcing of engineering work is difficult to explain and is not well known since there is not one process or method. In addition, the companies are reluctant to talk about their offshore outsourcing. Therefore, there is no data available to summarize the process. (The method used here to gain an understanding of the engineering services outsourced is through generalizations and then anecdotes of companies that are facilitating this trend.)

Some engineering fields are more technologically advanced and are utilizing current computer and technological capabilities. These firms are most prone to outsourcing as items can easily be sent electronically. This strongly affects the computer and electrical engineers first, and then the mechanical and chemical engineers. Civil engineers are the least prone to be affected due to the type of work and how the work is performed.

It is currently easier for large engineering firms to offshore outsource (examples of which were given previously in the section titled ‘Current situation’). Very large firms already have engineering and manufacturing sites offshore. So they outsource engineering work to their own engineers in another country. (Boeing currently has an engineering team in Russia.) Small firms are less likely to use outsourcing as it is costly to setup a counterpart in a foreign country at a small scale. After outsourcing consulting companies are setup, it will be easier for smaller companies to outsource the smaller quantities of work. Examples of such companies that offer globalization services (facilitates offshore outsourcing) is Genesys International and Continental Design & Engineering.

Genesys International is an engineering consulting firm that offshore outsources. It sends abroad such services as “Detailed engineering for distributed generation, co-generation and tri-generation ... Real-time Performance monitoring and Verification... Preventive Monitoring and Diagnostic Maintenance Training”. Its website outlines the following process for offshore outsourcing<sup>61</sup>:

- First, a US-based Customer Process Manager (CPM) will work with you to assess the specific talent, training and number of hours your project/process requires. The CPM is your prime contact.
- Next, an India-based Project Leader/Outsourced Process Manager (OPM) is selected and brought to your site by the CPM for the project's first few days. This Project Leader/OPM will manage all activities of the team offshore.
- After gaining an in-depth knowledge of your needs and requirements, the Project Leader/OPM will select the remote team members, chart out roles and responsibilities, and develop the specifications for the milestones and deliverables involved. A communication protocol will be established and reporting mechanism deployed so that you know exactly what has been accomplished and what needs to be accomplished at any point in time.
- Finally, your project leader will return to India to direct all activities of the team.

Most offshore outsourcing companies sell their products under the term ‘globalization services’. An internet search revealed multiple countries providing such services. Appendix B lists many of these companies as well as the range of engineering services that may be done offshore.

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<sup>61</sup> <http://www.igenesys.com/engineering/>

The process of offshore outsourcing is illustrated below in figure 18.

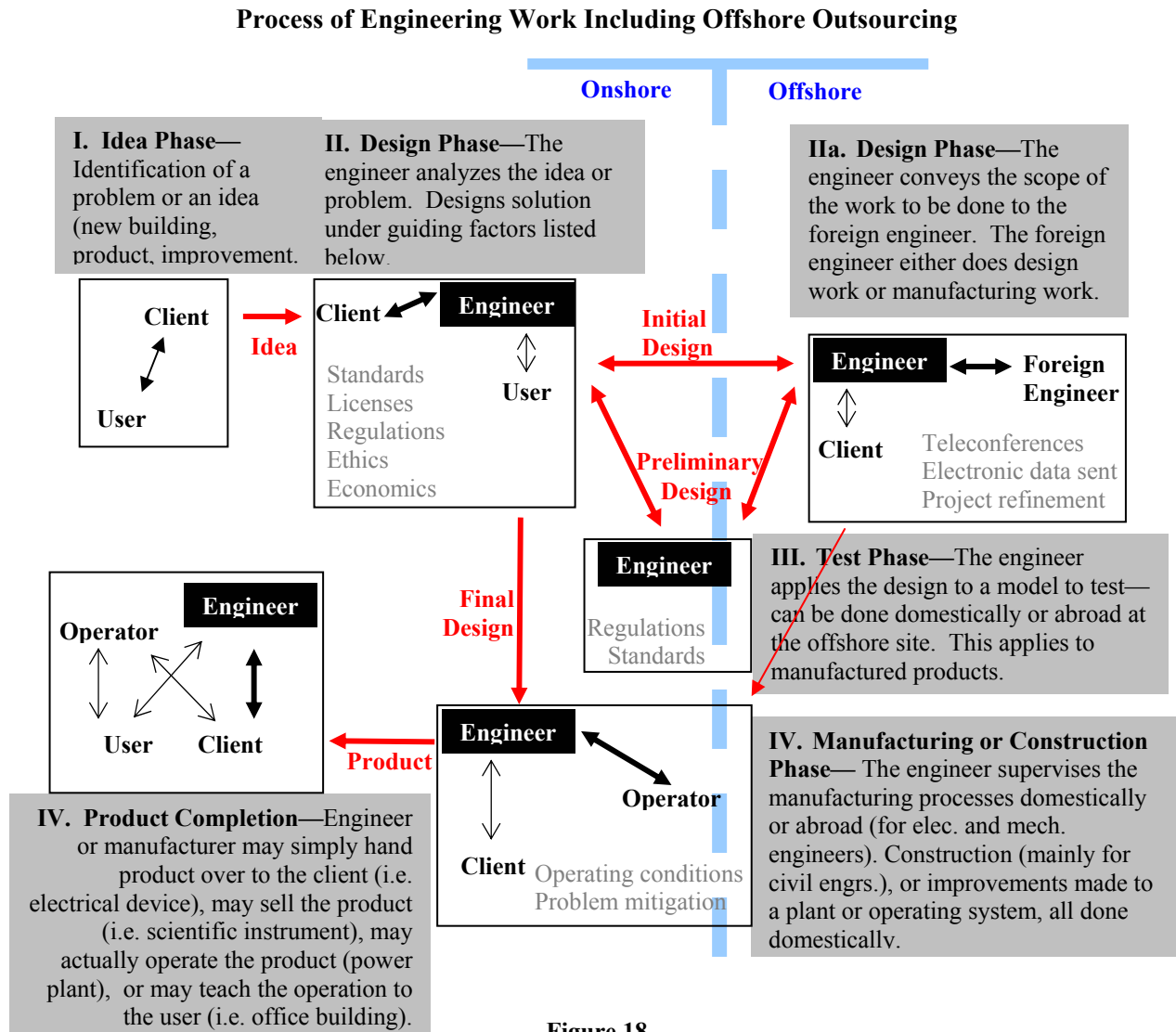


Figure 18 is similar to Figure 1 (process of engineering work), except for the addition of the offshore component. The offshored work could be in three categories: design, test, or manufacture. Design work could be done by the foreign engineer and then the design could be tested onsite, manufactured offshore, or sent back to the U.S. for testing, additional design work, or manufacturing. Or the product or process could be designed entirely in the U.S. and the design sent abroad to be manufactured and the manufactured product be returned to the U.S. These steps are shown above.

### Case Study of an Offshore Outsourcer

Tom Eply is the president of Continental Design and Engineering—a technical staffing firm.<sup>62</sup> His company was formed in 1986 to work in the growing consulting market. He states that outsourcing within the U.S. has been common practice for 20 to 30 years. His company currently has 250 staff in the U.S.—170 of which are engineers placed as consultants in various sites.

<sup>62</sup> Eply, Tom. President, Continental Design & Engineering. Phone Interview. 25 June 2004.

It was a few years ago that offshore outsourcing began. He attributes this to businesses seeking lower prices and a growing trust in the skill level of foreign engineers. His company gauged the functionality of offshore outsourcing off the success of the I.T. offshore outsourcing.

His company actually started to offshore outsource when his customers began to specifically ask for cheaper, offshore labor about two to three years ago. At that time, Indian engineering companies had been contacting him and asking if his company wanted to collaborate with them. His company decided to choose one company to work with in India and one in China. He chose the companies based on the quality of work that he reviewed and their compatibility with his company's type of work. He specifically chose the Indian company because they had an office in the United States and had already had offshore outsourcing experience with automobile manufacturers in Detroit. He chose the Chinese company based on contacts he made working for the automotive industry.

Mr. Epply uses the two affiliated companies for different purposes based on their skill and abilities. He uses the Indian company for product design and the Chinese company for manufacturing.

Mr. Epply currently has five customers getting work from India (up from 3 last year and 1 the penultimate year.) He states that the strong suit of Indian engineers is their design skills. He has noticed that their product design is equal in quality to that of engineers in the U.S. Although, their tool design is not as good as that of an American. He gave three examples of projects that he has actually facilitated. The first is when a company in Ohio told him of their need to convert all their paper-based drawings onto CAD. The company said that it would cost them \$400,000 to do the job themselves. Mr. Epply found that it would cost \$100,000 to be done in India. Thus entry level engineers in India performed the work. Mr. Epply saw his assistance as a means to make the U.S. company stronger by performing a service that they otherwise would not be able to afford.

A second company would like to offshore some of their design work. They will maintain their U.S. research and design site, but they would like to outsource their mature product changes. Continental sends one Indian engineer to work at the U.S. site. This person manages four engineers in India who do the engineering work on mature products.

The third example is a U.S. plastic molding company. They asked him for assistance in designing and manufacturing a new tool for a new process. Continental solicited bids from U.S. and the Indian company. The Indian company was cheaper and so they received the contract to design the tool. Then Continental solicited bids for a manufacturing site. The Chinese company beat out the U.S. company and they designed the tool.

Continental's contact in China is a manufacturing outsourcer. Their skill set lies in the manufacturing arena. They assist U.S. companies in locating pre-existing manufacturing centers for smaller products or parts to be manufactured. The Chinese company can more effectively evaluate and analyze Chinese manufacturing centers on behalf of Continental. Additionally, the company can mitigate disputes. One company asked Continental to assist in a problem they were experiencing with a contract they had with a Chinese manufacturing firm.

Standards play an important role in this work. A U.S. company asked Continental to aid in designing new brakes and brake pads. Continental sent the work to India, along with a book of U.S. product liability standards. He says that all U.S. work sent overseas follows U.S. standards.

Mr. Epply describes his company as small in operation, yet offers many services in his globalization department. Continental's website advertises the following<sup>63</sup>:

- Overseas manufacturing planning, supervision and quality control
- Offshore engineering and CAD design services
- Metrology management/ dimensional analysis inspections
- Production line problem identification & resolution
- Manufacturing plant launch & Greenfield activities

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<sup>63</sup> Continental Design & Engineering. "Globalization Services." (July 2004.) Online: <http://www.continental-design.com/globalization/index.html>.

Electronics testing labs quality investigations  
Plant engineering management analysis, design & implementation  
Mechanical equipment design & build  
Global experience in the engineering, design and manufacturing of:  
Automotive parts; Electronics; Plastics; Compressors; Jigs & fixtures; Roller bearings; Jet engine fan and compressor blades; Consumer products; Metal stamping, machining and cleaning processes; Ceramics, glass & crystal glass molding; grinding & polishing; Brass and titanium hot forging; Zinc die casting; Titanium

This list of services comprises only the offshore outsourcing component of his business. To get a full idea of Mr. Epply's company, it must also be known that he sends U.S. engineers to U.S. manufacturing sites in Mexico, Poland, and Hungary for consulting jobs. He emphasized the fact that the cost-savings techniques that he utilizes allows U.S. manufacturing companies to compete with Chinese manufacturing sites, which retains U.S. manufacturing jobs.

Mr. Epply believes there are limitations on offshore outsourcing. While it is normally cheaper to send the work overseas, it may not be more beneficial if there is a time deadline. In addition, he thinks that for security reasons, military contracts should not be offshore outsourced. He thinks that legislation is not necessary as the military contracts stipulate that no offshore work is allowed unless in specific instances. Additionally, Mr. Epply does not foresee the offshore outsourcing of structural engineering work. He said that the state rules and licensure requirements do not facilitate overseas transfer or work.

### Case Study of an Outsourcer

Continental is one company that actually does offshore outsourcing. There are many more companies that do onshore outsourcing. It is necessary to look at their operations to understand if their outsourced work could be offshored as well.

Lestor Wurfel, the Director of Business Development at CDI's Life Sciences division, spoke about his company's involvement with outsourcing in the U.S. and trends that he sees.<sup>64</sup> His division designs chemical and medicinal manufacturing plants. He stressed the fact that outsourcing within the U.S. is extremely common. This includes outsourcing across the U.S. Once a company develops a culture and adeptness at dealing with outsourcers across the country, it becomes very easy to make the transition to outside the country. He stressed the interconnectedness of large engineering companies. As bi-lateral contracts have been in place for twenty years, offshore outsourcing is a natural extension.

This is aided by current technology and the current culture. When the company holds their almost daily conferences, it is in a room with a large wall screen so that they can see their affiliates in other parts of the U.S. or in Europe.

He explains that a great deal of the engineering work is done on a computer: including writing specifications and CAD (computer aided drafting) drawings. Basically anything that is outsourced here in the U.S. could be offshore outsourced.

As far as the logistics of outsourcing, Mr. Wurfel explained the process other companies have gone through for large projects. The principle company would develop the plan and the scope. The initial conceptual level requires physical presence. Therefore, the U.S. company would bring in engineers from abroad to share in the initial steps. After the scope is complete, the foreign engineers as well as U.S. engineers would go abroad to develop the details and complete the project. This process is for large projects. Smaller projects would require less personnel exchange.

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<sup>64</sup> Wurfel, Lestor, Director of Business Development, Life Sciences division, CDI Business Solutions. Previously cited.

