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# Factors Affecting Competitiveness in International Construction: Results of a Survey

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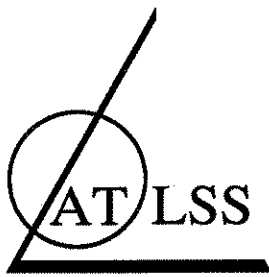
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### Recommended Citation

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**ADVANCED TECHNOLOGY FOR  
LARGE  
STRUCTURAL SYSTEMS**

Lehigh University

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**FACTORS AFFECTING COMPETITIVENESS  
IN INTERNATIONAL CONSTRUCTION -  
Results of a Survey**

by

**Johannes H. Egbers  
Atilla Sebuktekin  
David Veshosky**

**ATLSS Report No. 89-16**

**December , 1989**

**An NSF Sponsored Engineering Research Center**

## ABSTRACT

The decline in the global market share of U.S.-based engineering and construction companies has stirred concern among government and business leaders.

The National Research Council issued an excellent overview titled "Building for Tomorrow - Global Enterprise and the U.S. Construction Industry." This study by prominent national leaders in academia, government and industry concluded that renewed thrusts are required in research and innovation.

In order to obtain a better understanding of the impact of research and innovation on competitiveness, a survey was conducted by the Engineering Research Center for Advanced Technology for Large Structural Systems (ATLSS) at Lehigh University. The purpose was to investigate the influence of innovation and advanced technology on competitiveness compared to financial, political and social factors, especially in the large structural systems sector of the construction industry.

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List of Foreign Corporations

## I. INTRODUCTION

During the past 20 years, many national economies have evolved from independent entities into sub-systems of a global market. Numerous articles and reports have been written analyzing the effects of this change on the competitive position of U.S. industries, with most concluding that a drastic change is needed from the way business has traditionally been conducted.

The purpose of this paper is to report the results of a survey of U.S. and foreign construction companies regarding factors affecting competitiveness in the large structures sector of the international construction industry.

International construction activity is estimated to be about \$1,450 billion annually (National Research Council:11)\*. The U.S. domestic market is estimated to be about \$350 to \$400 billion, or about 25 percent of the global total (NRC:11). ENR estimates that about \$75 billion, or five percent of the world market, is open to international competition (NRC:11). Most projects in this international market are large and complex and, therefore, only within the capabilities of large, experienced companies.

Bridges, large structures and buildings, some large transportation vehicles, and, in the future, space stations belong to the large structural systems sector of this international market.

In the U.S., the large structural systems account for about 15 percent of total construction activity, or about \$50 billion annually (Veshosky:18). The breakdown according to type of construction is estimated to be approximately as follows:

35 percent of large commercial buildings;

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\*See References

10 percent of industrial construction; and  
10 percent of government capital investments.

Although no accurate statistics are available, it is estimated that about 50 percent of the international market, or about \$35 to \$40 billion annually, involves large structural systems (Veshosky:18).

Competition in this market has become intense. Total volume has decreased in recent years as fewer mega-projects, such as petrochemical complexes in the Middle East and the Alaskan pipeline, have been planned and authorized, and also because more companies from developing nations such as Korea, Turkey, and Brazil are entering the market. The market share held by U.S. companies declined from 40 to 31 percent between 1983 and 1986. A similar decline took place for West European construction companies but it leveled off after about 1984, so that by 1986 the total share of West European companies was larger than the total of U.S. corporations. It is believed that these trends are continuing (Strassman:14). A reduction in research and development activities and unfavorable tax regulations are cited as major causes of this decline. Currency exchange rates and fluctuations are, of course, making the situation even more complex.

Contract awards for international projects are based on a great number of variables, including:

- functionality and aesthetics of design;
- investment and life cycle cost;
- cost of capital;
- knowledge of local market;
- previous experience;
- reputation for reliability and quality;

availability of resources;  
schedule demands; and  
familiarity with the social and cultural climate.

To obtain a better understanding of what factors influence contractors' success in international construction markets, a number of major contractors were asked to complete a survey for the Engineering Research Center for Advanced Technology for Large Structural Systems (ATLSS). ATLSS is located at Lehigh University, in Bethlehem, PA, and is sponsored by the National Science Foundation, with additional funding support from the Ben Franklin Partnership of Pennsylvania and the private sector.

