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"BUILDING THE FUTURE: TRANSFORMING GLOBAL ENGINEERING AND CONSTRUCTION"

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Preface

In our "flattening" world of the 21st century, global engineering and construction are experiencing challenges that are transforming the face of the industry. The demands of the global economy have pushed industries to deliver major capital construction projects at greater risk, speed, and efficiency than ever before at a time of rapid developments in technology and of diminishing abundance of natural and human resources, all occurring under transcending geopolitical trends that demand greater international cooperative governance, business and political transparency, and environmental sustainability without diminution of economic growth.

The ACCL Princeton Symposium was organized to bring together senior industry leadership—public and private sector engineering and construction executives and their legal counsel; academic leaders in engineering, business, and international affairs; judges and lawyers who are Fellows of the American College of Construction Lawyers; and other U.S. and international invitees.

The shared contributions of ideas, experiences, and perceptions by the symposium's faculty and attendees resulted in the extraordinary discussion captured in this Record of Proceedings.

May the global construction and engineering industry learn and benefit from these Proceedings. For as we are reminded by Marcus Vitruvius Pollio, chief engineer to Caesars Julius and Augustus:

> It was a wise and useful provision of the ancients to transmit their thoughts to posterity by recording them…so that they should not be lost, but, being developed in succeeding generations through publication in books, should gradually attain in later times, to the highest refinement of learning. And so the ancients deserve no ordinary, but unending thanks, because they did not pass on in envious silence, and took care that their ideas of every kind should be transmitted to the future in their writings. Marcus Vitruvius Pollio, de Architectura, Book VII, Introduction (ca. 20 BCE) (English translation by Morris Hicky Morgan, 1914).

Philip L. Bruner, Chair
ACCL Princeton Symposium
February 25, 2007

In Memoriam

A. Richard Newton
Dean, College of Engineering
University of California at Berkeley
1951-2007

We remember and are grateful for the life and many contributions of A. Richard Newton, who argued well and passionately for the future of science and engineering and for the accessibility of the profession to everyone regardless of race or gender.

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Symposium Faculty

Thomas P. M. Barnett, Senior Managing Director, Enterra Solutions LLC, Vienna, VA.

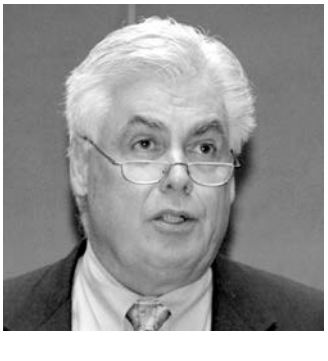
Tom Barnett is a strategic planner and is the New York Times-bestselling author of Blueprint for Action: A Future Worth Creating and The Pentagon's New Map: War and Peace in the Twenty-First Century. Named by Esquire in 2002 as "The Strategist" among "The Best and The Brightest," profiled in 2004 on the Wall Street Journal's front page, and described by U.S. News & World Report's Michael Barone as "one of the most important strategic thinkers of our time" and by The Washington Post's David Ignatius as "a combination of Tom Friedman on globalization and Karl von Clausewitz on war," he is a forecaster of global conflict and a consultant on international security and economic globalization issues. He regularly advises the U.S. Office of Secretary of Defense, Special Operations Command, and the Joint Forces Command and briefs senior members of all four military services, the intelligence community and Congress, and has worked in national security affairs since the end of the Cold War. He is a Baker Center Distinguished Scholar at the University of Tennessee's Howard H. Baker, Jr. Center for Public Policy and formerly served as Senior Strategic Researcher and Professor at The U.S. Naval War College, and as Assistant for Strategic Futures in OSD's Office of Force Transformation. He earned his Bachelor of Arts degree from the University of Wisconsin in Russian Language and Literature and in International Relations, Master of Arts degree in Regional Studies from Harvard University and Doctor of Philosophy degree in Political Science from Harvard University.

Henry C. ("Peter") Beck, III, Managing Director, The Beck Group, Dallas, TX.

Peter Beck is Managing Director of The Beck Group, one of America's premier builders/developers that offers integrated architectural, engineering, and construction services. Following his graduation from Princeton University with a Bachelor of Science degree-in Civil Engineering, he received a Master of Business Administration degree from Stanford Graduate School of Business. He has been associated with The Beck Group and its affiliates since 1978. He is Chair of the Advisory Committee of Princeton University's Department of Civil and Environmental Engineering, serves on the Boards of the Design Futures Council and the Greater Dallas Chamber of Commerce (of which he is a past chairman), and has served on the Stanford Business School Trust.

Robert F. Bruner, Dean, Darden Graduate School of Business, University of Virginia, Charlottesville, VA.

Bob Bruner is Dean and Charles C. Abbott Professor of Business Administration at the Darden Graduate School of Business Administration, University of Virginia. Business Week magazine cited him as one of the "masters of the MBA classroom." He is the author or co-author of many books and articles, and over 400 case studies and notes. Throughout his career his particular interests have been business leadership, entrepreneurship and innovation, and mergers and acquisitions. He received his undergraduate degree from Yale University and his degrees of Master of Business Administration and Doctor of Business Administration from the Harvard Business School. His most recently published book, Deals From Hell, surveys the failure of recent mergers and acquisitions among major companies.



George E. Conniff, Senior Vice President, Bechtel Corporation, San Francisco, CA.

George Conniff is Senior Vice President of Bechtel Corporation, one of America's premier engineering and construction firms. After joining Bechtel in 1971, George served in project management and control positions on twenty-five nuclear power and three geothermal power

projects. From 1998 to 1990, George led Bechtel's Information Technology Group and thereafter was elected president of Bechtel's Telecommunications and Industrial Global Business Unit which, under his leadership, became the world's leading engineering and construction company in the telecommunications industry, designing and constructing more than 140 projects worldwide. George then moved to lead Bechtel's global engineering procurement and construction function, with responsibilities which included project controls, information technology, and other functions with oversight of more than 15,000 employees across Bechtel's seven global business units. He currently directs one of the largest lump sum turnkey power projects ever undertaken by Bechtel. He holds a Bachelor of Science degree in Civil Engineering and a Master of Business Administration degree from Washington State University, where he is a member of the University's Advisory Board for the School of Engineering.

Patricia D. Galloway, P.E., Chief Executive Officer, The Nielsen-Wurster Group, Inc., Princeton, NJ.

Pat Galloway is CEO of the Nielsen-Wurster Group, Inc., one of the world's leading providers of engineering and management consulting services. She is a member of the National Science Board (the Governing Board of the National Science Foundation), a past President of the American Society of Civil Engineers, and a member of both the National Academy of Construction and the Pan-American Academy of Engineering. She is a Registered Professional Engineer in ten states, Manitoba, and Australia. She earned her Bachelors of Civil Engineering degree from Purdue University (which has conferred upon her its Distinguished Engineering Alumni Award), Masters of Business Administration degree from New York Institute of Technology, and Ph.D. in Infrastructure Systems Engineering from Kochi University of Technology in Kochi, Japan. Her book, The 21st Century Engineer, now in publication review, surveys challenges facing the engineering profession in the coming decades.