Mr. Wurfel's company is actually an example of a company that receives work from other countries. As there is not a large demand for new chemical plants here, companies from abroad outsource to his company. Airbus in France has contracted his company to design a part of the engine. He explains this is not difficult as the exact specifications are sent to CDI, and they are then charged with designing the part to fit. The reason the jobs were outsourced from France is that the work was cheaper here than by French engineers. (This same French company also began to outsource work to Romania.)

CDI also is outsourced to by a South Korean company. They designed a bio-technology facility here in the U.S. They then brought the plans to South Korea where details were added before finally being built. The Korean engineers were both educated in the U.S. and abroad. Mr. Wurfel said that there were no problems resulting from the different educational backgrounds; he said they had similar skill sets.

While his company does receive work from other countries, they lost a lot of work in the United States when manufacturing centers moved overseas. Mr. Wurfel said that most chemical plants left the country during the manufacturing offshoring period. This caused his division, which designs those plants, to decrease from 200 to 40 employees. He said that a lot of his work went to Ireland and Puerto Rico.

Mr. Wurfel contends that offshore outsourcing is a beneficial process. It allows a better product at a lower price. He does not believe that offshore outsourcing would hurt product quality. He said that all the offshore companies he has dealt with have had world-wide reputations, as there is a great number of companies abroad that already do bi-national collaborations.

## **Aspects that Affect Offshore Outsourcing**

There are many processes that serve to limit or encourage trade in engineering services. The ones that will receive the most attention here are trade agreements, issues of quality, and legislation.

Many organizations have conducted studies on offshore outsourcing as a limiting factor:

The Progressive Policy Institute found that there are two factors that limit the offshore outsourcing of general service jobs: "1) the degree to which functions can be cost effectively transformed into electronic flows facilitated by telecommunications; and 2) the degree to which these new activities still require spatial proximity to suppliers, customers, competitors, or other units in the firm."<sup>65</sup> The first point relates to the degree that work is done electronically. This means that CAD drawings would be easy to transfer, but processes that require monitoring of equipment could not be easily outsourced. The second point relates to the engineering culture: close relations between client and engineer in engineering projects.

The second point also relates to market-driven limitations. One example is the balance between transportation cost and price. Prices may go down when offshore outsourcing, but the farther away the shipping, the greater the shipping cost. This does not apply to service work as services (as defined in this report) generally require only a computer and the Internet. This means that distance plays an insignificant role except when considering the deployment of managerial staff.

A Gartner study showed that companies refrained from offshore outsourcing due to "concerns over security, the viability of providers, and service quality...there are also political risks in terms of instability in foreign nations and market risks of a consumer backlash against offshoring companies."<sup>66</sup>

The next sections will examine the most significant factors affecting offshore outsourcing of engineering work. These include trade agreements that serve to attenuate trade barriers, issues dealing with quality of engineering work in other countries, and finally legislative issues.

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<sup>65</sup> Atkinson, Robert D. 'Understanding the Offshoring Challenge'. Progressive Policy Institute. May 2004.

<sup>66</sup> "Worldwide IT Services Market Forecast, 2002-2007." Gartner Research. January 12, 2004.

# **Trade Issues**

Trade agreements are an important component to international trade in engineering services, as they can serve to inhibit or encourage the phenomenon. This section will look at the trade limitations that exist—focusing on licensure and government procurement. Next, various multinational agreements, which work to mitigate the barriers, will be examined.

## **Trade Limitations**

There are generally two aspects that limit international trade: tariffs and non-tariff trade barriers. The first, tariffs, do not apply to trade in engineering services, only to goods. The second, non-tariff trade barriers do apply to engineering services. Trade agreements generally serve to mitigate non-tariff trade barriers.

A member of the staff of the United States Trade Representative explained that international trade in engineering services are handled very differently than normal goods.<sup>67</sup> For one thing, goods are tracked by the government, imports require passage through Customs, and may be subject to tariffs. There is a schedule of tariffs for the different types of goods.

Services, which can be exchanged electronically, by professionals who temporarily travel to a foreign location, and through a commercial presence established abroad, are far more difficult to track. Engineering services are considered trade in professional services. Because there often is no physical product that can be observed crossing a border, the government can not directly monitor trade in services. Instead, the U.S. government develops estimates of services trade by surveying U.S. service suppliers.

There are also examples of services and goods tied together. John Sargent, Senior Policy Analyst at the Department of Commerce, gave the example of software programs on compact disks.<sup>68</sup> When imported, they receive a tariff based on the price of the physical object: only the price of the actual disk is taken into account. The cost of the software that is contained on the disk is discounted. There are certain processes that control it, but even these are done by the state governments. This would be the requirement for licensed engineers and the specifications on when a licensed engineer's seal is required.

There are multiple non-tariff trade barriers to trade in engineering services. The United States Council for International Business (USCIB) lists the following trade barriers<sup>69</sup>:

- Privacy laws that restrict transborder data flows
- Security concerns
- Government procurement laws: federal and state laws/legislation and no developing countries currently party to WTO government procurement agreement
- Need for further liberalization in services
- Weak intellectual property protection
- Tax structures that inhibit sourcing
- Other: energy policy, health care costs, pension costs.

The barriers that most closely relate to engineering services are standards involving licensure and government regulations. David Bohigian, Deputy Director in the Office of Policy and Strategic Planning at the Department of Commerce, believes the largest barrier is standards. Differing standards from state to state makes

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<sup>67</sup> Office of Services Trade Negotiations, Office of the United States Trade Representative. Executive Office of the President of the United States. Previously cited.

<sup>68</sup> Sargent, John. Senior Policy Analyst, Office of Technology Policy, Technology Administration, Department of Commerce. Previously cited.

<sup>69</sup> United States Council for International Business Associates Program. "Briefing on global sourcing: challenges and opportunities." United States Council for International Business. 6 April 2004. Online: [www.uscib.org/mem\\_docs/associates\\_briefing\\_outsourcing.ppt](http://www.uscib.org/mem_docs/associates_briefing_outsourcing.ppt).

manufacturing and design more difficult and costly.<sup>70</sup> Mr. Bohigian gave the following example: “say that your building code called for a certain type of concrete that is only made in your country, that could be found to be a barrier to trade.” In addition, foreign engineers cannot easily receive a U.S. engineering license. (Without a U.S. license, the engineer cannot assume responsible charge and sign a drawing before it can be used.) The final barrier is that of government procurement. The U.S. has agreed to various accords that state that federal government procurement contracts be open to bidders from specific countries. This component is relevant to offshore outsourcing as most current, proposed legislation acts to block foreign labor on federal government procurement.

The E.U. completed a study to determine the effects of regulatory restrictions on free trade among E.U. member states.<sup>71</sup> The E.U.’s Competition Directorate General looked at barriers to the trade in engineering design and other professional services. It concluded that regulations were having a negative impact on the E.U. There are only certain times when regulation was necessary: “to protect consumers from unsafe buildings, misleading publicity, inaccurate audits, and to satisfy other legitimate public interests”. The surveyors concluded that the restrictions were best dealt with at the national level. This included regulations and restrictions on professionals due to licensing requirements. Under current E.U. law, licensed professionals may work temporarily in another member state. If wishing to work permanently in that state, that person is required to adhere to the state’s standard of either an adaptation period or an aptitude test.

## Licensing and Trade

Licensing is seen as a trade barrier because it inhibits the flow of work and engineers. In the U.S., the practice of engineering is regulated by the laws that individually exist in 50 states and five territories. Administration and enforcement is done by the states’ independent licensing boards. (Currently a P.E. is only licensed for one state and must petition to each state that the engineer wants to be licensed in. Due to varying licensing requirements, a foreign worker is not eligible to be licensed in every state.) The subject of licensure is touched upon in various agreements.

Generally, there are three types of accords for creating engineering license agreements. Bernard Ascher, former Director of Service Industry Affairs at the Office of the United States Trade Representative (and currently works for the American Antitrust Institute), described the three types<sup>72</sup>:

- autonomous recognition—where a country unilaterally will accept another country's license of the practitioner;
- harmonization—where countries would adopt identical or similar rules and requirements so that they have the same licensing system; and
- mutual recognition agreements (MRAs)—where arrangements are made to bridge the differences in licensing systems by demonstrating competence through substantially equivalent education, experience and examination.

Mr. Ascher comments that the MRA is the most common type of agreement here in the United States:

U.S. trade agreements contain a rather unique mechanism for negotiating such mutual recognition agreements for professional services. Instead of negotiations on a government-to-government basis, this mechanism enables the professions themselves, together with the competent authorities, to conduct negotiations with their counterparts in other countries. These negotiations are subject to government oversight to ensure that the MRA is consistent with the basic trade agreement.

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<sup>70</sup> Bohigian, David, Assistant to the Secretary and Director, Office of Policy and Strategic Planning, Office of the Secretary, U.S. Department of Commerce. Personal Interview. 19 July 2004.

<sup>71</sup> Ascher, Bernard. ‘Toward a borderless market for professional services’. American Antitrust Institute. 26 April 2004. Online: <http://www.antitrustinstitute.org/recent2/316.cfm>.

<sup>72</sup> Ascher, Bernard. “Engineers Get Organized to Face Obstacles in International Mobility.” Engineering Times. National Society of Professional Engineers. February 2001. Online: <http://www.nspe.org/etweb/12%2D01viewpoint.asp>.

The fact that the legislation behind licensing is at the state level, the federal government cannot directly negotiate licensing agreements. Therefore, unique mechanisms have arisen to try and conjoin the state governments' agreements. The Council on Federal Procurement of Architectural and Engineer Services (COFPAES), the United States (USCIEP), the Engineering Mobility Forum (EMF) and the Washington Accord are all mechanisms to facilitate licensing accords. The goal of mechanisms is to either recognize engineering licenses from other countries or to certify that their education and work is suitable to U.S. standards.

The next sections will discuss the trade agreements that the U.S. is party to. These agreements include multi- or bilateral trade agreements.

## **World Trade Organization: General Agreement on Trade in Services**

The United States, as a member of the World Trade Organization (WTO), signed the General Agreement on Trade in Services (GATS). The U.S. Trade and Compliance Center describes this agreement as having:<sup>73</sup>

established a multilateral framework of rules and principles for trade in services, a large and fast-growing segment of world trade. It also set in motion a process for the progressive removal of restrictions on international services trade. The GATS is designed to ensure that the laws and regulations that WTO member governments apply to services trade are transparent and fair. Its key market-opening element is the Schedule of Specific Commitments that each signatory annexed to the GATS as an integral part of the Agreement. In these Schedules, which resulted from negotiations that took place during the Uruguay Round, signatories identified the extent to which they would accord full market access and national treatment in specific service sectors.

The two areas, licensure and government procurement, that most affect the trade in engineering services are not specifically covered under GATS. Article VII of the GATS permits negotiation of mutual recognition agreements (MRA), relating to engineering licensure, only on a bilateral or regional basis. Therefore, there is no stipulation for MRA, but it does say that it is possible. Similarly, regulations regarding government procurement is not specifically stated. Instead, there are suggestions for bilateral agreements.

One of the most important GATS provisions on domestic regulations is Article VI:4, dealing with qualification requirements and procedures, technical standards, and licensing requirements. To ensure that measures taken in these three areas do not constitute unnecessary barriers to trade in services, the GATS mandates that any such requirements be based on objective and transparent criteria and not be "more burdensome than necessary to ensure the quality of the service". The GATS stipulates that signatory governments shall not apply licensing requirements or technical standards in ways that nullify or impair the commitments that they have made under the agreement. It also encourages member governments to undertake negotiations to establish mutual recognition of the educational qualifications of service suppliers.

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<sup>73</sup> Trade Compliance Center. "WTO General Agreement on Trade in Services". Department of Commerce. (July 2004.) Online: <http://www.tcc.mac.doc.gov/cgi-bin/doi.cgi?204:65:748805190:55>.

Additionally, the government can make exceptions to this based on the U.S. Schedule of GATS Commitments. The U.S. has specified commitments related to engineering and integrated engineering services as shown in table 4 below<sup>74</sup>:

Mode	Limitations on market access	Limitations on national treatment
Cross-border supply from the territory of one WTO member country into the territory of another (for example, an architect in the U.S. sending plans to a client in Singapore);	None	None
Consumption abroad (for example, an Australian tourist taking a vacation in Las Vegas, or an Argentine citizen coming to the United States for health care);	None	None
Commercial presence (for example, the branch of an American bank in South Africa extending loans to local entrepreneurs);	None	None
The presence of "natural persons" for a limited period of time in another country (for example, the representative of an American software company spending a month in France installing the firm's products on a French company's computers).	Unbound, except as indicated in the horizontal section. In addition, US citizenship is required in the District of Columbia.	In-state residency is required for licensure in: Idaho, Iowa, Kansas, Maine, Mississippi, Nevada, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, and West Virginia

**Table 6**

The U.S. International Trade Commission issued a report regarding how it viewed the openness of certain markets. The portion on 'Architectural, Engineering, and Construction (AEC) Services' states<sup>75</sup>:

The schedules of commitments suggest that Mexico has the most restrictive market while Japan and Canada appear to have the least restrictive markets. In practice, however, industry representatives report that Japan's market for AEC services is most restrictive due to widespread informal barriers. ... Canada and Mexico, meanwhile, offer more favorable commitments for U.S. service providers under the NAFTA than under the GATS. ...

U.S. industry representatives have indicated that many informal barriers to trade in AEC services exist and were not addressed during the scheduling exercise. It is unclear to what degree such barriers will be affected by the outcome of the GATS.