The intent of the survey was to create a better understanding of the factors that determine competitiveness in this market. It was realized that the nature of projects vary greatly, as do the requirements of the countries or regions where the projects are to be built. A better understanding of the perceptions of international constructors regarding competitiveness issues would assist ATLSS in developing programs that address industry problems.

## II. DESCRIPTION OF THE SURVEY AND RESULTS

The survey was planned and developed during the summer of 1988. Questionnaires were mailed out in the fall of that year, and responses were received through early 1989. Following sections describe the survey, the target audience, and responses from participating firms.

### A. The Survey

The survey consisted of a four page questionnaire. A copy of the survey questionnaire and accompanying cover letter are presented as Appendix A.

The objective was to ascertain the perceptions of American and foreign construction executives responsible for international large structures construction regarding competitiveness in the global construction industry and the relative importance of technical, financial, economic, political, and social/cultural factors in the competition for international construction projects. The survey consisted of five parts: the first question dealt with the perceived overall competitive capability of U.S. construction firms, the second with the competitiveness of American and foreign construction industries, and the third and fourth questions dealt with the relative importance of competitive factors in international construction; the final question solicited comments concerning the current situation in the international construction market.

The two questions which addressed competitive factors focused on perceptions of their relative importance in the global construction market as well as in regional markets in North America, Latin America, Europe, the Mideast/North Africa, and the Far East. The question concerning the global market dealt with general factors, while the question dealing with regional markets presented more specific aspects of technical, financial, economic, political, and social/cultural factors, such as the cost and availability of capital, materials, machinery, and labor.

#### B. Target Audience

Contractors who compete in international construction markets were the target audience for the survey. Questionnaires were mailed to 34 U.S. and 30 foreign construction firms. A list of firms to whom the surveys were mailed is presented as Appendix B. The firms were selected on the basis of inclusion in ENR's 1988 listing of The Top 250 International Contractors.



The American corporations surveyed were major design and construction contractors active in international construction. The foreign firms were selected so as to generally reflect national shares of the international construction market, and also consisted of companies that are active in international construction.

### C. Responses

Responses were received from 12 U.S. firms and five foreign firms, representing response rates of 40 percent and 17 percent, respectively. Among the American firms responding were at least eight of the ten largest U.S. contractors, according to the ENR rankings. Responses from foreign firms included European and Canadian contractors. No responses were received from Japanese or other Far East national companies. The combined market share of American corporations that responded is estimated to be almost 40 percent of U.S. foreign construction business.

Despite much recent concern over the declining competitiveness of the U.S. construction industry, respondents strongly indicated that they perceived American firms as being capable of competing successfully in international markets, as shown in Exhibit 1. Twelve of the 17 respondents considered the U.S. industry as competitive or very competitive in international markets, two respondents were unsure, and two felt that U.S. firms were not competitive. One respondent (an American) believed that U.S. firms are definitely not competitive. Overall, American respondents were slightly more positive than foreign respondents in their perceptions of the competitive capabilities of the U.S. construction industry, with 75 percent of the American respondents indicating that they felt U.S. firms were competitive or very competitive, compared with 60 percent of the foreign

respondents.

As shown in Exhibit 2, U.S. firms were regarded as the primary competitors for international construction projects, followed by Korean, Japanese, German, and British firms. Among American respondents, U.S. and Japanese firms were cited equally often as being the primary international competitors, followed by Korean firms and, at a distance, by German and British firms.

In the opinion of foreign respondents, British firms were the primary competitors more often than American firms, with German firms cited almost as often as U.S. firms. This may reflect the fact that only European firms provided input. It is interesting to note that foreign corporations ranked Japanese firms fifth as primary competitors, following British, American, German, and Korean firms, compared to the top ranking of Japanese firms by American contractors.

Exhibit 3 shows respondents' rankings of competitive factors in the global construction market. As can be seen, financial factors were ranked as most important by all respondents, as well as by American and foreign respondents. All contractors ranked political factors as second in relative importance, followed by social/cultural, economic, and technical factors.

American companies ranked political and social/cultural factors as second in importance, followed by economic and technical factors, while foreign respondents ranked political factors second in importance, followed by technical, economic, and social/cultural factors. To some extent, this appears to contradict a frequently cited impression that American firms give insufficient attention to social/cultural factors and place heavy emphasis on technical factors, while foreign firms are more sensitive to the

Exhibit 1

How respondents answered the question "Do you believe that the U.S. construction industry is capable of competing with foreign firms in international markets?"