William K. Hellmuth, AIA, President, HOK Inc., Washington, DC.

Bill Hellmuth is President of HOK, a global provider of design and project delivery services. As President and as Design Director for HOK's Washington DC studio, Bill is recognized as one of the most innovative architects in the world. He has achieved a global reputation for design excellence with numerous national and

international design credits and is a driving force within the design profession for sustainable design, "green architecture." He has been honored with design awards by the American Institute of Architects, the General Services Administration, the American Society of Landscape Architects, and other industry associations. He earned his Bachelor of Architecture degree from the University of Virginia and Master of Architecture degree from Princeton University.

Alan P. Larson, Chairman, Transparency International-USA, and Senior Advisor with Covington & Burling, LLP, Washington, DC.

Alan Larson is Chairman of Transparency International-USA, a non-profit organization founded in 1993 to curb corruption in international transactions. He also is Senior Advisor with the law firm of Covington and Burling where he counsels on issues of international trade, finance, and anti/trust/comity. From 1999 to 2005, he was U.S. Under Secretary of State for Economic, Business and Agricultural Affairs. In that capacity, he directed global economic policy in the areas of trade, finance, telecommunications, transportation, and energy sanctions on behalf of Secretaries Colin Powell and Madeleine Albright. He is a Career Ambassador in the U.S. Foreign Service and served as Ambassador to the Organization of Economic Cooperation and Development in Paris. In addition to his current work, he is a Strategic Advisor and Director at the World Economic Forum and a Distinguished Fellow at the Council on Competitiveness. He earned his degrees of Bachelor of Arts in political science, Master of Arts in economics, and Doctor of Philosophy from the University of Iowa, which honored him in 2003 with its Distinguished Alumnus Award.

A. Richard Newton, Dean, College of Engineering, University of California, Berkeley, CA.

Richard Newton is Dean of the College of Engineering and the Carlson Professor of Engineering at the University of California, Berkeley. He also holds a professorship in the Department of Electrical Engineering and Computer Sciences. An Australia native, Richard received his Bachelor and Master of Engineering Science degrees from the University of Melbourne and his Ph.D. degree from the University of California, Berkeley. In 2004, he joined the National Academy of Engineering, and this year was elected to the American Academy of Arts & Sciences. Over the past twenty-five years, he has received numerous awards for his research and

teaching. Most recently, he received the 2003 Phil Kaufman Award for his research and entrepreneurial contributions to the electronic design automation industry. Dean Newton is a Trustee of the Anita Borg Institute for Women and Technology.

H. Vincent Poor, Dean, School of Engineering & Applied Science, Princeton University, Princeton, NJ.

Vince Poor is Dean of Princeton University's School of Engineering & Applied Science and is known worldwide as a distinguished researcher, teacher, and innovator. He earned his Bachelor's and Master's degrees in electrical engineering from Auburn University and his Ph.D. degree in electrical engineering and computer science from Princeton University. The National Science Foundation has honored him with the Foundation's highest award for excellence in both teaching and research. He is a member of the National Academy of Engineering. Vince Poor's top priority as dean is the setting of a new standard of engineering education with an emphasis on innovation and leadership; and conducting cross-disciplinary research that has a major impact on national and global problems.

The Hon. Sir Vivian A. Ramsey, High Court of England and Wales, Queen's Bench Division, London, U.K.

Mr. Justice Ramsey is one of the world's most distinguished construction lawyers and was a barrister and then head of Keating Chambers, London, prior to his elevation to the Queen's Bench Division of the High Court of England and Wales in November 2005. He was educated in Oriel College, Oxford and City University; called to the Bar in the Middle Temple; appointed Queen's Counsel; and, most recently received the honor of Knighthood conferred by Queen Elizabeth II. Prior to his appointment to the High Court, his law practice as a barrister and as a construction arbitrator took him throughout the world. Mr. Justice Ramsey is a Fellow of The American College of Construction Lawyers.

Mark E. Reagan, Chairman, Willis Construction Practice, Willis Group, New York.

Mark Reagan, Chairman of Willis Construction Practices, leads the global surety bond and construction insurance operations of Willis Group, the 175 year old pioneer in the commercial brokerage field and the oldest global insurance broker with over 13,000 employees operating in more than 300 locations in seventy-four countries. He is widely recognized as one of the world's leading construction insurance and surety executives. Prior to joining Willis in 1993, he held senior executive positions with AIG and Seaboard. He earned his Bachelor of Arts degree from Fordham University.

Lynn Marie Schubert, President, The Surety & Fidelity Association of America, Washington, DC.

Lynn Schubert is President of The Surety & Fidelity Association of America, an organization comprising 550 companies that write surety and fidelity insurance in America and internationally. She also is Executive Director of The International Surety Association, a federation of surety associations of the U.S., Canada, Mexico, Australia, and Europe. She is recognized as a leader in the field of international suretyship and financial guarantees relating to performance default risks in global construction and other activities. Lynn has devoted the past twenty-five years to the surety and insurance field, having previously served as the first woman Chair of the American Bar Association's Fidelity & Surety Law Committee, as Corporate Secretary of the American Insurance Association, as Counsel for Law and Regulatory Affairs to Aetna Life and Casualty Company, and as a partner in an Atlanta law firm specializing in surety law. She earned her Bachelors of Business Administration degree from East Carolina University and Juris Doctor degree from the University of Notre Dame.

Anne-Marie Slaughter, Dean, Woodrow Wilson School of Public and International Affairs, Princeton University, Princeton, NJ.

Anne-Marie Slaughter is Dean of the Woodrow Wilson School of Public and International Affairs and the Bert G Kerstetter '66 University Professor of Politics and International Af-

fairs at Princeton University. Prior to becoming Dean, she was the J. Sinclair Armstrong Professor of International, Foreign, and Comparative Law and the Director of Graduate and International Legal Studies at Harvard Law School. She is also a former President of the American Society of International Law. Dean Slaughter is a Fellow of the American Academy of Arts & Sciences and serves on the board of the Council on Foreign Relations. Her book, A New World Order, was recently published by Princeton University Press. Dean Slaughter is a frequent commentator on foreign affairs in newspapers, radio, and television and is a contributor to the America Abroad blog on TPMCafe.com. She is currently writing a book on America's founding principles for Basic Books. She earned her Bachelor of Arts degree from Princeton University, Master and Doctor of Philosophy degrees in International Relations from Oxford University, and Juris Doctor degree from Harvard Law School.

Thomas J. Stipanowich, Professor, Pepperdine University School of Law, and Academic Director, Straus Institute, Malibu, CA.

Tom Stipanowich is Professor and Academic Director of the Straus Institute for Dispute Resolution at Pepperdine University School of Law, ranked by US News & World Report as the nation's number one dispute resolution program in four out of the past seven years. Prior to joining the Pepperdine law faculty, he was President and Chief Executive Officer of the International Institute for Conflict Prevention and Resolution (CPR Institute). He also for many years was the William L. Matthews Professor of Law at the University of Kentucky Law School, where he taught construction law and authored leading books and articles on arbitration, mediation, and conflict resolution. He received his Bachelor of Science in Architecture, Master of Architecture and Juris Doctor degrees from the University of Illinois and practiced construction law for some years prior to entering academia. Professor Stipanowich is a Fellow of The American College of Construction Lawyers.