<sup>74</sup> "Each Sector and each level of development - Developed / 01.A.f. Integrated Engineering Services." World Trade Organization Services Database online. (July 2004.) Online: [http://tsdb.wto.org/wto/public.nsf/FSetReportPredifinedAffich?OpenFrameSet&Frame=F\\_PredifinedReport&Src=\\_j5trn8rpfelqm4r39ccn6ssr65so2uob36ko34cpjcoomaphn6pgm6cr364p3adjl6cp30c1kcoq6cd1h7t2m8qbk8hnm6tbdcln780\\_](http://tsdb.wto.org/wto/public.nsf/FSetReportPredifinedAffich?OpenFrameSet&Frame=F_PredifinedReport&Src=_j5trn8rpfelqm4r39ccn6ssr65so2uob36ko34cpjcoomaphn6pgm6cr364p3adjl6cp30c1kcoq6cd1h7t2m8qbk8hnm6tbdcln780_)

*This schedule relates only to engineering and integrated engineering services.*

<sup>75</sup> U.S. International Trade Commission. "General Agreement on Trade in Services: Commitments by the United States, the European Union, Japan, Canada, and Mexico." *General Agreement on Trade in Services: Examination of Major Trading Partners' Schedules of Commitments*. December 1995. Online: <http://usinfo.state.gov/journals/ites/0496/ijee/ej1.htm>.

One section of the GATS is titled the Government Procurement Act. This act states that the member country must give foreign owned or foreign firms “no less favourable” treatment than what would be given domestically.<sup>76</sup> The GPA is voluntary:

the GPA is what is known as a plurilateral agreement, meaning that membership is by choice. Only after a country opts in to the GPA does it agree to be bound by the GPA’s provisions, and even then, it is only bound to the GPA’s provisions to the extent that other member countries have agreed to be similarly bound.

The agreement speculates that one country will only open procurement in areas that the other country has opened procurement. (A listing of all federal agencies that have open procurement is found at [http://www.wto.org/english/tratop\\_e/gproc\\_e/usa1.doc](http://www.wto.org/english/tratop_e/gproc_e/usa1.doc).)

The GPA also specifies what type of services are covered. It currently covers a wide range of services and construction contracts. A newer provision is to cover procurement by sub-central authorities (catalan governments in Suisse and prefectural governments in Japan). (Information about U.S. sub-central authorities who have signed can be found at [http://www.wto.org/english/tratop\\_e/gproc\\_e/usa1.doc](http://www.wto.org/english/tratop_e/gproc_e/usa1.doc).)

There are currently 27 signatories to the GPA. The following countries agree to the procurement provisions (all pre-enlargement European Union member states are included)<sup>77</sup>:

United States	Greece	Sweden	Israel
Austria	Ireland	United Kingdom	Japan
Belgium	Italy	Aruba (NL)	Liechtenstein
Denmark	Luxembourg	Canada	Norway
Finland	the Netherlands	Hong Kong China	Rpblc of Korea
France	Portugal	China	Singapore
Germany	Spain	Iceland	Switzerland

Additionally, the following countries are in the process of negotiating GPA accession:

Albania	Estonia	Kyrgyz Rpblic	Moldova
Bulgaria	Georgia	Latvia	Oman
Chinese Taipei	Jordan	Lithuania	Panama & Slovenia

The federal government is a signatory to the GPA. This states that federal government contracts are open to the aforementioned countries. However, the federal government cannot sign an agreement on behalf of the state governments. Therefore, a special provision was made in the agreement<sup>71</sup>:

Although the Government Procurement Agreement as originally conceived was applicable only to member countries, a mechanism was established to allow so-called sub-national governments — in the case of the United States, individual states — to agree to be bound by the GPA’s provisions.

Thirty-seven states obligated themselves in whole or in part to the GPA’s provisions, while North Dakota and West Virginia committed to providing nondiscriminatory treatment of suppliers, goods, and services from Europe with respect to state procurements. Moreover, as members of the United States, which has the constitutional authority to act on behalf of the

<sup>76</sup> Klinger, Shannon and M. Lynn Sykes. “Exporting the Law. A Legal Analysis of State and Federal Outsourcing Legislation.” The National Foundation for American Policy. April 2004. Online: [http://www.nfap.net/researchactivities/studies/NFAPStudyExportingLaw\\_0404.pdf](http://www.nfap.net/researchactivities/studies/NFAPStudyExportingLaw_0404.pdf).

<sup>77</sup> Office of the United States Trade Representative. “The President’s 2003 Annual Report on the Trade Agreements Program.” Executive Office of the President of the United States. 2004. Online: <http://www.ustr.gov/reports/2004Annual/II-wto.pdf>.

states in the international arena, and certainly to the extent that states receive federal monies, for example, on a mass transit or highway project, all states are arguably required to comply with the federal statutory requirements incorporating the GPA regardless of whether they expressly agreed to the Government Procurement Agreement provisions. These trade agreements have a significant impact on the current outsourcing debate. For the federal government and at least thirty-nine states, the analysis is clear: laws enacted that impermissibly conflict with federal and/or state trade obligations place the United States at risk of being found in violation of one or more of the trade agreements set forth above.

(This statement illustrates the debate concerning the international trade in services. Traditionally, the federal government is the main negotiator regarding international contracts. In the case of government procurement and licensure, the state governments have the power to make their own decisions: basically creating laws regarding the international trade in services. The United States has initially gotten around this debate by including a clause in multinational agreements that the states have powers regarding certain international trade issues.)

The World Trade Organization plays a large role in controlling trade in goods and services over a large range of countries. It is the broadest agreement that the U.S. has regarding government procurement. It does not include a specific licensure agreement.

## **NAFTA**

The WTO is a signatory organization that combines countries from all over the world. The North American Free Trade Agreement (NAFTA) is a free trade agreement between the U.S., Canada, and Mexico. It includes more specific points regarding certain trade aspects. “Canada and Mexico, meanwhile, offer more favorable commitments for U.S. service providers under the NAFTA than under the GATS.”<sup>78</sup>

Canada, Mexico and the United States, the three parties to the NAFTA, agreed in Chapter Twelve to apply the following principles to their services trade<sup>79</sup>:

**National Treatment.** Each NAFTA Party agreed to accord the service providers of the other Parties treatment that is no less favorable than the treatment that it provides, in like circumstances, to its own service providers.

**Most Favored Nation (MFN) Treatment.** Each NAFTA Party agreed to accord the service providers of the other Parties treatment that is no less favorable than the treatment that it accords, in like circumstances, to the service providers of any other country.

**Local Presence.** No Party may require a service provider of another Party to establish or maintain a representative office or other presence, or to be resident in its territory, as a condition for the provision of a service.

NAFTA specifically addresses the issue of engineering licensing. It recognizes that licensing is difficult to deal with as it is a state issue.<sup>80</sup>

### Section C Temporary Licensing of Engineers

1. The Parties shall meet within one year of the date of entry into force of this Agreement to establish a work program to be undertaken by each Party, in conjunction with its relevant professional bodies, to provide for the temporary licensing in its territory of

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<sup>78</sup> U.S. International Trade Commission. “General Agreement on Trade in Services: Commitments by the United States, the European Union, Japan, Canada, and Mexico.” Previously Cited.

<sup>79</sup> Trade Compliance Center. “NAFTA: Chapter 12 (Trade in Services).” U.S. Department of Commerce. (July 2004.) Online: <http://www.tcc.mac.doc.gov/cgi-bin/doi.cgi?205:64:547172661:0>.

<sup>80</sup> Trade Compliance Center. “NAFTA - Chapter Twelve: Cross-Border Trade in Services. Part Five: Investment, Services, and Related Matters.” Previously cited.

nationals of another Party who are licensed as engineers in the territory of that other Party.

2. To this end, each Party shall consult with its relevant professional bodies to obtain their recommendations on:

- (a) the development of procedures for the temporary licensing of such engineers to permit them to practice their engineering specialties in each jurisdiction in its territory;
- (b) the development of model procedures for adoption by the competent authorities throughout its territory to facilitate the temporary licensing of such engineers;
- (c) the engineering specialties to which priority should be given in developing temporary licensing procedures; and
- (d) other matters relating to the temporary licensing of engineers identified by the Party in such consultations.

3. Each Party shall request its relevant professional bodies to make recommendations on the matters referred to in paragraph 2 within two years of the date of entry into force of this Agreement.

#### Appendix 1210.5-C

##### Civil Engineers

The rights and obligations of Section C of Annex 1210.5 apply to Mexico with respect to civil engineers ("ingenieros civiles") and to such other engineering specialties that Mexico may designate.

The result of this is the establishment of a MRA for temporary and permanent licensing of engineers.<sup>81</sup> (Temporary licenses are renewable, one-year licenses. Permanent licenses allow the engineer to participate in the governance of the profession in Canada.) Canadian and Mexican federal authorities have signed, but only one U.S. state, Texas, has ratified the agreement. Thus engineers from Texas can practice in Mexico, but not in Oklahoma without additional paperwork.

Government procurement is another large issue.<sup>82</sup>

[The agreement] requires each of the three NAFTA countries to accord non-discriminatory, "national" treatment to suppliers of goods and services in the other two countries in public sector procurement that is covered by the Chapter. These suppliers must be treated no less favorably than domestic companies competing for the same procurement opportunities.

To be covered by Chapter Ten, contracts for goods and services must meet minimum dollar thresholds. These thresholds are reviewed every two years and adjusted, as needed, on the basis of the U.S. inflation rate. The following table shows the thresholds in effect as of February 2001:

#### For Procurement by Federal Departments and Agencies

Goods and services contracts \$56,190

Construction services contracts \$7,304,733

#### For Procurement by Government-controlled Enterprises

Goods and services contracts \$280,951

Construction services contracts \$8,990,862

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<sup>81</sup> APEC Electronic Individual Action Plan. "Chapter 3 (a:4): Business Services: Engineering." Asia Pacific Economic Cooperation. (July 2004.) Online: [http://www.apec-iap.org/document/CDA\\_2003\\_Business\\_Services\\_Engineering.htm](http://www.apec-iap.org/document/CDA_2003_Business_Services_Engineering.htm).

*More detailed information is available from the website of the Canadian Council of Professional Engineers (<http://www.ccpe.ca/>) and from the document entitled "The Canadian Engineering Services Industry".*

<sup>82</sup> Trade Compliance Center. "NAFTA: Chapter 10 (Government Procurement)." Previously cited.

A special threshold of \$25,000, which is not subject to revision, applies to procurement of goods by federal departments and agencies in the United States and Canada. The benefits of this threshold do not extend to Mexican suppliers.

Each party has specified service exclusions relating to government procurement.<sup>83</sup> Canada excludes all classes of research and development; and architecture and engineering services related to airfield, communication, and missile facilities as well as marine architect and engineering services. Mexico excludes research and development services. The United States excludes all classes of research and development; and operation of government-owned facilities in the following agencies: Department of Defense, Department of Energy, the National Aeronautics and Space Administration, and all research and development facilities.

Thus NAFTA has resulted in a mutual recognition agreement of engineering licensure only between Canada, Mexico, and Texas. The issue of government procurement states that, with a few exceptions, procurement should be open to all three countries. (This will come into play later in the section titled 'legislation'.)

## **Free Trade Area of the Americas**

The Free Trade Area of the Americas is a plan sponsored by the United States Trade Representative (under President George W. Bush) that would incrementally remove all tariffs between countries in the Western Hemisphere by 2015.<sup>84</sup> It focuses on five major areas: consumer and industrial goods, agriculture, services, investment, and government procurement. "Market access opportunities would be provided broadly across the U.S. investment and services sector, with markets open unless a specific exception is taken... Companies in FTAA countries would be able to compete for U.S. government procurement contracts on an unequal footing with firms from current NAFTA partners. This market opportunity covers nearly all the goods and services purchased by 51 federal government agencies." This would allow all member countries to provide engineering services for these 51 agencies.

## **Asian Pacific Economic Cooperation**

The Asian Pacific Economic Cooperation (APEC) is an existing forum for facilitating economic growth, cooperation, trade and investment in the Asia-Pacific region.<sup>85</sup> Its goal is to establish free and open trade and investment in the Asia-Pacific by 2010 for developed economies and 2020 for developing economies. It has "set out three key areas of cooperation... these are the areas of Trade and Investment Liberalisation, Business Facilitation, and Economic and Technical Cooperation." The Trade and Investment Liberalisation serves to eliminate tariff and non-tariff barriers to trade. Business facilitation focuses on aiding businesses in their efforts to trade more efficiently. The Economic and Technical Cooperation (ECOTECH) assists the people of these countries in participating in this process.

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<sup>83</sup> Trade Compliance Center. "Section D: General Provisions. Article 1018: Exceptions." Previously cited.

<sup>84</sup> Office of the United States Trade Representative. "Free Trade Area of the Americas." Executive Office of the President of the United States. (July 2004.) Online:  
<http://www.ustr.gov/regions/whemisphere/ftaa.shtml>.

<sup>85</sup> Asia-Pacific Economic Cooperation. "Frequently asked questions." (July 2004.) Online:  
<http://www.apecsec.org.sg/apec/tools/faqs.html#Q1>.

*APEC's 21 member countries include Australia, Brunei Darussalam, Canada, Chile, People's Republic of China, Indonesia, Japan, Republic of Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, The Republic of the Philippines, The Russian Federation, Singapore, Chinese Taipei, Thailand, United States of America, and Viet Nam.*

This agreement has plans for multiple provisions. Only one is a provision for the mutual recognition of engineering degrees.<sup>86</sup> The purpose being:

To arrange institutional establishment for the qualified professional engineers in the APEC member economies by registering as an APEC engineer and to fulfill their tasks without restrictions in the member economies as a professional engineer

The ultimate purpose is to expand mutual exchange of manpower through the promotion of technical manpower exchange followed by the mutual recognition of qualification and to promote the common interests of member economies.