Yes!	24%
Yes	47
Not Sure	12
No	12
No!	6

Exhibit 2

How respondents ranked national construction industries in terms of international competitiveness (Max. ranking = 100).

	<u>All Respondents</u>	<u>American Respondents</u>	<u>Foreign Respondents</u>
U.S.	69	72	60
Korean	61	68	45
Japanese	60	72	30
German	37	30	55
British	36	22	70
French	11	10	15
Italian	11	14	5
Turkish	10	6	20
Other	6	8	--

social/cultural aspects of international business. Variations in interpretation of "importance" must also be recognized as a factor.

Exhibit 4 shows the respondents' rankings of specific competitive factors in regional construction markets. Not surprisingly, financial factors, particularly cost and availability of capital, were considered to be less important in developed regions (i.e., North America and Europe) than in developing regions (i.e., Latin America, the Mideast/North Africa, and the Far East), apparently reflecting the greater wealth and more sophisticated capital markets of most industrialized countries.

As would be expected, European firms perceived exchange rates to be significantly less important for projects in Europe than did American firms; however, U.S. firms perceived exchange rates and availability of capital as only slightly less important than did foreign firms in competition for projects in North America, apparently reflecting the extensive though somewhat diminishing role of the U.S. dollar as an international currency. Financial factors were considered particularly important in competition for projects in Latin America.

Introduction of new technologies was considered to be more important in developed regions than in developing regions, apparently reflecting the greater technical sophistication of many projects in industrialized countries. Availability of construction materials and machinery was considered to be less important in the mature markets of North America and Europe than in the Mideast/North Africa, the Far East, and, to a lesser extent, Latin America.

### Exhibit 3

How respondents ranked competitive factors in the global construction market  
(Max. ranking = 100).

<u>Factors</u>	<u>All Respondents</u>	<u>American Respondents</u>	<u>Foreign Respondents</u>
Technical	55	55	56
Financial	67	64	76
Economic	56	58	52
Political	64	62	68
Social/Cultural	57	62	48

### Exhibit 4

How respondents ranked competitive factors in regional markets (5-most important).

<u>Financial Factors</u>	<u>North America</u>	<u>Latin America</u>	<u>Europe</u>	<u>Mideast/ N. Africa</u>	<u>Far East</u>
Cost of Capital	2.7	4.3	3.0	3.7	3.8
Exch. Rates	2.3	4.1	3.1	3.5	3.2
Cap. Availability	2.0	4.1	3.0	3.6	3.5
<u>Techn. Factors</u>					
New Technologies	3.6	3.1	3.7	3.1	3.3
Availability of Constr. Matls. & Equipment	2.0	2.9	2.4	3.5	3.5
<u>Econ. Factors</u>					
Avail. & Cost of Labor	3.4	3.4	3.1	3.7	3.4
Taxes	2.5	3.3	2.7	2.9	2.6
<u>Political Factors</u>					
Protectionism	2.5	3.5	3.8	3.1	3.7
Permits/Regulations	2.8	3.0	3.4	2.9	2.9
Pol. Infl.	2.6	4.2	3.3	4.1	4.1
<u>Cultural Factors</u>					
Non-nationals Acceptance	2.9	3.3	3.1	3.5	3.1
Ethics	2.6	3.0	3.1	3.9	3.6

While availability and cost of labor were judged to be more important than taxation, U.S. firms considered taxation to be a significantly more important competitive factor in every regional market than did foreign firms. This appears to indicate a strong perception by American firms that U.S. tax laws represent a competitive disadvantage in international construction.

Political influence was cited as an important competitive factor in Latin America, the Mideast/North Africa, and the Far East. American firms considered political influence to be more important in every region, including North America, than did European firms. This was particularly true in the Far East, which could have serious implications as that area develops and increases in importance as a market for international construction.

Political and social/cultural factors were perceived as relatively unimportant in competition for projects in North America. However, this probably reflects the dominance of American firms among respondents. For example, foreign firms considered protectionist tendencies and acceptance of non-nationals significantly more important in competition for construction projects in North America than did U.S. firms; conversely, European firms considered these factors to be less important in competition for projects in Europe than did their American counterparts.