Lt. Gen. Carl A. Strock, P.E., USA, Chief of Engineers & Commander, U.S. Army Corps of Engineers, Washington, DC.

General Carl Strock, as Chief of Engineers and Commander of the U.S. Army Corps of Engineers, manages a budget in excess of $5 billion and more than 35,000 military, federal, and contractor employees in carrying out the Corps' global engineering and construction mission. Prior to his selection as Commander,

he was Deputy Director of Operations for the Coalition Provisional Authority in Iraq. Over a distinguished thirty-five year military career, he has held senior command assignments in the Engineer Branch since his transfer in 1983 from the infantry where he completed both ranger and special forces training. He holds a Bachelor of Science degree in Civil Engineering from Virginia Military Institute and a Masters degree in Civil Engineering from Mississippi State University. He is a Registered Professional Engineer and a member of the Order of Engineers of the American Society of Civil Engineers.

Michael A. Wilke, Chief Operating Officer of The Americas, Parsons Brinckerhoff Inc., New York.

Mike Wilke is Chief Operating Officer of the Americas, the western hemispheric infrastructure company of Parsons Brinckerhoff Inc. He oversees all company operations in North and South America involving transportation and other infrastructure projects. A native of Australia, he began his career twenty years ago working on water, mining, and environmental projects for the Australian subsidiary of Parsons Brinckerhoff, of which he ultimately was named Managing Director and Chairman. He played a significant role in the development of the integrated project delivery method known as "project alliancing," under which the owner, design professional, and contractor team together to design and construct the project and share project financial risks and rewards. He was named one of Australia's 100 Most Influential Engineers in 2004, 2005, and 2006. He earned his Bachelors Degree from Queensland University of Technology, Masters Degree in Engineering Science from the University of Queensland, and Graduate Diploma of Management from Central Queensland University.

Symposium Moderators

Philip L. Bruner, Symposium Chair

Partner, Faegre & Benson LLP,
Minneapolis, MN.

Phil Bruner is President and a Fellow of The American College of Construction Lawyers. He has engaged in private practice in the construction law field for over forty years as trial counsel, arbitrator, or mediator of major international and domestic construction disputes. He is co-author of *Bruner & O'Connor on Construction Law*, the seven volume, 6000 page treatise on American law governing construction and design. In 2005 he was honored by the American Bar Association's Forum on the Construction Industry with its Cornerstone Award for "exceptional service to the construction industry, to the public, and to the legal profession." He earned his Bachelor of Arts degree from Princeton University, Master of Business Administration degree from Syracuse University, and Juris Doctor degree from the University of Michigan Law School.

Katherine Hope Gurun, Symposium Co-Chair

JAMS Mediator and Arbitrator, London,
United Kingdom.

Katherine Gurun is a Fellow of The American College of Construction Lawyers and is a JAMS mediator and arbitrator in construction and commercial matters. Based in London she practices in the U.S. and internationally. Prior to joining JAMS, Ms. Gurun spent twenty-five years with Bechtel

Corporation and was Senior Vice President and General Counsel from 2001 to 2006. From 1995 to 1998 she was Senior Vice President and General Counsel of Intergen (an international independent power company). Prior to joining Bechtel she was Counsel to the International Atomic Energy Agency in Vienna, Austria and to the United States Arms Control and Disarmament Agency in Washington D.C. She also practiced law with Bustamante y Crespo in Quito, Ecuador. She earned her Bachelor of Arts degree from Mills College and Juris Doctor degree from the University of Oregon School of Law, where she serves as a member of the Dean's Advisory Council. She is a Fellow of the American Society of International Law, a Director of Transparency International-USA, and a Director of the Cypress Fund for Peace and Security.

John W. Hinchey, Symposium Co-Chair

Partner, King & Spalding LLP, Atlanta, GA.

John Hinchey is President-Elect of The American College of Construction Lawyers. He has engaged in private practice in the construction law field for over forty years as trial counsel, arbitrator or mediator of international and domestic construction disputes. He is a member of The London Court of International Arbitration, Chartered Institute of Arbitrators, Distinguished Panel of Neutrals-CPR, and the Master Panel of Construction Arbitrators of the American Arbitration Association. In 2006 he was honored by the American Bar Association's Forum on the Construction Industry with its Cornerstone Award for "exceptional service to the construction industry, to the public, and to the legal profession." He earned his Bachelor of Arts and Juris Doctor degrees from Emory University, Master of Literature degree from Oxford University, and Master of Laws degree from Harvard Law School.

Introduction

H. Vincent Poor

Dean, School of Engineering and Applied Science,
Princeton University,
Princeton, NJ.

Philip L. Bruner

President, The American College of Construction Lawyers,
Minneapolis, MN.

DEAN VINCENT POOR:

On behalf of the School of Engineering and the University, I welcome you to Princeton and to the campus. I am Vince Poor, Dean of Princeton's School of Engineering and Applied Science. I am delighted that this symposium is being held here at Princeton. I really appreciate Phil Bruner and Katherine Gurun and their colleagues bringing it here. I also would like to congratulate them on organizing such a distinguished group of panelists and such provocative subject matter. As an electrical engineer and as an engineering educator I am very interested in the subject matter of this meeting. Although the focus of today and tomorrow will be primarily global design and construction leadership, which is quite broad technologically, I think the subject matter of this meeting is sure to transcend that subject. I am looking forward to hearing what people have to say about leadership, as all of us who are in the business of educating young people to be leaders have a lot to learn particularly in this dynamic era of internationalism and technological change. I believe this will be a great experience for me and I hope it will be for you.

Since I will have a chance to speak more this afternoon, I will turn it over to Phil now. Thanks again and welcome.

PHILIP BRUNER:

On behalf of the American College of Construction Lawyers, I am pleased to join Dean Poor in welcoming you. I am Phil Bruner, president of the College. Let me begin by expressing the College's appreciation to Princeton University

for hosting this event, and to Dean Poor and Associate Dean Maggard of the School of Engineering and Applied Science, and Dean Anne-Marie Slaughter of the Woodrow Wilson School, for their special support of this program. And let me express gratitude to our distinguished Symposium faculty from whom you will be hearing.

This Symposium is convened by invitation to explore and address challenges and trends likely to transform the face of global engineering and construction in the coming decade. Never before to our knowledge has so much experience and so many disciplines related to global engineering and construction been assembled in North America to engage in such a collective dialogue. In geographic diversity, we here come from thirty states, Canada, and the United Kingdom. In vocational diversity, we include leading scholars, contractors, architects, engineers, building owners, material fabricators, insurers, sureties, and members of the legal profession—all with different perspectives but with a common interest in the challenges transforming global engineering and construction. In organizational affiliation, we are members of leading American associations—the National Science Board, the National Academy of Engineering, the National Academy of Construction, the American Academy of Arts and Sciences, the American Society of Civil Engineers, the American Institute of Steel Construction, the American Institute of Architects, the Associated General Contractors of America, the Design-Build Institute of America, the American Surety and Fidelity Association, The Construction Industry Institute and the Construction Users Roundtable, along with the American College of Construction Lawyers. We represent, by my reckoning, collective accumulated experience in this industry of almost 4,000 years. This is a distinguished group of senior people who can collaborate together to confront and solve problems. By my reckoning, this room today contains the intellectual brainpower perhaps second only to when Albert Einstein wandered through this room alone.