There are 17 countries participating in MRA talks<sup>87</sup>:

Australia	Japan	Philippines	United States
Canada	Korea	Russia	Vietnam
China	Malaysia	Singapore	
Hong Kong China	New Zealand	Taiwan	
Indonesia	Papua New Guinea	Thailand	

As of 2003, the current plan is to proceed using bilateral agreements among members. The only existing APEC engineering MRA is between Japan and Australia (for mechanical, electrical, and chemical engineers). Additionally, there is an APEC licensed engineer registry. In June, 2003 there were 3,903 engineers registered. This currently does not mean anything as there is no existing multilateral MRA.

## TEP

The Trans-Atlantic Economic Partnership (TEP) is similar in scope to APEC. They differ in the member countries: TEP has European and American countries as opposed to Asian, Australian, and American countries. The goals are similar:

- increasing worldwide market access opportunities
- addressing specific obstacles faced by several service sectors
- improving the conditions for establishment
- improving the cross-border commitments to make full use of the opportunity for electronic trading
- examining ways in which movement of persons necessary to the supply of services can be enhanced
- developing additional disciplines to strengthen market access and guarantee that services can be supplied in a pro-competitive environment

One aspect that will help to facilitate offshore R&D is the emphasis on protection of intellectual property.

One area of focus is the reduction of technical barriers to trade. This requires the group to “identify specific sectors in which a comparison of regulatory requirements shows the potential for mutual recognition of technical regulations...improving cooperation in standards development at the national, regional and international level”. These are very important in engineering due to the level of precision needed. This would enable countries to recognize each others’ standards as similar to those of the U.S. without requiring additional oversight by the U.S.

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<sup>86</sup> 26th Human Resources Development Working Group. “APEC Engineer Mutual Recognition Project.” Previously cited.

<sup>87</sup> 26th Human Resources Development Working Group. “APEC Engineer Mutual Recognition Project.” Previously cited.

In 2000, a joint declaration on US-EC cooperation in the field of metrology in support of trade was issued. This “sets out the policy basis and orientation for a joint technical program of work between the United States and the European Community in view of supporting and furthering mutual recognition of test reports, calibration and measurement certificates provided for regulatory and market place compliance purposes.” The purpose is to internationally standardize and/or recognize national measurement standards. One concrete result is the Agreement on Mutual Recognition of Certificates of Conformity for Marine Equipment. This purports to improve safety at sea and help to prevent marine pollution.

As far as promoting mutual recognition of licensing, the TEP plans to seek mutual recognition of licensing. As far as architectural and engineering services, the TEP states that it will look at “the U.S. –Canada Free Trade Agreement [and] the North American Free Trade Agreement [to] provide a framework for the competent authorities and professional organizations to negotiate mutual recognition agreements with their counterparts in other countries.”<sup>88</sup>

A work plan was developed in 2000 to plan for mutual recognition of architecture and engineering services. Six elements were included<sup>89</sup>:

Respect of each others' regulatory systems: ...extent to which home country regulations and host country regulations apply to an individual practicing in another country or jurisdiction [and] requirements for licensing/registration/certification in a host country

Determining equivalence of education: purpose of education requirements for licensing or registration of professionals

Determining equivalence of qualifications other than education: ...experience and examinations...process by which equivalence will be determined and who will make the determination

Notification to the World Trade Organization of the intent to negotiate mutual recognition

Scope of practice: functions performed by licensed or registered individuals

Implementation of agreements: steps to be taken by regulatory authorities...governments at federal and sub-federal...professional associations...that may be necessary to make the agreement work.

Similarly, this does not set out any specific plans for a MRA. It only sets the basic framework.

## **Mutual Recognition Agreements**

The collection of agreements on engineering licensure recognition and organizations negotiating them is quite large. This is due to the fact that there are many components to becoming licensed: education, exams, practice, and state regulations.

The processes for multinational reciprocity began in the 80's. ABET and the Canadian Engineering Accreditation Board (CEAB) began negotiations to mutually accept each others' engineering standards for

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<sup>88</sup> Transatlantic Economic Partnership (TEP) Steering Group. “Report of the Transatlantic Economic Partnership Steering Group To the Meeting of Trade and Economic Ministers Services Regional Initiatives.” European Union. 31 May 2000. Online:  
[http://europa.eu.int/comm/external\\_relations/us/summit\\_05\\_00/report\\_tep\\_steering\\_grp.htm](http://europa.eu.int/comm/external_relations/us/summit_05_00/report_tep_steering_grp.htm).

<sup>89</sup> Report of the Transatlantic Economic Partnership steering group.  
[http://europa.eu.int/comm/external\\_relations/us/summit12\\_00/tep\\_report.htm](http://europa.eu.int/comm/external_relations/us/summit12_00/tep_report.htm)

programs.<sup>90</sup> The Treaty National agreement was developed. This established comparable equivalency of engineering education. This facilitated the movement of engineers between the US and Canada.

Later, additional countries wanted to have the same network. The Washington Accord (WA) was signed in 1989. This was an agreement between the bodies responsible for accrediting professional engineering degree programs in English-speaking countries. The countries involved are Australia, Canada, Ireland, Hong Kong, New Zealand, South Africa, United Kingdom, and the United States. (In the latest round of talks, non-English language countries were allowed to join after Germany expressed interest.)

This Washington Accord states that an engineering education is substantially equivalent in member countries. This meaning that an engineering degree that is accredited by the representative country's agency would be viewed by the US ABET as a degree from an accredited institution. Thus, an engineer with one of these degrees would pass the first step for licensing in the United States. (As this accord deals with engineering education, ABET is the primary negotiator.)

Later the members of this accord wanted to take this agreement a step further in not only mutually recognizing engineering degrees, but also recognizing engineering licenses. To work towards this end, the members of the Washington Accord established the Engineering Mobility Forum (EMF). The goal of this program was to explore mutual recognition of experienced engineers that are members of the Washington Accord countries. In 2001, the Engineers Mobility Forum Agreement was signed. This agreement created the

“EMF International Register of Professional Engineers by which the signatories aim to facilitate cross-border practice by experienced professional engineers by establishing a framework for their recognition, based on confidence in the integrity of national assessment systems.

The minimum standards for acceptance into the EMF Registry are:

- 1) To reach an overall level of academic achievement that is Substantially Equivalent to that of a graduate holding an engineering degree, accredited by an organization holding full membership in and acting in accordance with the terms of the Washington Accord,
- 2) To gain a minimum of seven years practical experience since graduation,
- 3) To spend at least two years in responsible charge of significant engineering work,
- 4) To gain assessment within registrant's own jurisdiction as eligible for independent practice,
- 5) To maintain continuing professional development (CPD) at a satisfactory level, and be bound by the codes of professional conduct.”<sup>91</sup>

The agreement was left open to the possibility of adding more interested countries. There are provisional plans to combine this program with the Asian Pacific Economic Cooperation (APEC). The components of the plans that deal with license recognition are under the oversight of the United States Council for Engineering Practice (USCIEP). (There is an additional organization, the Unión Panamericana de Asociaciones de Ingeniería (UPADI), formed to facilitate cooperation among engineers and engineering societies in North and South America.)

## United States Council for Engineering Practice

The difficulty in negotiating these agreements is coordinating the interested parties in the US: the Accreditation Board for Engineering and Technology (ABET), the National Council of Examiners for Engineering and Surveying (NCEES), the National Society of Professional Engineers (NSPE), and the state engineering boards. To alleviate these complications, the three aforementioned societies (and the American

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<sup>90</sup> Schwartz, Arthur, Deputy Executive Director and General Counsel, National Society of Professional Engineers. Personal Interview. 10 June 2004.

<sup>91</sup> Engineers Mobility Forum. “Engineers Mobility Forum Washington Accord.” Conference: Progress Toward Cross-Border Mobility in South Africa. June 2001. Online: <http://www.acec.org/publications/lastword/forum.doc>.

Council of Engineering Companies or ACEC) have formed the United States Council for Engineering Practice (USCIEP). The USCIEP acts as the U.S. representative in negotiations with other countries. It is currently working with NAFTA, the European Union (EU), Trans-Atlantic Economic Partnership (TEP), and Asian Pacific Economic Cooperation (APEC).

Additionally, the USCIEP is developing an international database of licensed engineers. The requirements for a U.S. engineer to enlist on USCIEP registry is stricter than simply being licensed. It requires that an engineer be licensed as well as<sup>92</sup>:

- must have no prior sanctions resulting in a suspension or revocation by any jurisdiction of the engineering practice license;
- complete an application for entry into the NCEES Records Program;
- have at least five references from licensed professional engineers who are familiar with the candidate's work, character, and integrity;
- periodically update his/her professional activities record and supplement the record with testimonials from professional references;
- have at least 7 years of qualifying experience. At least 4 years must be obtained at the time of initial registration as a professional engineer;
- have at least 2 years of experience being in responsible charge of significant engineering work as defined in the USCIEP Assessment Statement;
- meet minimum standards for continuing professional competence (CPC) as a condition for remaining on the registry as defined in the USCIEP Assessment Statement;
- must be a citizen of the United States of America.

Engineers can register, but this (as of now) does not allow them to be recognized in other countries. The plan is to eventually achieve this end.

## Accreditation Board for Engineering and Technology

ABET is internationally recognized as the engineering education evaluation society. ABET plans to facilitate many of these plans through consultative evaluations. Thus far, ABET has not accredited foreign institutions (except those covered by the provisions of the Washington Accord). It only offers suitable accreditation. This means that the program is basically equivalent to the U.S. programs. While some parts of the educational procedure may vary, the quality of the education is basically the same.

Many foreign universities have found it beneficial to be evaluated by ABET. They think that it will add credibility to their programs. ABET has conducted consultative evaluations in Kuwait, Egypt, the former Soviet Union, and the Netherlands and has conducted on-site visits to evaluate programs offered by institutions in Colombia, Iceland, Korea, Kuwait, Mexico, Netherlands, Saudi Arabia and Turkey.<sup>93</sup>

## Summary of Trade Agreements

These accords are all suggestions in the sense that they do not have the jurisdiction to mandate implementation. They are suggestions in the sense that they create guidelines for international reciprocity. For them to actually be initiated, the states must write specific provisions into their laws. The aim of developing the guidelines is that a structured format would be more enticing for state governments. It would simplify the process by establishing equivalence of the education or the actual licensure.

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<sup>92</sup> United States Council for Engineering Practice. "Admission Requirements." 2004. Online: [http://www.usciep.org/adm\\_req.shtml](http://www.usciep.org/adm_req.shtml).

<sup>93</sup> Aberle, Kathryn and George Peterson. "A Summary of ABET International Engineering Activities." Accreditation Board for Engineering and Technology. As presented at the Conference: Trade Agreements, Higher Education, and the Emergence of Global Professions: The Quality Dimension. Online: [http://www.abet.org/international/international\\_act.html](http://www.abet.org/international/international_act.html).

As stated earlier, Texas is the only state that allows mutual recognition of Canadian and Mexican engineering licenses.<sup>94</sup> Dan Clinton, former president of the National Society of Professional Engineers, believes that this agreement was motivated by trade in oil between Texas and the two countries. He stated that there are movements in Idaho, Montana, Washington, Oregon, and Utah to negotiate a MRA with Canada. Negotiating organizations are working through the state legislatures.

Government procurement agreements (GPA) have been negotiated through NAFTA and the WTO. NAFTA opens government procurement to Canada and Mexico in all areas except research and development, and in specified agencies (there are threshold levels as well).

The U.S.'s commitments to the WTO's GPA include construction and service contracts. This allows 27 other countries to bid on federal agency contracts. 37 states have also opted to sign onto the GPA and allow procurement under that GPA rules. States can choose if they will participate and at what level.

This will be an issue when looking at the proposed legislation later. (Most proposed legislation would restrict government procurement to work performed in the US.)

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<sup>94</sup> Clinton, Dan, former President, National Society of Professional Engineers. Personal Interview. 28 June 2004.

## **Quality Issues**

Issues of quality are important to look at because of its potential future effects. Continued poor quality could lead to limitations of the type and amount of work sent abroad as safety becomes an issue. Poor quality could also lead to security concerns when the information and data is not well managed.

The education and training is one aspect in determining how proficient an engineer is in another country. The actual work is a second way of determining quality. As there were no data to be found on these subjects, anecdotal evidence will be given.

## **Security and Safety**

Security issues have not been looked at in relation to the offshore outsourcing of engineering work. Most security is handled on a case by case basis. The government specifies necessary security provisions in its contracts. The private sector handles this through contracts.

Lester Wurfel of CDI explained how his company dealt with security issues in their multinational projects: through security agreements with their clients and international partners.<sup>95</sup> It is basically a contract that prevents the dissemination of the work. This also prevents companies from outsourcing their work without the approval of the main firm. If there is a breach in the contract, legal repercussions can be pursued in either country's court system. This would also hurt the reputation of the firm.

One example of a security concern occurred when a U.S. hospital outsourced sensitive patient health information to a medical transcriber in Pakistan.<sup>96</sup> The foreign worker later threatened to post the patients' medical records online as she claimed she had not been paid. This example can be extrapolated to forecast what could happen with other sensitive data sent overseas.