Respondents' comments tended to reinforce the notion that U.S. firms are competitive on engineering and management of selected high-tech projects, but are unable to compete with the low labor costs in many developing countries. Since indigenous labor is typically used in most large construction projects, this appears to refer to the cost of foremen and

specialty trades, where U.S. firms may be at a competitive disadvantage to construction companies from countries such as Korea and Turkey.

### III. CONCLUSIONS

Based on analysis of responses, the following represent the most significant conclusions that can be drawn from this survey:

1. U.S. firms are perceived as being capable of competing in international construction markets, more so for engineering and management services than for labor-intensive construction projects.
2. U.S. firms consider the Japanese construction industry to be more competitive internationally than do European firms.
3. Korean firms are considered by American and European firms to be primary competitors for international construction projects.
4. None of the competitive factors were placed in a dominant position; differences in evaluation were relatively minor. However, technical factors were perceived as having less impact in competition for international construction projects than financial, economic or political factors. This could explain why some corporate executives are reluctant to fund technology R&D efforts.
5. U.S. firms consider technical factors to be less important in competition for international construction projects than do European firms, a finding that also has consequences for R&D spending.
6. U.S. firms consider socio-economic and cultural factors as more important in competition for international construction projects than do European firms. It may well be that this is influenced by a state of mind among European firms that always consider cultural influences as an integrated process and, therefore, award it less importance.

7. Financial factors are perceived to be relatively important in competition for projects in developing regions; technical factors are perceived to be relatively important in competition for projects in developed regions.
8. American firms perceive U.S. tax laws to represent a serious competitive disadvantage in international construction.
9. While political influence is perceived to be relatively important, particularly in developing regions, U.S. firms attribute it greater impact than the European respondents did. From comments received, we believe that the cause can be found in stronger legal restrictions imposed on U.S. firms regarding business ethics.
10. Technology is an important competitive factor but not a dominating one. In a future report we hope to analyze the impacts of technological innovation on competition.

This survey reflects the perceptions of U.S. and European executives of international contractors concerning international competitiveness and the relative importance of technical, financial and socio-economic factors. The need for attention to all competitive factors is recognized by all participants in the survey. With regard to the role of ATLSS and other construction industry R&D efforts, it can be concluded that technological innovation is necessary because the loss of technological leadership will mean a loss of comparative advantage. Research is also needed to improve management and financial systems that enhance construction industry productivity and competitiveness.



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Strassman, W. P. and J. Wells. 1988 The Global Construction Industry. Boston: Unwin-Hyman, 1988.

**APPENDIX A**

**THE SURVEY**

*Lehigh University*



*Center for Advanced Technology  
For Large Structural Systems*

*117 ATLSS Drive, H Building  
Bethlehem, Pennsylvania 18015*

A SURVEY ON GLOBAL COMPETITIVENESS OF INDUSTRIES INVOLVED WITH  
LARGE STRUCTURAL SYSTEMS

ATLSS Research Center:

The Engineering Research Center for Advanced Technology for Large Structural Systems (ATLSS) was established at Lehigh University with a grant from National Science Foundation. Its major objective is to conduct research that will lead to technological development benefiting structures-related industries in design, fabrication, construction and maintenance. In order to achieve this goal, the research program is organized in three distinct thrusts : (1) Advances in design concepts; (2) Innovations in fabrication and construction; and (3) In-service monitoring and protection.

Definition of the Industry:

The term " large structural systems " embraces all fabricated structures which typically involve large members. In practical terms, it involves such civil engineering structures as buildings ( commercial, industrial, institutional, and residential, arenas, auditoriums, stadiums, transportation terminals, etc.), bridges, offshore structures, and power plants.

Purpose of the Survey:

The competition in the international construction market is increasing rapidly. There are presently fewer large projects worldwide and on the other hand, increased capabilities of the construction firms. This survey is being conducted in order to obtain a better understanding of the factors that affect competitiveness in the large structural systems industry.



*Telephone (215) 758-3535  
Telefax (215) 758-5553*

COMPETITIVENESS SURVEY

1. Do you believe that the U.S. construction industry is capable of competing with foreign firms in international markets?