Given our collective backgrounds, we have the capacity to build a common understanding of and approaches to the global challenges transforming this industry. Through this program may we begin to establish a dialogue between and among all industry groups, which can be continued in the future.

Princeton University, by the way, is a particularly appropriate place to hold this symposium because of its strong connection with the fields of global engineering, construction, and international affairs. To get a flavor for this connection, you can begin by visiting the dining room right behind this auditorium during a break and viewing the portrait of a Princetonian, George P. Schultz, who you may recall was President of Bechtel for eight years before becoming President Reagan's Secretary of the Treasury and then Secretary of State.

In looking at your symposium program this morning you undoubtedly have noted that there are no lengthy papers. There are no Power Point outlines. There are no printed articles. And the reason for this is that this symposium is not about entertainment; it is about engagement. Although some speakers may use graphs or photos to illustrate points, your mission will be to

listen carefully to their remarks and then to apply your experience and contribute your observations to the discussions about the challenges facing global engineering and construction. For this purpose, each of you have a pad of paper in front of you on which to take notes as you focus on the presentation of each speaker and organize your own remarks. And for those of you who may feel what Yogi Berra described as "déjà vu all over again," you have a rational reason for feeling that way. You are in fact in college again.

Now to preserve the many thoughts to be expressed here over the next day and a half, the symposium proceedings are being recorded, and a record of the proceedings will be prepared for distribution to each of you. So that there will be no damper on our discussions, there will be no quotation specifically attributed to any of you without your consent. You should know that one media representative has been invited, and is in attendance. He is Bill Krizan, Managing Editor of *Engineering News Record*. The understanding we have with Bill is that he will regard the formal speaker presentations as "on the record," but all other discussions as "off the record." You also will see a photographer roaming about. This photographer is taking photos to maintain an historical record of this Symposium for The American College of Construction Lawyers as well as for Princeton University.

Let me introduce to you at this time my co-organizers of this symposium: Katherine Gurun and John Hinchey. They both are Fellows of American College of Construction Lawyers. Katherine Gurun recently retired as Senior Vice President and General Counsel of Bechtel Corporation and is now an arbitrator and mediator with JAMS. John Hinchey is a partner in the Atlanta law firm of King & Spalding.

In organizing this symposium, we sought to focus on big picture transformational issues facing the next decade and beyond. In the broadest sense we are reminded by Tom Friedman of the New York Times that the world is "getting flat." The implications of "flatness" for American construction and engineering firms truly are enormous. Yet American construction and engineering firms have not traditionally paid a great deal of attention to global opportunities. Statistics in the August 1, 2006, issue of *Engineering News Record* tell the story: The largest 225 contractors in the world, of which 108 (or 48%) are resident here in the United States, generated 2005 total revenues of $563 billion. But our 108 U.S. contractors comprising 48% of the total generated only $153 billion (or 27%) of the total revenues of the largest 225 contractors. The largest ten contractors in the world, comprising seven European firms and just three American firms, generated collective 2005 revenues by themselves of $125 billion.

The next significant statistic is this: the largest 225 international contractors, which *Engineering News Record* ranks by international revenues only, generated collective 2005 international revenues from outside of their home countries of $189 billion. Among those top 225, there are only 52 U.S. contractors—or 23% of the total. These U.S. contractors generated aggregate international revenues of $35 billion or just 18% of the total of the top 225 international contractors. Of that $35 billion U.S. total, three U.S. firms,

Bechtel, Fluor and KBR, earned $22 of the $35 billion. In contrast, the largest five listed international firms earned total international revenues of $53 billion, more than the entire 52 U.S. contractors combined. So it tells you that there is a lot of activity in the international market, but that United States contractors have only a relatively small piece of the action. The numbers suggest that American contractors have plenty of work at home and have ceded much of the international work to foreign firms. Yet American contractors and design professionals already are being impacted by a flattening world in which American multi-national owners build plants overseas; and in which outsourcing of engineering work to foreign countries is accelerating, material and equipment manufacturers are moving offshore, and everyone is being impacted by world price and market fluctuations.

The American inertia sometimes is attributed to cautious perceptions of international risks and perhaps to beliefs that construction and engineering have become commodities that are so readily available elsewhere in the world that it's unnecessary for U.S. firms to go overseas.

On one hand pessimists read too much into the morning papers and develop the perception that large parts of the world fulfill the prophecy of the Book of Revelations and are prey to the Four Horsemen of the Apocalypse—Conquest, War, Famine, and Death—and to their outriggers of malgovernance, corruption, lawlessness, and environmental destruction. On the other hand optimists see the developed and undeveloped areas of the globe as great opportunities—golden opportunities for their own futures and futures of their countries. According to these optimists, if you follow the manure trail far enough, somewhere up ahead you will find a pony. And certainly foreign firms have found a lot of ponies in international markets.

Beyond these competing perceptions of international risk, which have discouraged many from venturing overseas, there is the transformational issue of American engineering education itself. I think we're all aware of the statistics about the number of engineering students being educated in China versus the United States. Statistics published by the National Science Board and by others suggest that in China 60% of all bachelor's degrees are awarded in science and engineering, in Korea it is 33%, and in Taiwan 40%. By contrast those taking bachelor's degrees in science and engineering in the United States remain roughly at 31%. Factoring out science degrees, the percentage of Americans who graduate with pure engineering degrees is 5% as compared to 25% in Russia and 46% in China. A new vision of engineering leadership adequate to meet the needs of the 21st century is called for and it is one vision that we are here to discuss.

The high calling of this symposium is, first, to engage each other in exploring the implications of a flattening world upon global engineering and construction; second, to propose steps required to maintain and advance America's engineering and construction leadership in the flattening world; and, third, to confront changing approaches to management of international risks and resolution of disputes in the international world.

Foretelling the Future: Trends That Impact the Future of Global Engineering and Construction

Moderator:

Philip L. Bruner,

Partner, Faegre & Benson LLP,
Minneapolis, MN.

Panelists:

Anne-Marie Slaughter,

Dean, Woodrow Wilson School,
Princeton University,
Princeton, NJ.

Alan P. Larson,

Chairman, Transparency International—USA,
Washington, DC

William K. Hellmuth, AIA

President, HOK, Inc.,
Washington, DC

George E. Conniff,

Senior Vice President, Bechtel Corporation,
San Francisco, CA

◆

PHILIP BRUNER:

Our morning panel will discuss some of the broad transformational trends involving international governance, transparency, sustainability, and energy. Our distinguished panel includes Anne-Marie Slaughter, Dean of Princeton's Woodrow Wilson School; Alan Larson, President of Transparency International USA; Bill Hellmuth, President of the international architectural firm HOK; and George Conniff, Senior Vice President of Bechtel Corporation.