The issue of public safety has not been directly addressed as there currently does not seem to be much professional engineering work being sent offshore. Professional engineering work is most directly related to safety as this work is to create critical infrastructure. This could change in the future as a result of mutual recognition agreements between the U.S. and other countries or as a result of loosening of state requirements regarding professional engineers' signatures. Richard Weingardt, CEO of a Denver-based structural engineering firm, worries about the effect of sending work overseas. "I'm concerned about the watering down of the PE. I also think it raises some ethical issues as well."<sup>97</sup>

## **Foreign engineers' training and Stability in country**

There is not a good way to evaluate foreign engineers. No collected data could be found. Anecdotes will be relied upon. Multiple engineering professors from the U.S. were asked to describe the differences they saw in international and domestic undergraduate and graduate students, as well as the differences in educational systems. Professors were contacted at the University of Nebraska Lincoln where there is a high number of students from China and India.

John Ballard, associate dean of engineering at the University of Nebraska Lincoln, stressed that U.S. universities place a stronger emphasis than foreign universities in key areas such as design, ethics, and the

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<sup>95</sup> Wurfel, Lester, Director of Business Development, Life Sciences division, CDI Business Solutions. Previously cited.

<sup>96</sup> Nelson, Bill and Dianne Feinstein. "Protections Sought for Consumers' Outsourced Financial and Medical Records." 21 May 2004. Online: <http://billnelson.senate.gov/>.

<sup>97</sup> Boykin, Danielle. "Offshore Outsourcing Stirs National Debate". Previously cited.

economic impact.<sup>98</sup> He stated that foreign engineering curricula is more technically focused and does not focus on problem solving. Foreign students are also handicapped due to their lack of experience with U.S. design standards and government codes.

Another professor, who wished to remain anonymous, elaborated on the differences among foreign students from different parts of the world.<sup>99</sup> He said students from Western Europe are very similar to U.S. students in attitudes, work ethic, and philosophy of education. The difference comes with students from mainland Chinese (specifying a difference from the Taiwan) and India. Their educational systems place a strong value on independent thought, initiative, or problem solving—instead relying on memorization. Many communication problems arise. These students say what they believe the teacher or boss wants to hear rather than what is true. There is also an aversion to showing a lack of understanding through asking questions. He stated that these communication problems have arisen with an industry contact who outsources software development to India.

A Polish-born professor of mechanical engineering, Wieslaw Szydlowski, believes that the education has deteriorated in Eastern Europe from a quarter century ago.<sup>100</sup> He believes that 25 years before, the students had a deeper knowledge base partially due to rigorous entrance exams. He remarks that their ethics were sometimes questionable (cheating on tests). This also occurs with U.S. students.

William Poole of the Federal Reserve Bank of St. Louis even commented on his experiences as a professor.<sup>101</sup> He felt that the foreign students paid much more attention to writing and learning effective use of the English language.

The Accreditation Board for Engineering and Technology lists foreign universities that it has declared ‘accredited engineering programs’.<sup>102</sup> These are from the countries that fall under the Washington Accord. Additionally, it lists the programs it deems substantially equivalent. It has deemed specific universities in Chile, Germany, Kuwait, Mexico, the Netherlands, Saudi Arabia, United Arab Emirates, Turkey, and Singapore to be substantially equivalent. There is no listing of institutions ABET has deemed to no be substantially equivalent. These are all institutions that have requested and paid for expenses incurred from an ABET evaluation.

The quality of universities in India was remarked upon by Dr. Kamal Dwivedi, counselor of Science and Technology at the embassy of India.<sup>103</sup> There is a ranking system of universities based on the quality of the education. He was the former vice-chancellor of Arunachal University. He states that the engineering students are of the highest caliber—citing that each year 500,000 students sit for an exam to receive one of 3,000 seats in an engineering department at one of the seven Indian Institutes of Technology. There is a practical component to their education as students are required to do training in industry.

One person interviewed did comment on the quality in foreign industries. Tom Epply, president of Continental Design and Engineering, outsources work to engineers in China and India. He stated that product design in India was on par with that of the U.S. However, India’s tool engineering was not as good. China’s manufacturing engineering is not as good as that of the U.S.

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<sup>98</sup> John Ballard, Associate Dean, College of Engineering and Technology, University of Nebraska Lincoln. Personal Correspondence. July 21, 2004.

<sup>99</sup> Anonymous, Associate Professor, University of Nebraska Lincoln. Personal Correspondence. July 21, 2004.

<sup>100</sup> Szydlowski, Wieslaw, Associate Professor, Department of Mechanical Engineering, University of Nebraska Lincoln. Personal Correspondence. 23 July 2004.

<sup>101</sup> Poole, William. “Trade, Wages and Employment.” Previously cited.

<sup>102</sup> Accreditation Board for Engineering and Technology International. “Substantially Equivalent Evaluations.” Accreditation Board for Engineering and Technology. 16 December 2003. Online: <http://www.abet.org/international/recognized2003.html>.

<sup>103</sup> Dwivedi, Kamal Kant, Counselor, Science and Technology, Embassy of India. Personal Interview. 19 July 2004.

These anecdotes emphasized the differences between U.S. and foreign students. Of course, these are all generalizations and do not apply to all students. This is only a way of stereotyping the differences in students. The degree that this carries over to the workplace needs to be looked at as well. Richard Garber reminds that there are many foreigners working in the U.S. without what is construed as a problem between cultures.

Finally, even if premium costs or managing costs (due to poorer communication) were higher, it might not be significant enough to compel one not to offshore outsource.

## **Insurance**

Insurance companies play a large role in engineering work. Richard Garber, vice president of Victor O. Schinnerer & Company, Inc., spoke of his firm's role in insuring engineering firms.<sup>104</sup> His company insures engineering firms (from multiple disciplines) that work on construction work. They buy professional liability policies, which cover all projects done by each firm.

The premium charged to the firm depends on many factors. An underwriter will look at the type of firm, be it structural, civil, mechanical, or electrical. A second factor is the location as certain states are more litigious than others. Finally the work of the firm, including how many claims were brought against it, are considered. This brings into play the quality of the firm's work.

Mr. Garber said that his firm currently does not look at if the companies offshore outsource. As part of the underwriting process, the underwriter will ask about use of subcontractors, but do not ask who are the subcontractors or where they are located. The firm does not currently have intentions to look more into offshore outsourcing.

The premiums paid are based on historical factors. If the insurer were to discover a pattern of poorer quality by firms that offshore outsource, then this would be taken into consideration.

## **Summary**

Quality is seen as an issue regarding the offshore outsourcing of engineering work. The professors have highlighted the differences in education. It is yet to be shown the difference in quality. A good indicator of this may be the insurance companies—if they determine that there is a correlation between offshore outsourcing and poorer quality, premiums will rise for that type of work.

As far as security, it is hard to gauge its impact without knowing the full range of work that is being sent offshore. It would have to be examined if the work contains sensitive information such as designs for critical infrastructure. Additionally, the level of security for this information has yet to be proven in the engineering realm. (Indian information technology providers already advertise their security procedures on the Internet.)

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<sup>104</sup> Garber, Richard B. Vice President, A/E/C Risk Management Services, Victor O. Schinnerer & Company, Inc. Personal Interview. 23 July 2004.

# **Legislation**

Current government legislation only guides government procurement. Currently there are no restrictions on offshore outsourcing in the private sector. This section will review the existing legislation that affects offshore outsourcing as well as proposed legislation.

Representatives from both the Department of Commerce and the U.S. Trade Representative stated that the policies of their agencies are that of laissez faire: that offshore outsourcing is a global trade pattern that can not be stopped by government legislation.

## **Existing legislation that affects offshore outsourcing**

Current legislation affects offshore outsourcing only in accordance with government contracts. There is currently no legislation that limits offshore outsourcing done by private companies. (The exception being that trade in services is illegal with countries the federal government has issued an embargo against.). The existing legislation limits offshore outsourcing in government contracts in two ways: certain government contracts cannot be outsourced and companies must fully disclose plans to offshore outsource or risk reprisal.

The Thomas-Voinovich amendment forbids certain segments of the government from using offshore labor when outsourcing specified government work. Section 647. (e) of the January 23, 2004 Omnibus Appropriations bill (HR bill 2673) states<sup>105</sup>:

An activity or function of an executive agency that is converted to contractor performance under Office of Management and Budget Circular A-76 may not be performed by the contractor at a location outside the United States except to the extent that such activity or function was previously performed by Federal Government employees outside the United States.

This stipulation refers only to contracts resulting from appropriations in this specific bill. This bill funds the Department of Agriculture, Food and Drug Administration, Commodity Futures Trading Commission, and Farm Credit Administration.

John Sargent, Senior Policy Analyst at the Department of Commerce, explained that “Circular A-76 relates to former civil service activities outsourced to the private sector.”<sup>106</sup> It was the result of a study that summarized the benefit in government outsourcing functions to the private sector. The circular outlines the procedure for procurement.

The Thomas-Voinovich amendment does not mean that foreign firms cannot bid for and receive the contract. It simply means that any firm, foreign or domestic, that receives the contract must have the labor performed in the United States. The constitutionality of this was considered by the National Foundation for American Policy.<sup>107</sup> They determined that the amendment may violate the Government Procurement Act that the U.S. signed as a member of the World Trade Organization. This act states that a GPA member country must give foreign suppliers, goods, and services “no less favourable” treatment than those same good or services would be given domestically and member countries must not discriminate among or between foreign suppliers, goods, or services.

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<sup>105</sup> One Hundred Eighth Congress of the United States of America. “H.R.2673: Consolidated Appropriations Act, 2004 (Enrolled as Agreed to or Passed by Both House and Senate).” The Library of Congress. 7 January 2003. Online: <http://thomas.loc.gov>.

<sup>106</sup> Sargent, John. Senior Policy Analyst, Office of Technology Policy, Technology Administration, Department of Commerce. Previously cited.

<sup>107</sup> Klinger, Shannon and M. Lynn Sykes. “Exporting the Law. A Legal Analysis of State and Federal Outsourcing Legislation.” Previously cited.

The amendment does not discriminate between domestic and foreign-owned firms. It does indirectly discriminate against foreign firms that do not employ workers in the United States or U.S. firms who use offshore labor. This makes it possible that a dispute could be brought against the United States in the WTO.

This amendment is temporary—lasting only one year. There is another proposed amendment, the Dodd Amendment, which would make permanent this provision. The amendment was passed by the Senate in March 2004 and is awaiting approval in the House. This legislation is discussed further in the section titled ‘Proposed Legislation’.

There exists additional legislation that affects offshore outsourcing. Government restrictions are outlined in an analysis done by Kenneth Bruntel, a lawyer at Crowell Moring law firm.<sup>108</sup> This letter outlines the legal challenges that may present a company that chooses to offshore outsource. The letter outlines the liability for private contractors have when fulfilling government contracts. Not having full disclosure could result in legal or financial consequences.

In government procurement contracts, liability could result from not fully disclosing the contractor’s intent to use offshore labor. Mr. Bruntel states “of particular concern are the provisions of the Truth in Negotiations Act (“TINA”) (10 U.S.C. § 2306a; 41 U.S.C. § 254b). Under that Act, contractors are often required to provide the government with detailed information about the way in which contracts will be performed and the costs of that performance.” Simply put, this means that a contractor would be in breach of contract if the use of American labor had been stated, and then lower-cost foreign labor was used.

The letter points out that government contracts can include “provisions that restrict the personnel and subcontractors a contractor may use in performing the contract...A contractor who chooses to perform in a manner or location that is inconsistent with what it disclosed to the government during the procurement or inconsistent with the terms of its agreement could risk liability for breach of contract, termination of its contract, or, as discussed below, allegations of fraud.”

The third component of the letter refers to the False Claims Act, 31 U.S.C. § 3729. The letter states that the Act “allows the federal government to recover substantial (i.e., treble) damages and penalties from a contractor who knowingly submits a claim to the government that is false. This can occur in circumstances where a contractor, without informing the government, does not adhere to representations it made prior to contract award or does not observe contractual requirements during performance.”

This letter basically advises that all offshore labor used in government procurement should be disclosed in the initial contract. Failure to do so could result in penalties guided by various acts.

This transparency requires that a company state all intentions to offshore outsource when bidding for a government contract. Under current procurement regulations, the government contract should be awarded to the most qualified bidder without taking price into account. By listing offshore outsourcing intentions, it signifies such companies could potentially be appreciably less costly. This could add bias and skew the the quality based selection method.

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<sup>108</sup> Bruntel, Kenneth M. “Legal Opinion on Offshore Outsourcing.” Crowell Moring law firm. Correspondence to John Palatiello regarding the Offshore Subcontracting Under Federal Government Contracts. 27 January 2004. Online: <http://www.mapps.org/outourcingopinion.asp>.

## Proposed Legislation

Legislation has been proposed in the House of Representatives and the Senate regarding offshore outsourcing. Most bills fall into five categories: restricting government procurement to only U.S. labor, restricting corporate benefits from companies who offshore outsource, requiring companies who use offshore services to disclose such information and protecting the privacy of the individual, changing the procedure regarding H1-B and L-1 visas, and amending the Trade Adjustment Assistance program to also cover service jobs.