YES! \_\_\_\_\_ YES \_\_\_\_\_ NOT SURE \_\_\_\_\_ NO \_\_\_\_\_ NO! \_\_\_\_\_

2. Please rank the national origin of the companies that are your primary competitors ( Rank five of them ; 5=greatest competition )

American _____	Italian _____	British _____	Turkish _____
Japanese _____	German _____	Dutch _____	Other _____
Korean _____	French _____	Swiss _____	

3. What is the relative importance of the following factors on your company's competitiveness in the global market ?

( Please rank from 1=least important to 5=most important )

Financial	_____
Technical	_____
Political	_____
Economic	_____
Social/Cultural	_____

4. Could you please indicate the influence of the listed factors on your company's competitiveness in the regions shown below ?

( 5=very high , 4=high , 3=neutral, 2=low , 1=very low )

R E G I O N S

	North America	Latin America	Europe	Mideast / North Africa	Far East
<u>FINANCIAL FACTORS</u>					
Cost of Financing	_____	_____	_____	_____	_____
Exchange Rates	_____	_____	_____	_____	_____
Capital Availability	_____	_____	_____	_____	_____
<u>TECHNICAL FACTORS</u>					
Introduction of New Technologies	_____	_____	_____	_____	_____
Availability of Construction Materials and Machinery	_____	_____	_____	_____	_____
<u>ECONOMIC FACTORS</u>					
Availability & Cost of Labor	_____	_____	_____	_____	_____
Taxation	_____	_____	_____	_____	_____
<u>POLITICAL FACTORS</u>					
Protectionist Tendencies	_____	_____	_____	_____	_____
Permits / Regulations	_____	_____	_____	_____	_____
Need for Political Influence	_____	_____	_____	_____	_____
<u>CULTURAL FACTORS</u>					
Acceptance of Non-Nationals	_____	_____	_____	_____	_____
Ethics	_____	_____	_____	_____	_____



## **APPENDIX B**

### **CONTRACTORS RECEIVING THE SURVEY**

U.S. INTERNATIONAL CONTRACTORS WORKING ABROAD

Bechtel Group Inc.  
The M. W. Kellogg Co.  
Foster Wheeler Corp.  
The Parsons Corp.  
Brown & Root Inc.  
Lummus Crest Inc.  
Fluor Daniel  
Kaiser Engineers Inc.  
Guy F. Atkinson Co.  
McDermott International  
Stone & Webster Eng. Corp.  
Lehrer McGovern Bovis Inc.  
Dillingham Construction Corp.  
Dravo Corp.  
CBI Industries Inc.  
George A. Fuller  
Turner Construction  
Burns & Roe Enterprises Inc.  
BE & K Inc.  
Ebasco Services Inc.  
Kiewit Construction Group  
Harbert International Inc.  
Nico Inc.  
Jacobs Eng. Group  
Litin Engrs. & Constrs.  
Perini Corp.  
CRSS Constructors  
RUST International Corp.  
Morrison Knudsen Corp.  
H-R International

Note: Companies listed above are selected among Top 250 Contractors (ENR). Their foreign billings amount to 40 million dollars or more. All of them design and/or construct large structural systems.



FOREIGN INTERNATIONAL CONTRACTORS

Bouygues Group - France  
Auxiliare D'Entreprises - France  
GTM Entrepose - France  
Spie Batignolles - France  
Philipp Holzman Ag - W. Germany  
Hochtief Aktiengesellschaft - W. Germany  
Lurgi Group - W. Germany  
Bilfinger & Berger - W. Germany  
Taylor Woodrow Pk. - U.K.  
P & O Bovis Division - U.K.  
Ballast-Nedam Groep Nv - Netherlands  
Armerad Betong Vagforbattringar Ab - Sweden  
Italimpianti-Societa Italiana Impianti - Italy  
Lodigiani Impresa Ing. Spa. - Italy  
Wimpey George Plc. - U.K.  
Laing John Plc. - U.K.  
Kajima Corporation - Japan  
Shimizu Construction Co. Ltd. - Japan  
Ohbayashi-Gumi Ltd. - Japan  
Kumagai Gumi Co. Ltd. - Japan  
Chiyoda Chem. Engr. & Construction Co. - Japan  
Aoki Construction Co. Ltd. - Japan  
Fiat-Civil Engineering Group - Italy  
Sadelmi Cogepi Spa - Italy  
Finn-Stroi Oy - Finland  
Samwhan Enterprise Co. Ltd. - Korea  
Losinger Ltd. - Switzerland  
PCL Construction Ltd. - Canada  
Dogus Insaat Ve Tic Ltd. - Turkey  
Energopol - Poland