Their detailed bios are in your symposium program. We have as our lead speaker this morning Anne-Marie Slaughter, who is a distinguished scholar of international law and international relations, who is Dean of Princeton's Woodrow Wilson School, who has written an outstanding book entitled The New World Order. She came to Princeton from Harvard Law School where as a full professor she taught international law for many years. We are truly pleased to have her as our lead speaker this morning.

DEAN ANNE-MARIE SLAUGHTER:

Thank you. Welcome to my house. It's delightful to have all of you here. For those of you, who are engineers as well as lawyers, if you are wandering the Woodrow Wilson School and you see things that perhaps we should change, feel free to let me know. It has been a pleasure to help in the organization of this symposium, both because I've had the chance to work with Phil and Katherine, and because it marks collaboration between the Woodrow Wilson School and the Engineering School, something that Vince Poor and I both strongly believe in. Princeton's engineering school has as one of its mottos "engineering for the world." We think the engineers we train are learning not only the best fundamentals of engineering but also how to think strategically, how to think in terms of public issues in a wider world. I can think of no better sign of that collaboration than this particular symposium. We hope that it will be the first of many such joint events here at Princeton and probably around the world.

My job is to talk about international law this morning and make it interesting. Many of you are lawyers, so that task may be a little easier than to most of my audiences, but even so, I will try to present to you a vision not of the technical details of international law but of how I see global governance evolving in ways that really mean new sources for what we might call international law. I am much less concerned with the details of what is public international law and what is private international law and what is transnational law and what is extraterritorial national law. We can leave all that behind. I want to talk in a much broader way about the trends that are shaping international law and global governance.

Let me start with one of the fundamental clichés of globalization, almost as much a cliché as these days as the argument that the world has become flat (although it is to Thomas Friedman's great credit and pocketbook that that phrase is becoming a cliché). We live in a networked world. Now I would wager that countless speeches that you've heard on globalization over the last five years, maybe the last decade, starts with "we live in a networked world." We live in a networked world among corporations. I don't have to do anything more than just say that to you. That has been the great evolution in corporate organization and corporate management.

I always say that when I became Dean I got all these books on CEO transitions. I read them and I threw them away. They all have to do with managing people you can actually fire which has nothing to do with my world.

But the more interesting part of those books was their description of the shift from vertical to horizontal management, from managing in hierarchies is to managing in networks. And those networks are global. So in the corporate world networks are well established.

In the NGO world, and we're going to hear from Alan Larson, the power of non-governmental organizations in the last decade has arisen from their ability to network across national borders—so you have a global environmental movement, a global labor rights and human rights movement. These are national NGOs that are now part of global networks which think of themselves as global movements comprised of various national actors. The criminal world is a networked world; terrorism as the most obvious example, but think also about crimes like money laundering, arms trafficking, drug trafficking, trafficking in people, all crimes now conducted by global criminal networks. That's what makes them so hard to fight. You knock them out in one place and they pop up in another. So in all these areas—corporate, civic, criminal—the fact that we live in a networked world is well established and organizations have adapted to it.

Then come to the public world, to the government world. Government, perhaps as in many things, has been slow to recognize and adapt to this fundamental shift in the way the world is organized. So what I'm going to do this morning is talk to you in a stylized way about the traditional way we think about global governance, and here when I say "we," I mean international lawyers, international relations scholars, and I think it's fair to say politicians. All these people have a very traditional notion of what global governance consists of.

Then I'm going to talk about what I see when I look out at the world, which is a networked order of government networks. And I will talk about horizontal government networks and to some extent vertical government networks, just describing what I see. And I should say here I have no Power Point, I have no paper. (But if you would like to buy my book afterwards I won't object. My descriptions of government networks are laid out in greater detail there.) Then I'm going to talk about what I see coming with the evolution of these networks. And then I will close with what I think the bottom line is for corporations, certainly, as I see it, for corporate counsel.

Start with the traditional way we think about global governance. All of you are lawyers. I think for most national lawyers you probably start as I used to start when I taught international law: with the extraterritorial application of national laws. Obviously if you are in the United States you're thinking about how our antitrust law applies abroad, our securities law applies abroad, and our environmental law. That is the first place we think about laws that affect people outside our borders. And we think about the overlap and the clash of those national laws.

Then if you shift to the public side of international law, there are traditional formal intergovernmental institutions, whether it is the WTO or the UN or the World Intellectual Property Organization. We think of organizations that are created by treaty that have headquarters and stationery and lots

of bureaucrats and whose job it is to enforce treaties and to develop the rules that lead to the interpretation and the enforcement of those treaties. And traditionally when you teach international law that is really all you do: you either talk about treaty law and international institutions or you talk about national laws and how they intersect and conflict. Take all that together—and again some of it is public international law and some of it is private international law—and it is the world of international law.

When we shift from the term "international law" to "global governance" what we are really saying is that there are governments and they make law, but there also are lots of non-governmental actors—NGOs, corporations, and other semi-private organizations—who participate in various informal systems of rules as well as the formal systems of rules. And if you take all that together, that is global governance.

To give you an example, think about global environmental law. There are global treaties, and those of course are ratified by national parliaments or national congresses and those are the basic rules. But then you often have NGOs and the codes of conduct they put forward and the ways they work with international institutions. And you also have corporations who come together and adopt their own codes of conduct in various ways that are informal. And if you take all that together, you get global governance.

As I said, that is a very stylized description, but I think it will serve to start with that kind of traditional model. And again, when I taught international law that is what I taught. If I were standing here as my professor once stood here in this auditorium and taught me international relations, that is the way I would talk about international law. In both international law and international relations scholarship and teaching, it is the mental map that we have of the world.

Now shift. The world that I actually see when I look out at international law, and that I think if you read any newspaper and you are attuned to thinking about these actors you will see, is a world that is between those formal intergovernmental institutions and national laws that conflict. It is what I think of as the intermediate infrastructure of global governance. It is a world of government networks, not of formal foreign ministers and ambassadors, the formal representatives of countries who are secunded to places like the United Nations and other international institutions, but rather of national government officials who no longer can do their job domestically unless they reach out to their counterparts abroad.

Let me get specific. Let's start with government regulators and ministers in other countries, executive branch officials and cabinet secretaries here. Start with the financial sector. Well, it's not going to be a surprise to many of you to think about the powers in the financial sector. One of the places you would surely start is the Basel Committee. The Basel Committee of Central Bankers, thirteen central bankers from the most advanced industrial countries and some other key countries like Switzerland and Luxembourg. Those central bankers have no formal status at all in international law: there is no treaty, there is no government institution. They are a group of central bankers who

get together and decide on what is best, from their point of view, for global banking. And they then agree on rules, and then those rules get implemented, generally by the central banks themselves.

There is no formal treaty process and there is no formal ratification. It's a group of government officials who get together, decide what they want to do, and go back and then try to implement what they have decided on a national level. That's probably the core and it's probably the most powerful government network today.