The following chart, Table 5, shows the most relevant legislation, along with the sponsors and current status as of July 14, 2002.<sup>109</sup>

Bill #	Sponsor	Bill Description	Status	Comments
<b>Section 647 (e) of HR 2673</b>	<b>Voinovich/Thomas</b>	<b>Transportation-Treasury 2004 Appropriation Act (Thomas-Voinovich amendment):</b> Prohibits OMB Circular A-76 contracts from being performed outside the U.S.	Amendment was adopted in the Senate by a vote of 95-1 and was included in the FY2004 Omnibus Appropriations bill that was signed into law January 23, 2004.	Provision may prove illegal under the WTO plurilateral Agreement on Government Procurement (GPA) or other relevant treaties.
<b>S.Amdt . 2660 to S.1637</b>	<b>Dodd (D-CT)</b> no cosponsors	<b>United States Workers Protection Act of 2004:</b> These bills attempt to bar federal and state contracts to firms with offshore operations.  A version of the Dodd bill, S.Amdt. 2660, was adopted during consideration of S. 1637 on March 4, 2004.	The Senate bill was introduced on February 12, 2004 and referred to the Senate Government Affairs Committee.  The amendment was adopted by a vote of 70-26. All 26 votes in opposition were Republicans.	
<b>HSAR 3037.11 0-70(a) DHS Rule</b>		The provision precludes foreign nationals from working on certain types of DHS service contracts. Specifically requires a restrictive clause entitled "Qualifications of Contractor Employees" to be included in any solicitation or contract for services that requires contractor employees to have recurring access to government facilities or sensitive information.  The HSAR clause does not expressly permit the agency to waive the ban.	On December 4, 2003, the Department of Homeland Security (DHS) issued this rule as part of its interim rules establishing DHS Acquisition Regulation (HSAR), which supplement the Federal Acquisition Regulation (FAR).	

<sup>109</sup> United States Council for International Business. "Trade Provisions." 6 April 2004. Online: [http://www.uscib.org/mem\\_docs/federal\\_legislation.xls](http://www.uscib.org/mem_docs/federal_legislation.xls).

Chart was created by the USCIB. The author of this paper has updated the information given on the chart using Thomas locator ([thomas.loc.gov](http://thomas.loc.gov)).

S Amdt 2783	Boxer (D- CA)	On March 11, the Boxer amendment was defeated (41-53). This amendment would have enacted just about the entire anti-offshoring agenda. It included Dorgan provision to prohibit deferral of corporate income tax on production moved overseas; Durbin provision to extend TAA and health insurance to service sector employees; Dodd Amendment to prohibit federal/state contracts that involve offshoring; and Daschle bill to expand WARN act.	Four Democrats joined 49 Republicans in voting against the amendment: Baucus; Breaux; Miller, and Nelson (NE). Absent Senators were: GOP - Burns and Ensign; Dems - Edwards, Johnson, Kerry, and Reid of Nevada.	
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**Table 7**

The Thomas-Voinovich amendment was discussed previously in the section titled ‘current legislation’. The Dodd amendment has passed in the Senate and is waiting for approval in the House. The Department of Homeland Security passed regulations regarding procurement. Finally, the Boxer amendment failed in the Senate.

The most relevant legislation (as of July 16, 2004) is the Dodd Amendment, which is attached to the Jumpstart Our Business Strength (JOBS) Act (bill number S.1637). This was passed in the Senate on March 5, 2004. The provisions of this amendment are more significant than those of the Thomas-Voinovich amendment. The Dodd amendment includes more permanent and more widespread provisions. Portions of the amendment are shown below (the full text is found in Appendix C)<sup>110</sup>:

- An activity or function of an executive agency that is converted to contractor performance under Office of Management and Budget Circular A-76 may not be performed by the contractor or any subcontractor at a location outside the United States
- A contract that is entered into by the head of an executive agency may not be performed outside the United States
- [F]unds appropriated for financial assistance for a State may not be disbursed ... unless ... that State has transmitted ... a written certification that none of such funds will be expended for the performance outside the United States of contracts<sup>111</sup>

<sup>110</sup> Bill summary of S2094 <http://thomas.loc.gov/cgi-bin/bdquery/z?d108:SN02094:@@L&summ2=m&>

<sup>111</sup> How significant is engineering work in state contracts?

Surveys show that at a minimum (not all agencies responded to the surveys):

- Natural-resource and environmental-protection agencies in 18 states outsource engineering services;
- General-services agencies in 22 states outsource architectural, building-construction, or facility maintenance functions;
- Transportation agencies in 34 states outsource highway design, road and bridge construction, road maintenance, architectural services, or airport projects;
- Correctional agencies in 26 states and dozens of counties and cities have outsourced designing, building, and/or operating correctional facilities; and Virtually all local governments outsource the design and construction of roads, bridges, solid-waste facilities, schools, and water and wastewater facilities.

Moore, Adrian T., Geoffrey F. Segal, and John McCormally. “Infrastructure Outsourcing: Leveraging Concrete, Steel, and Asphalt with Public-Private Partnerships.” American Council of Engineering Companies. September 2000. Online: <http://www.acec.org/advocacy/pdf/fullstudy.pdf>.

The amendment includes exemptions:

- to meet a requirement ... for the contract to be performed specifically at a location outside the United States.
- such activity or function was previously performed by Federal Government employees outside the United States.
- the President determines in writing that it is necessary in the national security interests
- the property or services needed by the executive agency are available only by means of performance of the contract outside the United States
- no property or services available by means of performance of the contract inside the United States would satisfy the executive agency's need.

The amendment further exempts the Department of Defense, all military departments, Department of Homeland Security, Department of Energy, and any element of the intelligence community. For the state exemptions, the head of that state would detail in writing why the exemption is necessary. The head of the executive agency receiving the notification has to confirm the necessity and notify the director of the Office of Management and Budget (OMB).

Additionally, the amendment says that the provisions “shall not apply to procurement covered by the World Trade Organization Government Procurement Agreement [GPA].” This is significant because it would allow most work (according to the specific work outlined in the US GPA schedule) to be done by the 27 signatory countries—including most of Europe, China, and South Korea. This would not allow work to be done in India.

This last exception would serve to avoid disputes in the WTO. However, the amendment does not address or other accords such as NAFTA. NAFTA includes a provision for opening government procurement to Canada and Mexico. As Canada is part of the WTO, Canadian firms could still receive contracts. However, Mexico is not a signatory to the GPA of the WTO. Thus their procurement abilities outlined in NAFTA would conflict with the provisions of this amendment.

This legislation has passed the Senate. It still must be sent to the House of Representatives to be passed and then signed by the president. According to the president’s earlier comments, it seems unlikely that he would sign such a bill.

There have been many other amendments and bills introduced. However, the rest have either been referred to committee or have been struck down. The following chart, Table 6, shows a brief listing of proposed legislation. More information about each bill can be found in Appendix D.

<b>Restrict Government Procurement</b>			
<b>Bill #</b>	<b>Sponsor</b>	<b>Bill Description</b>	<b>Status</b>
HR 3134	Walsh (R-NY) 21 Cosponsors	American Manufacturing Retention Act	Introduced September 17, 2003 and referred to committee.
HR 3820	DeLauro (D-CT) 31 cosponsors	United States Workers Protection Act of 2004	Introduced February 24, 2004 and referred to the committee.
<b>Restrict Benefits to Corporations</b>			
<b>Bill #</b>	<b>Sponsor</b>	<b>Bill Description</b>	<b>Status</b>
HR 3888	Sanders (I-VT) 70 cosponsors	Defending American Jobs Act of 2004	Introduced March 3, 2004 and referred to committee
S 2148	Coleman (R-MN) no cosponsors	USA Jobs Protection Act of 2004	Introduced on March 1, 2004 and referred to the committee
HR 3911	Waters (D-CA) no cosponsors	Federal grant eligibility	Introduced on March 4, 2004 and referred to the committee

	Dorgan (D-ND)	Deny foreign tax deferral for U.S. firms operating abroad	Rejected on a 60-39 motion to table the amendment
DRAFT	Meehan (D-MA)	Outsourcing Tax Loophole Elimination Act	Intention to introduce
<b>Offshore Outsource Disclosure &amp; Privacy Protection</b>			
<b>Bill #</b>	<b>Sponsor</b>	<b>Bill Description</b>	<b>Status</b>
SA 2879, SA 2897, SA 2918 to S 1637	Clinton (D-NY)	Limit companies from transmitting personally identifiable information.	Submitted March 23, 2004.
S 1873	Kerry (D-MA) 7 cosponsors	Call Center Consumer's Right to Know Act of 2003	Introduced November 17, 2003 and referred to committee.
HR 3816	Strickland (D-OH) 19 cosponsors	Call Center Consumer's Right to Know Act of 2003	Introduced February 11, 2004 and referred to committee.
S 2090	Daschle (D-SD) 24 Cosponsors	A bill to amend the Worker Adjustment and Retraining Notification Act	Introduced February 12, 2004 and referred to the committee
Speech		U.S. privacy protection laws.	Intention to introduce
<b>Assistance to Affected Workers</b>			
<b>Bill #</b>	<b>Sponsor</b>	<b>Bill Description</b>	<b>Status</b>
S 2143	Durbin (D-IL) 4 cosponsors	Service Workers Fairness Act	Introduced February 27, 2004 and referred to committee
HR 3881	Smith (D-WA) 108 cosponsors	Extend the trade adjustment assistance program to the service sector.	Introduced on March 3, 2004 and referred to the House Ways and Means Committee.
SA 2650 to S 1637	Bayh (D-IN) no cosponsors	To provide a health insurance tax credit for TAA recipients.	Submitted March 3, 2004.
SA 2916 to S 1637 S 2157	Wyden (D-OR)/ Coleman (R-MN)/ Baucus (D-MT)	Extension of trade adjustment assistance to services sector.	Rejected by a 45- 54 vote. The amendment failed to get the 60 votes necessary under Senate budget waiver procedures.
S 2230	Snowe (R-ME) no cosponsors	Amend the Trade Act of 1974	Introduced March 24, 2004 and referred to committee.
HR 4090	Camp (R-MI) 10 cosponsors	Extend the trade adjustment assistance program	Introduced March 31, 2004 and referred to the committee.

**Table 8**

## Administration

Two of the most important opinions on offshore outsourcing are those of President Bush and Senator Kerry. Statements made by President Bush suggest a *laissez faire* attitude. President Bush's annual economic report (released February 9, 2004) touched on the topic of offshore outsourcing. It said that "One facet of increased services trade is the increased use of offshore outsourcing...When a good or service is produced more cheaply abroad, it makes more sense to import it than to make or provide it domestically."<sup>112</sup>

<sup>112</sup> '2004 Economic Report of the President'. <http://www.gpoaccess.gov/eop/index.html>

A statement on President Bush's campaign website quotes sources that say that offshore outsourcing has been overblown<sup>113</sup>:

Some have exaggerated and distorted the outsourcing phenomenon for political or commercial gain...The new BLS data, while not perfect, indicates that outsourcing has proved to have much less of an impact that has been charged and is a much less significant factor than the increase in productivity.

Few U.S. jobs are lost because of foreign outsourcing, indicating that concerns that U.S. companies are exporting jobs may be overblown, Labor Department data released Thursday show. (Source: Rex Nutting, "Foreign Outsourcing Costs Few Jobs, CBS Marketwatch, 6/10/2004)

For the first quarter of this year, 4,633 workers were laid off because their job moved overseas. That's just 2.5% of layoffs. The trend of job relocation is real, but the practice is much more prevalent in shifting jobs domestically. (Source: Bureau of Labor Statistics, 6/10/04)

The last two quotes relate to the statistics discussed previously in the section titled 'Jobs Lost / Current Situation / What is Offshore Outsourcing'. These comments suggest that President Bush believes that this trend is exaggerated. Based on these beliefs, it is then assumed that he would not sign legislation relating to such measures.

Senator Kerry is seen as much more protectionist in his measures. He often speaks in protectionist way. On his official campaign website, the Kerry campaign has announced the following goals<sup>114</sup>:

- Use Government Contracts for U.S. Workers;
- Stop Giving Government Contracts to Corporations Breaking the Rules;
- Consumers "Right to Know" on Call Center Workers;
- End Every Single Tax Credit That Gives Corporations Breaks for Moving Jobs Offshore;
- Trade Laws to Protect American Workers;

Similarly E-Business Strategies reported that Senator Kerry has "three offshore-specific proposals".<sup>115</sup>

1. Stop giving government contracts, tax credits, and other incentives to U.S. companies that move jobs offshore.
2. Force offshore call center reps working for U.S. companies to disclose their location.
3. Require companies moving jobs offshore to give affected workers three month's notice.

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<sup>113</sup> Policy Memo: The Economy and the Middle Class. Memorandum from BC'04 Policy Department. <http://www.georgewbush.com/Economy/read.aspx?ID=2759>

<sup>114</sup> Kerry, John. "Kerry-Edwards Campaign Unveils New Round of National Ads Highlighting Their Positive Vision for America." 7 July 2004. Online: [http://www.johnkerry.com/pressroom/releases/pr\\_2004\\_0707a.html](http://www.johnkerry.com/pressroom/releases/pr_2004_0707a.html).

<sup>115</sup> E-Business Strategies. "Offshore Outsourcing and the 2004 Presidential Election: The Reality Beyond the Rhetoric." *10 Trends of Mobile Business*. 2003. Online: [http://www.ebstrategy.com/Outsourcing/policy/reports/Offshore\\_Outsourcing\\_and\\_2004\\_election.pdf](http://www.ebstrategy.com/Outsourcing/policy/reports/Offshore_Outsourcing_and_2004_election.pdf).