Now think about securities regulation; same thing. The International Organization of Securities Commissioners is a global organization comprising securities commissioners from last I checked I think over 150 countries. But as many of you also probably know the rules get made in the technical committee, and the technical committee is a much smaller group of, and you might expect this, securities commissioners from advanced industrial economies who have the most power in that organization and who come together and agree on codes of conduct and best practices in the securities industry. Same thing occurs with insurance supervisors, through the International Association of Insurance Supervisors. When you put all these things together, when you put central bankers and securities commissioners and insurance supervisors together with finance ministers, you get what you call the Joint Stability Forum, which is an organization—a network of networks. So it's a network that brings all those different actors together.

Now in many ways, in the U.S. at least, and I think in many other countries, it's no secret that the Finance Ministries (the Treasury here) conduct their own foreign policy. When the G8 meets, the presidents—the heads of state—issue their communiqué and then the finance ministers issue their communiqué. And the finance ministers make little secret of the fact they don't want any interference from the heads of state in what they are going to do.

That is fairly well-known. What is less well-known is that countless other ministries all now have international affairs divisions and are all capable of networking with their counterparts and making rules that don't trump what the head of state says but have a big influence on the overall environment in which we make national policy. Other examples outside the financial arena: the Justice Department. Janet Reno said that the biggest change over her time in the Clinton Administration was the degree to which she started hosting and interacting with her fellow Justice ministers from around the world. They would come, and of course she would receive and host them, but then increasingly she started doing business through these networks. And of course our Justice Department now has an international affairs division, and when I mentor young lawyers who want to go into international law, I tell them that they might be equally or more happy in the international affairs division of the Justice Department as in the legal advisor's office in the State Department; same thing for Treasury, same thing for the Environmental Protection Agency. The Environmental Protection Agency has its own international lawyer, and that lawyer now has his or her own staff.

You are seeing this trend across the board in agencies that once were purely domestic. It's a necessary response to globalization. If the rest of the world has to network to be able to operate in a globalized world, it's not very surprising that government officials have to do the same thing. It's not just in the United States. In the past year, I've been invited to speak to the German Foreign Ministry, to the British Foreign Ministry, and to the Danish Foreign Ministry. The foreign ministries understand that this phenomenon is going on and their question of course is: what is their role in a world in which other government ministries have their own foreign representatives. It's an interesting subject. The first thing I tell them is that the horse has left the barn. Don't think you can pull this back. The best you can do is perhaps coordinate it. But this trend is developing in response to much larger forces.

I call these networks "government networks." They are informal networks of national government officials operating with one another across borders. When I say informal, the charter of the International Organization of Securities Commissioners is a Montreal city ordinance. That's a long way from a treaty, right? The organizers just needed to charter the organization, so they did so under the rules of the city where they happened to be meeting. That's the kind of instrument that establishes these networks. They typically exchange memoranda of understanding, so again, there are no formal agreements. And they exchange best practices, develop codes of conduct, do a lot of things that don't look anything like traditional international law.

Yet as you well know, in an information economy these codes of conduct or statements of best practices operate as focal points, both for developing countries and often for investors, both World Bank and IMF who say look, if you are following the best practices put forward by the securities commissioners or the central bankers, that is our litmus test for good governance. Private investors often follow the lead of the World Bank or the IMF. As a result, although a lot of the rules and the practices these networks generate have no significance in our traditional framework, they have a lot of practical impact.

That is the regulatory arena, the area in which these networks are thickest. The second area is among judges. I started writing on this subject in 1994, trying to track the extent to which the U.S. Supreme Court and other supreme courts were citing each other. At that point it was a quite new phenomenon. It wasn't a new phenomenon in one way because other countries had been citing U.S. precedents for a long time. And of course, the U.S had established supreme courts in countries like Japan and in Germany. We were not shy about letting the rest of the world know that we thought we had the world's best system of constitutional jurisprudence and that they should emulate it. Further, many lawyers abroad who became judges were trained in the U.S. and looked to U.S. law.

What's new is that today we no longer have only a one-way system of citing American law. We see instead an actual global judicial dialogue. By the time I published my book, there were articles by Supreme Court Justices in Canada and South Africa and Germany talking openly about just that—a

global human rights dialogue. Indeed, I cite the Chief Justice of the Supreme Court of Norway who wrote that he thought it was his duty and the court's duty in Norway to be a participant in this global human rights dialogue. They didn't mean a dialogue about enforcing international human rights law, although for many of those countries, international human rights law is part of their domestic law. They meant a dialogue about how different constitutional courts resolve questions like the right to privacy, free speech, the death penalty, a whole host of issues that arise in virtually every liberal democracy.

In fact, the chief justice of the Canadian Supreme Court announced in an article that the U.S. Supreme Court was really losing out because it was not participating as much in this dialogue as other courts and the result was that its own influence was diminishing. Courts in India and Africa were looking more to the Canadian court, the German court, and the European Court of Justice than they were looking to the American court. And as you well know, if you follow the politics of this at all, looking to foreign law for any purpose has become an enormous political issue within our own Supreme Court and within our Congress. It's what I think of as the perfect political storm. It combines what appears to be judicial activism and surrendering sovereignty all at the same time.

What's really happening, of course, is that the judges themselves are increasingly in contact with their fellow judges; sometimes because they have to be. In the bankruptcy arena it is necessary for our judges actually to be talking to their counterparts, and in some bankruptcy cases, they actually draw up what they call an order and protocol of how you actually have to resolve a global bankruptcy. Again, when I took international law, the idea that a bankruptcy judge would sign something called an order and protocol was unthinkable. That's something only the State Department did—but today it is driven by the necessity of dealing with global bankruptcies.

At the Supreme Court level, it is driven more by an increasing sense that there is a cosmopolitan community of judges. That they have a great deal in common. That they uphold the same values of judicial independence and of the rule of law, but that they have interesting variation among their systems and they learn a great deal from one another.

This sense of community does not mean that they then apply a foreign precedent in lieu of their own law—that would violate the idea of the rule of law. But it does mean that where there is an open question in U.S. law—just as they look to law and economics or sometimes even the writing of political scientists or law professors—judges can now look to how another court has grappled with the same issue; not just as precedent, but as persuasive authority. And if you talk to Justice Breyer about what he's learned looking at issues from the way the EU organizes itself to EU administrative law, he will say it is simply made him a better judge. There are also many examples of judicial organizations, of constitutional judges and of more specialized judges like refugee judges and environmental judges. So, judicial networks are a fast-growing part of the larger phenomenon of government networks.

Finally, the legislature. Here the legislators are lagging behind for some very understandable reasons. They are the ones who are most tied to their constituents in all countries. At least in this country, if they go abroad to meet with foreign legislators who are interested in the same subjects as they are, they risk being accused of taking junkets. And just in general, they tend to be less internationally oriented except for the handful of legislators who focus on international issues. But here, too, networking with their foreign counterparts is a phenomenon that is growing. More slowly than in the other two branches, but nevertheless you have meetings of legislators who are focused on issues like the death penalty or environmental issues or human rights issues.

When Senator Frist was still Majority Leader, I suggested to him that he should invite his equivalents from a number of countries around the world to the United States—maybe to do it under UN auspices or maybe simply under national auspices. The point is that it is very important for our top legislators to know their counterparts abroad. The elected representatives of the American people should be at least as engaged in government networks as the non-elected representatives.

When I give this talk, I often get people coming up to me afterwards saying, "so you are really telling me there is a global technocracy—this confirms my worst fears—regulators and judges are meeting behind closed doors around the world and we, the people, know nothing about it." The accountability issues are not nearly as grave as that depiction makes them seem, but they do exist. And one of the best answers to that particular critique is for our legislators to be more actively engaged in these networks as well. And that is beginning to happen.

In sum, government networks are proliferating. They are the intermediate infrastructure between formal intergovernmental organizations and national legislatures passing laws that apply extra territorially. Now let me turn to where I think we are going, which is the intersection of these horizontal transgovernmental networks with vertical government networks. Let me just say what I mean by a vertical government network. This is, I think, a far easier concept to grasp; we are more familiar with it. If you take something like the EU, or if you take NAFTA (although it is much better developed in the EU than it is here), you are seeing the relationship between a supranational court or regulatory entity—the European Court of Justice or the antitrust directorate of the European Commission—and their national counterparts. It is a vertical between a supranational judge and a national judge. The EU legal system was built based on these vertical networks. Effectively, European Court of Justice judges had to convince their national counterparts to send them cases, and they did so through lots of personal contact—something that is happening today with the European Court of Human Rights and lots of national judges. The European Court of Justice judges said, essentially, "look, you send cases up to us and we will send them back down to you; we will pay attention to your jurisprudence and you pay attention to ours." There was, of course, a legal requirement that national courts send cases raising questions of European law up to the ECJ, but national judges weren't doing it very much at the outset of the European Community.

Similarly, in NAFTA, you increasingly have national courts paying attention to what is happening in the formal NAFTA dispute resolution tribunals. It's a much slower process here, however, than it has been in Europe. The same process is happening gradually with the WTO. Many American judges, of course, are very hesitant to look at WTO partly because it is so complicated. But increasingly as I talk to American judges, I hear them saying, look, some of these issues are so complicated—what we would like to be able to do is simply recognize that there is a judgment here by a WTO panel and we will borrow part of it. Again, it's not a formal enforcement requirement; it's much more of a network relationship.

You see this in the economic area, but you also see it, interestingly enough, in the international criminal law area. Now this, I hope, is not an area any of you have had much to do with, but I'm thinking about the International Criminal Court which, despite American's best efforts, is alive and well and operating in the Hague. It is housed in a handsome multistory building full of lawyers and judges who are actually working. One of the most interesting things happening in the International Criminal Court is that the prosecutors at the international level, operating within an international treaty, are training national prosecutors to prosecute under international criminal law. In fact, that is really the philosophy of the prosecutor of the International Criminal Court. He says he will have succeeded if he gets no cases because what he really wants to be doing is training national prosecutors to try their own criminals—their perpetrators of war crimes or crimes against humanity.

That is a vertical government network. It is a network where you have an international entity that is working with, in lots of informal ways, its national counterparts. Sometimes the national counterparts find it valuable to send a case up. Often, the international tribunal finds it valuable to actually train national officials to do what they would otherwise have done. That's the pure law example—the judicial example of how these vertical networks work. But it can also happen, as it has in the EU, between the antitrust directorate and national antitrust officials. The antitrust directorate would really prefer to have national antitrust officials applying EU law on their own.

As these systems evolve, you are going to see this crosshatching of national government networks and vertical government networks in ways that really do create, not just this horizontal intermediate layer of global governance, but a much denser set of horizontal networks and vertical networks that create a real global infrastructure of rules of national law, of trans-governmental law and of some treaty law. The example is the EU itself. I do not think that the world as a whole is going to look exactly like the EU, but if you know how the EU is governed, the primary actors are national government officials operating in these networks. That is what The Council of Ministers is: the council of agricultural administers, environmental administers, transport administers, finance administers, and they all work through networks of their national government officials. When a new member comes into the EU, it is socialized precisely by having all of their government officials be part of these horizontal networks. And, these horizontal networks then also interact with the formal EU institutions, the commission and the court primarily and the parliament.

This is not world government; it's not even regional government Nation states still hold maximum power, but it is a way in which sovereign nation states can develop rules that allow them to integrate horizontally and to delegate some things vertically to a supranational institution when they absolutely have to. It is a model that is incredibly attractive to Asia right now. My husband wrote a 450 on EU Integration. It's superb, but if I do say so myself, it's rather dense. The Chinese have translated it and he gets constant invitations to talk because they are so interested in the European model; same thing in Africa and, in Latin America, although in many more halting ways. This overall model of networked government, primarily horizontal networks with a much smaller number of vertical networks, is what I see as the infrastructure of global governance of the future.

Let me close with what I think the bottom line is at this point for those of you who are actually out there practicing with these different actors rather than for people like me, who have the luxury of observing the world, if not from a bird's eye perspective, at least from the luxury of Princeton.

The first point is simply to be aware of all these networks. I have sketched only a few and, honestly, as I was writing the book examples popped up faster than I could document them. The reason to know about them, of course, is to know who makes up the network, which government officials. When they meet and what is on the agenda. When the International Organization of Securities Commissioners first met, it really met simply as government officials. Now, of course, the securities dealers are well aware of when those meetings take place and they are there at those meetings, and they lobby and do exactly the same thing at that global level that they would do nationally in any particular country. That is often how our democracy works, you know when Congress is in session, and you know what is on the agenda, and you lobby.

This knowledge is perhaps most important for the nongovernmental sector, which is often the least aware of these networks and what they are doing and when they are deciding issues. Again, if you look at the agenda, it's not formal, it's "we are going to discuss best practices or we are going to examine the code of conduct," but it has real impact. As we know more about who are in these networks and what they are deciding and when they are deciding it, it's important to push for greater transparency. There will be a public backlash; indeed, to some extent there already has been one. If you look at the website of the organization Public Citizen, it talks about the process of global harmonization as a great danger to the public interest.

It is important that these networks, as I put it, become real by becoming virtual—that they develop websites; that they communicate through their websites who they are and what they are doing. The Basel Committee of Central Bankers has moved in this direction on its own. It actually has a sort of informal version of notice and comment because it got so much heat for the way in which the Basel One agreement was adopted in secret—this is the agreement that regulates capital adequacy standards. On Basel Two, revisiting this agreement, they have been much more forthcoming.

So the first point is to map those networks that are of greatest concern to your industry and figure out who they are; when they are meeting and figure out ways they can be more transparent, both to corporations and also to nongovernmental actors and to citizens. Second, I think it's very important to understand the judicial networks and to understand how it is that individual national courts are looking to not only international law but to foreign bodies of law and to think about how you can educate judges in different countries on foreign precedents. One of the biggest drivers of this phenomenon has been LexisNexis—it's not very surprising, right—because now you can get these various decisions easily and quickly and in English. The Taiwanese Supreme Court decided to start translating its opinions into English precisely so that they could be part of these larger judicial networks. That means that lawyers and clerks are searching more broadly. That means the judges then are getting access to these opinions through the normal ways in which judges get their information.