However, the actual proposals that Senator Kerry has supported in the Senate do not actually enact protectionist measures. A search through the Library of Congress website revealed only one offshore outsource-related measure introduced by Senator Kerry. He Introduced the Call Center Consumer's Right to Know Act of 2003 (S 1873). This would require “employees at a call center who either initiate or receive telephone calls to disclose the physical location of such employees, and for other purposes”.<sup>116</sup>

## Summary

The Thomas-Voinovich amendment led the way for offshore outsourcing legislation by prohibiting work done offshore for all items appropriated in the same bill. This was the groundbreaker. Since then, more legislation has been proposed with the intentions of restricting government procurement, restricting federal government benefits from companies that offshore outsource, and reforming trade assistance programs to include those affected by service job losses. There has also been proposed reform for H-1B and L-1 Visa abuses.

The Dodd amendment has come closest by passing in the Senate. It would prevent a larger range of contracts from being performed offshore while making a few exceptions, including that for the Government Procurement Act [GPA] of the WTO. Since the GPA gives broad procurement rights to 27 countries, including China and Canada, the Dodd amendment is much less restrictive than it appears. It may not hold up though as it contradicts provisions in U.S. trade agreements such as in NAFTA.

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<sup>116</sup> Kerry, John. “Call Center Consumer's Right to Know Act of 2003 (Introduced in Senate as S 1873).” U.S. Senate. 108<sup>th</sup> Congress. 17 November 2003. Online: <http://thomas.loc.gov>.

## **Conclusion**

The significance of offshore outsourcing of engineering work is unknown. Offshore outsourcing reports do not put as much attention on engineering services as other services. Statistics from the Bureau of Labor Statistics suggest that only 2% of service jobs were lost to overseas relocation. However, this is an underestimate as not as layoffs are included in the survey. Additionally, there could have been jobs created offshore rather than onshore. As far as how much of this is engineering services, it is unknown. Less than three percent of revenue from service jobs went to engineering services. This suggests that engineering services would represent a very small percent of that 2%.

This is looking at the current situation for all engineering disciplines. There is a noticeable difference among disciplines. Unemployment statistics show that electrical engineers have a higher unemployment than the nationwide average unemployment. This may be due to a number of things, such as the purported Visa program abuses.

The current situation suggests that offshore outsourcing is not currently having a large impact on engineers. What is important to look at is the future. Many engineering services are currently outsourced within the U.S. These jobs have the potential to be sent offshore. An example of this was shown with Continental Engineering and Design. When companies came to them as a consultant, Continental would send the work overseas to established partners. This type of arrangement opens up the possibility for far vaster use of offshore labor. Before, only the largest engineering firms could afford to set up operations overseas to utilize cheaper foreign labor. Now, smaller firms are able to do this for smaller projects.

There are natural limits. It would be very difficult to send structural engineering work overseas as this type of work requires site supervision and constant modifications. A second limiting factor is the expertise found in the United States. Many other countries outsource to the U.S. as there is expertise in special areas such as aerospace and power plant design. However, developing countries show much improvement in the number of engineers, the number of papers written, and the number of patents received. This and the fact that many of the aerospace and plant companies have operations overseas, foreign engineers are 'catching up' on the expertise in the U.S.

The extent to which this will impact engineers is not yet known. If this trend were to increase and a significant number of engineers were to lose their jobs, this would require the interjection of legislation to correct for externality in the economy. The problem now is that there are no relevant statistics and there are no plans to track this trend. David Bohigian at the Department of Commerce reported that there are currently no plans at the DOC to monitor the international trade in engineering services. He said that it is possible that legislation may be handed down from Congress requiring a government agency to collect statistical data to be used in describing the offshore outsourcing trend.

While there is currently legislation in Congress to fund studies, none focus specifically on engineering services and none have left committee. One bill aimed at preventing government contracts from being performed overseas has passed. This is only a temporary bill. Additional proposed bills are larger in scope, but must make large exceptions for U.S. trade obligations, such as the Government Procurement Act signed under the WTO.

It is important to look specifically at the offshore outsourcing of engineering services due to the nature of the products. Engineers must be licensed to perform special tasks because the work relates directly to the public welfare and safety, such as in the case of buildings and infrastructure. This type of work does not appear to be easily outsourced overseas. This does not mean that it is not happening. While some government contracts require disclosure of where the work is done, other contracts do not. This gives the contractors liberty to use offshore engineers. This adds risk when the foreign engineers are not familiar with U.S. codes and regulations.

This could become a larger issue with the passage of mutual recognition agreements (MRA) that would allow engineers licensed in other countries to sign and seal drawings for work done in the U.S. A MRA is

seen as a benefit to U.S. engineers who want to practice abroad. They are also uncommon in that it requires each state and territorial government to pass legislation accepting the terms of the agreement. Currently, the only existing MRA is among Texas, Canada and Mexico. However, there are many coalitions, including many of the economic partnerships, which are working to facilitate more MRA's.

In conclusion, at this point legislation is not necessary as there is not sufficient data or knowledge to make that assertion. There are two things that need to be known first. The first one is the number of engineering jobs that are being lost. This would signify whether there is an externality in the market. The second thing that needs to be known is the type of engineering work being sent overseas. This needs to be examined so as to ensure that the public welfare is protected by having quality work—including the signature of a professional engineer that has actually supervised the work if required. This last part requires investigating abuses to determine if the work sent abroad requires a signature, and if so, a licensed, professional engineer is actually supervising the work.

The studies proposed above will create a larger knowledge that will allow elected officials to determine if legislation is necessary in the future.

# **Postword**

## **About the Author**

Lori Simpson graduated from the University of Nebraska Lincoln in May 2004 with a Bachelor of Science degree in Mechanical Engineering and a Bachelor of Arts degree in Spanish. She will pursue a Master of Science degree in Technology and Public Policy at the Massachusetts Institute of Technology starting in the fall of 2004. She hopes to study more languages with the ultimate goal of working on infrastructure development abroad. Her past experiences include matriculating in engineering courses at the Universidad Publica de Navarra in Spain, attending an environmental risk security conference in Israel and a volunteer program in the West Bank, researching flush mounted shear stress sensors as part of a NASA grant, serving as president of Golden Key International Honour Society at UNL, and mentoring a great person as part of the Latino Achievement Mentoring Program.

## **W.I.S.E.**

The Washington Internships for Students of Engineering is a ten week introduction to public policy for engineering students. It is not a traditional internship. Rather, it is an exploratory investigation into the role of engineers in public policy development and administration. Visits are arranged to visit various governmental and non-governmental agencies to hear from people who deal with science and technology policy. In addition, with the support of one of the sponsoring engineering societies, a topic is chosen and investigated. The paper gives the student justification for meeting with representatives from different government agencies and learning their roles.

## **Acknowledgements**

First I must thank the National Society of Professional Engineers (NSPE) and the National Science Foundation for sponsoring me. NSPE provided me with an office space and resources. Thank you to Sharon Jones, our faculty mentor in residence who spent a lot of time evaluating my paper and trying to improve the manner in which I thought about the topic. She is very knowledgeable about public policy and motivated me to think more critically during our visits. Thank you to Bethany Nadeau who showed an interest in my topic and supported me throughout my stay at NSPE. She helped me with the logistics of my topic. Thanks to the Harvard group for making me an unofficial member. Finally, to my team (the PNM) “oh no”!

# **Appendices**

## Appendix A

Table 6.1. Professional, Scientific, and Technical Services (except Notaries and Landscape Architectural Services) (NAICS 54)—Estimated Revenue for Employer and Nonemployer

Kind of business	2002	2001	2000	1999	1998	2002/2001	2001/2000	2000/1999	1999/1998
Total for selected service industries	4,596,465	4,484,832	4,360,717	4,016,836	3,701,443	2.49%	2.85%	8.56%	8.52%
Professional, scientific, and technical services (except notaries and landscape architectural services)	940,970	932,172	894,781	813,217	745,427	0.94%	4.18%	10.03%	9.09%
Architectural, engineering, and related services (except landscape architectural services)	176,142	174,823	166,709	148,240	137,989	0.75%	4.87%	12.46%	7.43%
Architectural services	27,255	28,900	27,174	24,411	22,827	-5.69%	6.35%	11.32%	6.94%
Engineering services	129,330	127,796	123,463	108,675	99,920	1.20%	3.51%	13.61%	8.76%
Testing laboratories	9,213	8,263	7,487	7,271	7,340	11.50%	10.36%	2.97%	-0.94%
Other related services	8,449	9,865	8,586	7,884	7,902	14.35%	14.90%	8.90%	-0.23%
Scientific research and development services	63,006	57,434	51,428	45,739	41,695	9.70%	11.68%	12.44%	9.70%
Research and development in the physical, engineering, and life sciences	58,344	53,072	47,411	42,077	38,325	9.93%	11.94%	12.68%	9.79%
Research and development in the social sciences and humanities	4,662	4,363	4,017	3,662	3,370	6.85%	8.61%	9.69%	8.66%

“The US Census Bureau conducts the Service Annual Survey to provide national estimates of annual revenue and expenses, by kind of business and tax status, for selected service industries.

We develop the estimates in this report using data from mailed survey questionnaires and administrative records. The survey questionnaires are mailed to a probability sample of firms located in the United States and having paid employees. The sample includes firms of all sizes and covers both taxable firms and firms exempt from Federal income taxes. Administrative records data or imputed values are used to account for firms without paid employees.

All dollar values presented in this report are expressed in current dollars; that is, the estimates are not adjusted to a constant dollar series. Consequently, when comparing estimates to prior years, users also should consider price level changes.”

## Appendix B

Indovance is a U.S. based engineering consulting firm that specifically focuses on offshoring work to India. The following is a list of their services:

Offerings to US clients include concept modeling of products based on customer requirements, as well as the design and manufacture of:

- Jigs and fixtures
- Hydraulic systems
- Material handling equipment
- Assembly systems

Indovance delivers a flexible offering of CAD and design services in AutoCAD, SolidWorks, SolidEdge, and Pro/E:

- Architectural drawings
- Building and Systems layout (HVAC, piping, systems, etc.)
- Legacy data conversion
- Drafting and detailing
- 3D modeling and assembly
- Preparation of production drawings
- Parts lists and bill of materials
- Handling ECNs (Engineering Change Notices)
- Higher-level CAD tasks
- AutoCAD, SolidWorks, SolidEdge, Pro/E

Additional companies that offer globalization services or engineering services can be found at:

<http://www.antengineering.com/>

<http://www.revaodem.com/>

<http://themagnumgroup.net/>

<http://www.shinotechchina.com/>

<http://www.square1pd.com/>

<http://www.designticket.com/>

<http://www.prodigylabs.com/>

<http://www.square1pd.com/>

[http://www.knowledge.com/Top/Business/Industrial\\_Goods\\_and\\_Services/Engineering/Consulting/](http://www.knowledge.com/Top/Business/Industrial_Goods_and_Services/Engineering/Consulting/)

[http://www.geometricsoftware.com/services/engineering\\_services.htm](http://www.geometricsoftware.com/services/engineering_services.htm)

<http://www.deloitte.com/dtt/article/0,2297,sid%253D2233%2526cid%253D23286,00.html>

<http://www.nycedo.com/edocorp/SupportServices.htm>

## Appendix C

### Full text of the Dodd Amendment

An activity or function of an executive agency that is converted to contractor performance under Office of Management and Budget Circular A-76 may not be performed by the contractor or any subcontractor at a location outside the United States except to the extent that such activity or function was previously performed by Federal Government employees outside the United States.

`(b) OTHER FEDERAL CONTRACTS- (1) A contract that is entered into by the head of an executive agency may not be performed outside the United States except to meet a requirement of the executive agency for the contract to be performed specifically at a location outside the United States.

`(2) The prohibition in paragraph (1) does not apply in the case of a contract of an executive agency if--

`(A) the President determines in writing that it is necessary in the national security interests of the United States for the contract to be performed outside the United States; or

`(B) the head of such executive agency makes a determination and reports such determination on a timely basis to the Director of the Office of Management and Budget that--

`(i) the property or services needed by the executive agency are available only by means of performance of the contract outside the United States; and

`(ii) no property or services available by means of performance of the contract inside the United States would satisfy the executive agency's need.

`(3) Paragraph (1) does not apply to the performance of a contract outside the United States under the exception provided in subsection (a).

`(c) STATE CONTRACTS- (1) Except as provided in paragraph (2), funds appropriated for financial assistance for a State may not be disbursed to or for such State during a fiscal year unless the chief executive of that State has transmitted to the Administrator for Federal Procurement Policy, not later than April 1 of the preceding fiscal year, a written certification that none of such funds will be expended for the performance outside the United States of contracts entered into by such State.

`(2) The prohibition on disbursement of funds to or for a State under paragraph (1) does not apply with respect to the performance of a State contract outside the United States if--

`(A) the chief executive of such State--

`(i) determines that the property or services needed by the State are available only by means of performance of the contract outside the United States and no property or services available by means of performance of the contract inside the United States would satisfy the State's need; and

`(ii) transmits a notification of such determination to the head of the executive agency of the United States that administers the authority under which such funds are disbursed to or for the State; and

`(B) the head of the executive agency receiving the notification of such determination--

`(i) confirms that the facts warrant the determination;

`(ii) approves the determination; and

`(iii) transmits a notification of the approval of the determination to the Director of the Office of Management and Budget.

`(3) In this subsection, the term `State' means each of the several States of the United States, the District of Columbia, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, the Virgin Islands, Guam, American Samoa, and the Trust Territory of the Pacific Islands.

`(d) Subsections (b) and (c) shall not apply to procurement covered by the World Trade Organization Government Procurement Agreement.

`(e) NATIONAL SECURITY EXEMPTION- Subsection (b) shall not apply to any procurement for national security purposes entered into by--

`(1) the Department of Defense or any agency or entity thereof;

`(2) the Department of the Army, the Department of the Navy, the Department of the Air Force, or any agency or entity of any of the military departments;

`(3) the Department of Homeland Security;

`(4) the Department of Energy or any agency or entity thereof, with respect to the national security programs of that Department; or

`(5) any element of the intelligence community.

`(f) RESPONSIBILITIES OF OMB- The Director of the Office of Management and Budget shall--

`(1) maintain--

`(A) the waivers granted under subsection (b)(2), together with the determinations and certifications on which such waivers were based; and

`(B) the notifications received under subsection (c)(2)(B)(iii); and

`(2) submit to Congress promptly after the end of each quarter of each fiscal year a report that sets forth--

`(A) the waivers that were granted under subsection (b)(2) during such quarter; and

`(B) the notifications that were received under subsection (c)(2)(B)(iii) during such quarter.

`(g) ANNUAL GAO REVIEW- The Comptroller General shall--

`(1) review, each fiscal year, the waivers granted during such fiscal year under subsection (b)(2) and the disbursements of funds authorized pursuant to the exceptions in subsections (c)(2) and (e); and

`(2) promptly after the end of such fiscal year, transmit to Congress a report containing a list of the contracts covered by such waivers and exception together with a brief description of the performance of each such contract to the maximum extent feasible outside the United States.'.

(2) CLERICAL AMENDMENT- The table of sections in section 1(b) of such Act is amended by adding at the end the following new item:

`Sec. 42. Limitations on off-shore performance of contracts.'.

(b) INAPPLICABILITY TO STATES DURING FIRST TWO FISCAL YEARS- Section 42(c) of the Office of Federal Procurement Policy Act (as added by subsection (a)) shall not apply to disbursements of funds to a State during the fiscal year in which this Act is enacted and the next fiscal year.

## Appendix D

### Proposed Legislation

Referred to Committee				
Restrict Government Procurement				
Bill #	Sponsor	Bill Description	Status	Comments
HR 3134	Walsh (R-NY) 21 Cosponsors 15 Republicans	<b>American Manufacturing Retention Act:</b> Requires that federal contractors have at least 50 percent of their workforce located in the U.S.	Introduced September 17, 2003 and referred to both the Government Reform and Armed Services Committees. October 15, 2003 requested and still awaiting comment from DOD.	
HR 3820	DeLauro (D-CT) 31 cosponsors (29 D, 1R, 1I)	<b>United States Workers Protection Act of 2004:</b> These bills attempt to bar federal and state contracts to firms with offshore operations.	The House bill was introduced on February 24, 2004 and referred to the Committee on Government Reform.	These bills would prohibit state financial assistance
HSAR 3037.110-70(a) DHS Rule		The provision precludes foreign nationals from working on certain types of DHS service contracts. Specifically requires a restrictive clause entitled "Qualifications of Contractor Employees" to be included in any solicitation or contract for services that requires contractor employees to have recurring access to government facilities or sensitive information. The HSAR clause does not expressly permit the agency to waive the ban.	On December 4, 2003, the Department of Homeland Security (DHS) issued this rule as part of its interim rules establishing DHS Acquisition Regulation (HSAR), which supplement the Federal Acquisition Regulation (FAR).	
Restrict Benefits to Corporations				
Bill #	Sponsor	Bill Description	Status	Comments
HR 3888	Sanders (I-VT) 70 cosponsors	<b>Defending American Jobs Act of 2004:</b> Would prohibit "government assistance" to companies that lay-off a greater percentage of their U.S. employees than those they have employed abroad.	Introduced March 3, 2004 and referred to the House Government Reform Committee. May 6, 2003 introductory remarks made.	
S 2148	Coleman (R-MN) no cosponsors	<b>USA Jobs Protection Act of 2004:</b> Bars federal financial assistance to any state that has not certified to the Administrator for Federal Procurement Policy that no state funds have been "expended for the performance of State contracts outside the United States".	Introduced on March 1, 2004 and referred to the Committee on Government Affairs.	
HR 3911	Waters (D-CA) no cosponsors	A bill to make certain <b>companies that have outsourced jobs during the previous five years ineligible for the receipt of Federal grants</b> , Federal contracts, Federal loan guarantees, and other Federal funding, and for other purposes.	Introduced on March 4, 2004 and referred to the House Committee on Government Reform.	
None	Dorgan (D-ND) & Mikulski (D-MD)	Intends to offer an amendment to the FSC-ETI bill that will deny foreign tax deferral for U.S. firms operating abroad (at least if they previously operated in the U.S.) who ship their production back to the U.S.	Rejected on a 60-39 motion to table the amendment.	

<b>DRAFT</b>	<b>Meehan (D-MA)</b>	<b>Outsourcing Tax Loophole Elimination Act:</b> would deny deductions or credits with respect to transactions which transfer the production of goods or performance of services from the U.S. to outside the U.S., resulting in the replacement of workers residing in the U.S. with those residing outside the U.S. Deductions that would be disallowed arising from such transactions would include: any item of expense, including depreciation or amortization; training of the non-U.S. replacement workers; transportation of tangible property; associated general or administrative expenses; acquisition of any non-U.S. property or facility; and any other item specified by the U.S. Treasury.	Meehan is shopping D's right now in the House to be cosponsors.
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Offshore Outsource Disclosure & Privacy Protection

Bill #	Sponsor	Bill Description	Status	Comments
<b>SA 2879, SA 2897, SA 2918 to S 1637</b>	<b>Clinton (D-NY)</b>	In general, the Clinton amendments would bar companies from transmitting personally identifiable information to foreign affiliates that are not certified by the FTC to have "legal systems that provide adequate privacy protections" unless they first obtain a consumer's consent. Consent must be renewed within "1 year before such information is transmitted." In the case of amendment 2918, before obtaining a consumer's consent to transmit personally identifiable information to "any foreign affiliate," a company must first disclose whether the foreign affiliate has been "certified" by the FTC to have adequate privacy protections.	Submitted March 23, 2004.	
<b>S 1873</b>	<b>Kerry (D-MA)</b> 7 cosponsors	<b>Call Center Consumer's Right to Know Act of 2003:</b> Requires call centers to disclose their physical location to U.S. consumers at the beginning of each call.	Introduced November 17, 2003 and referred to the Senate Commerce Committee.	
<b>HR 3816</b>	<b>Strickland (D-OH)</b> 19 cosponsors	<b>Call Center Consumer's Right to Know Act of 2003:</b> Requires employees at a call center who either initiate or receive telephone calls to disclose the physical location of such employees.	Introduced February 11, 2004 and referred to the House Energy & Commerce Committee.	
<b>S 2090</b>	<b>Daschle (D-SD)</b> 24 Cosponsors	<b>A bill to amend the Worker Adjustment and Retraining Notification Act (WARN Act P.L. 100-379)</b> to require advance notice of pending layoffs due to outsourcing.	Introduced February 12, 2004 and referred to the Committee on Health, Education, Labor, & Pensions.  May be offered as an amendment to S 1637, the Grassley JOBS Act.	
<b>Speech</b>	<b>Nelson (D-FL)</b>	This bill would require U.S. companies and their foreign agents to be jointly subject to U.S. privacy protection laws.	Announced his intention to introduce the legislation at a speech on March 11, 2004.	

Assistance to Affected Workers

Bill #	Sponsor	Bill Description	Status	Comments
<b>S 2143</b>	<b>Durbin (D-IL)</b> 4 cosponsors	<b>Service Workers Fairness Act:</b> Allows service sector employees to petition Secretary of Labor for Trade Adjustment Assistance (TAA) if they feel their jobs were lost due to offshoring.	Introduced February 27, 2004 and referred to the Committee on Finance.	
<b>S 2157</b>	<b>Baucus (D-MT)</b> 27 cosponsors	<b>Trade Adjustment Assistance Equity for Service Workers Act:</b> A bill to amend the Trade Act of 1974 to extend the trade adjustment assistance program to the services sector, and for other purposes.	Introduced on March 2, 2004 and referred to the Senate Finance Committee.	
<b>HR 3881</b>	<b>Smith (D-WA)</b> 108 cosponsors	<b>To amend the Trade Act of 1974 to extend the trade adjustment assistance program to the service sector.</b>	Introduced on March 3, 2004 and referred to the House Ways and Means Committee.	

<b>SA 2650 to S 1637</b>	<b>Bayh (D-IN)</b> no cosponsors	To provide a health insurance tax credit for TAA recipients.	Submitted March 3, 2004.
<b>SA 2916 to S 1637</b>	<b>Wyden (D-OR)</b> 1 cosponsor (Coleman R-MN)	Extension of trade adjustment assistance to services sector.	Submitted March 23, 2004.
<b>S 2230</b>	<b>Snowe (R-ME)</b> no cosponsors	A bill to amend the Trade Act of 1974 to include shifts in production, for purposes of trade adjustment assistance, to countries to which the U.S. has extended permanent normal trade relations.	Introduced March 24, 2004 and referred to the Finance Committee.
<b>HR 4090</b>	<b>Camp (R-MI)</b> 10 cosponsors	To amend the Trade Act of 1974 to extend the trade adjustment assistance program to the service sector.	Introduced March 31, 2004 and referred to the Ways & Means Committee.

Visa Program Adjustment

<b>Bill #</b>	<b>Sponsor</b>	<b>Bill Description</b>	<b>Status</b>
<b>S 1452</b>	<b>Dodd (D-CT)</b> 2 cosponsors	<b>USA Jobs Protection Act:</b> Imposes additional restrictions on the L-1 and H-1B visa programs. Includes requirements that employers utilizing L-1 or H-1B visas not displace current workers and that L-1 status workers be paid the prevailing wage for their job classification.	Both bills were introduced on J... referred to the respective Judiciary...
<b>HR 2849</b>	<b>N. Johnson (R-CT)</b> 28 cosponsors (7 D, 21 R)		
<b>S 1635</b>	<b>Chambliss (R-GA)</b> no cosponsors	<b>L-1 Visa Reform Act of 2003:</b> Denies L-1 visa status to aliens that are supervised by a third party employer.	Introduced September 17, 2003; Committee.
<b>HR 2154</b>	<b>Mica (R-FL)</b> 22 cosponsors 5 D, 16 R, 1 I	<b>Amends Immigration and Nationality Act</b> to prohibit L-Visa intracompany transfers unless an employer certifies in writing that the L status worker will not perform work for another employer.	Introduced May 19, 2003; referre Judiciary Committee, Subcomm Border Security, and Claims.
<b>HR 2688</b>	<b>Tancredo (R-CO)</b> no cosponsors	<b>To amend the Immigration and Nationality Act</b> to repeal authorities relating to H1-B visas for temporary workers	Introduced July 9, 2003; referre Subcommittee on September 4,
<b>HR 2702</b>	<b>DeLauro (D-NY)</b> 24 cosponsors	The bill caps L visas at 35,000 for 2004; limits employment to 3 years; requires prevailing wage for L-1 visa holders; prohibits participating employers from displacing U.S. workers; and prohibits employers from outsourcing L-1 visa status employees.	Introduced July 10, 2003; referre Subcommittee on September 4,  House International Relations C on L visas on 2/4/04.
	<b>Feinstein (D-CA)</b>	<b>Feinstein amendment to FY04 CJSJ Approps bill:</b> As adopted in committee, the amendment prohibited the inclusion of immigration provisions in any future trade negotiations.	Provision was <b>dropped in conf</b>  Issue may resurface as part of f
<b>SA 2909 to S 1637</b>	<b>Grassley (R-IA)</b> no cosponsors	Temporary Worker Provisions - would apply H1-B and L1 Visa petition fees to TAA program.	Submitted March 23, 2004.

Manufacturing-Related

Bill #	Sponsor	Bill Description	Status
S 1637	Grassley (R-IA) 8 cosponsors	<b>Jumpstart Our Business Strength (JOBS) Act:</b> Provides corporate rate reduction for manufacturers from 35% to 32%.	Chairman Grassley reported S. Finance Committee November Senate Legislative Calendar No.
HR 2896	Thomas (R-CA) no cosponsors	<b>The American Jobs Creation Act:</b> reduces the top tax rate for U.S. manufacturers from 35% to 32%. The bill further cuts the top tax rate for small and medium-sized corporations from 35% to 32%.	Chairman Thomas reported H.F. Means on November 21, 2003. ranking member, Rep. Charlie introduced his version of the legislation February 25, 2004.
S 1072	Clinton (D-NY) 10 cosponsors	<b>TEA-21 Authorization:</b> Amendment expressing the sense of the Senate concerning the outsourcing of American jobs. The amendment called for tax incentives to preserve domestic manufacturing jobs.	Amendment was offered to S. 1. The amendment was not germane "cloture" and was stripped.
SA 2718 to S 1637	Schumer (D-NY) 8 cosponsors, 2 Republican (Graham/Specter)	Would impose a 27.5 percent duty on imports from China, unless the President certifies (within 180 days) that China has achieved a substantial upward revaluation of its currency.	Submitted March 9, 2004.
SA 2916 to S 1637 S 2157	Wyden (D-OR)/ Coleman (R- MN)/ Baucus (D-MT)	Extension of trade adjustment assistance to services sector.	Rejected by a 45- 54 vote. The amendment failed to get the 60 votes necessary under Senate budget waiver procedures.

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