It would be enormously valuable in the U.S. to depoliticize this issue. Instead of railing about the erosion of national sovereignty, we ought to be thinking about how you educate judges in a world of global legal transparency and access. What are the rules if you are going to use foreign precedents? Do you have to at least cite all the foreign precedents you have looked at? Does there have to be the same tradition of "but see," so that you can't cherry pick a foreign precedent and say, "look, the British law lords have decided a case this way" without having to add that the same court also decided another case in a completely different way? There need to be standards about the citation of foreign judicial decisions, as in the early days of this country citing another state's law was relatively new and unusual, a practice that we think now think of as routine. Knowledge of foreign legal practices and judicial decisions is not a genie that can be put back in the bottle. Instead, we must develop ways to harness this knowledge in ways that are positive and that avoid potential abuses.

Finally, I think it's appropriate in this conference to ask you to think bigger. These government networks are there. They are growing incredibly quickly. They are growing for all the same reasons that the corporate, civic, and criminal networks are. They are the response to the forces of globalization: to a globalized economy and the efforts of a global polities and society to catch up but without any kind of global government. We are not going to get a global government and we shouldn't get a global government.

But, how do we use these networks positively; not just observe them as a phenomenon, document the phenomenon, and analyze it, as I and many others now have done. How do we think creatively about actually harnessing these networks, about giving them a name—the Global Health Network, the Global Justice Network, as we now have the International Competition Network. After being initially very supportive of the International Competition Network, the U.S. government then decided that it didn't want it after all. That's ridiculous. We, in the United States, and lawyers in other countries ought to be thinking how to use these entities—they are flexible, they are able to expand or contract, and they are able to operate much more quickly than

formal international institutions. How do we use them actually to provide technical support and expertise and help in areas where we are working with fragile countries that need the help? How do we use them to implement laws that we want implemented? How do we use them actually to exchange information in more efficient and more valuable ways?

Think of these networks as a tool of global governance comprised of national government officials, people who ordinary citizens have a hope of getting access to. These officials are certainly closer to national voters than their counterparts off in Geneva or New York. They are the very same people we lobby nationally. How do we harness their contacts with one another in ways that actually fit us to attack global problems, to aid global business, to advance global non-governmental interests? Those are the questions of the future, just as government networks are the future of global governance.

It's been a pleasure talking to you. I look forward to your questions.

PHILIP BRUNER:

Thank you, Anne-Marie. Our next speaker is Alan Larson who is a career ambassador in the U.S. Foreign Service. From 1999 to 2005, he was the U.S. Under Secretary of State for Economic, Business, and Agricultural Affairs. In that capacity he directed global economic policy in the areas of trade, finance, telecommunications, transportation, and energy sanctions on behalf of Secretaries of State Colin Powell and Madeline Albright. We are delighted to have Alan with us. Welcome Alan.

AMBASSADOR ALAN LARSON:

Thank you very much Phil. Good morning everyone. I am really pleased to be with a group that both literally and figuratively is building the future, and I am going to do my best, inspired by Dean Slaughter's remarks, to build on this concept of networks. In many respects a lot of what I did as an Under Secretary of State as ambassador to the OECD was helping to build some of these networks that Dean Slaughter was talking about. I will discuss political and economic risks in a relatively traditional way. I will, drawing on my current experience as a senior international policy advisor in the Washington law firm Covington & Burling, talk a little about my experiences in helping businesses deal with international risks. And as Chairman of the U.S. Chapter of Transparency International, I will talk to you a little bit about the international policy environment surrounding the corruption, extortion, bribery issues, and offer some ideas about how you can help us shape that environment, and how you can protect yourself in that environment.

Let me begin by outlining four trends that strike me as very significant for your industry. One is that there is tremendous international demand for infrastructure. It's a cliché, but you only have to travel to China or India and see the cranes and see the tremendous size of the infrastructure needs that they have. When I deal with people in our own hemisphere and Latin America, the number one issue I hear about from the head of the Interamerican Development Bank and from other Latin American officials is the need for infrastruc-

ture. Here in the United States, as a very developed country, we also do not have our infrastructure problems solved. My first posts were in Africa, and we worked on projects like the Inga Shaba Electric Transmission Line. To some extent, some of these big African infrastructure projects may have been before their time, but, if you believe, as I do, that an African renaissance is perhaps happening, I think some of these projects will return.

A second nearly obvious trend is the tremendous need for investment in the energy sector on the worldwide basis, including exploration, production of oil and gas and electric generating plants and transmission lines; it involves very significant transformational energy technologies. If you come from Iowa as I do, you are very focused on ethanol and windmills. And I think they will have an increasing role. But there are also looming questions about so-called sequestration of carbon from coal plants, about fusion, and about whether there may be a renaissance of the nuclear power industry in the United States, as I think there probably will be.

A third trend, again obvious, is the increasing role of the private sector. Now, the private sector has always played the leading role in the construction building phase of infrastructure. But increasingly, with halts and bursts forward, the private sector is going to be the financers, the owners, and the operators of big infrastructure projects. One reason starts from the fact that the private sector is where the money is. If you look at how we are going to finance development globally, it increasingly is coming from private sector resources. Public sectors, whether it's India or the United States, are very, very strapped, and they can't play the role in infrastructure finance that they once did. I also think the technological and managerial capabilities of the private sector are increasingly being called on.

The fourth obvious trend is that globalization will shake your industry in many ways, some of which are clear and some of which we may not discern for a while. Certainly there will be large international firms with expertise. It was interesting to hear Phil's comments about how many of those are not American firms, that they are European and other firms, and that is something that I think has to be a source of concern. I think that there will be very large construction and engineering infrastructure firms coming out of China and India, maybe Turkey and places like that. There will be new, larger competitors. You already see them but I think they will become more of a factor. I expect that the financing of big infrastructure will continue to become more and more of an international phenomenon partly because of the size of the financing needs and partly because of the interest in diversifying risk. And I think that there will be a continuing tendency for the workforce in construction infrastructure to internationalize even further, and for there to be some significant degree of specialization in specific aspects of operation of infrastructure. The Dubai Ports World (DPW) phenomenon notwithstanding, if we can manage the protectionist impulses that all of our countries have, it could be a sign of the future that today there are specialized firms operating internationally that have real expertise in things like port terminal management. There are a number of such government-owned firms. In fact, DPW was trying to buy out

a British firm's interest in these six terminals on our east coast. I expect that this is likely to continue.

A few comments about the risk environment in which construction, engineering, and infrastructure operate: Again, they are fairly pedestrian. The first is the need for very large capital requirements. A second one is the critical path delay phenomenon; the fact that there are so many different companies involved, and one depending on another and it doesn't take long for delays in one area to mushroom. And that can raise costs significantly; it's a risk factor. A third risk factor is the necessity of dealing with government regulation at all phases: both the construction phase and the operations phase. If you are an operator of an infrastructure project you typically have rates that you may charge that are controlled by governments. Often these rates are very sensitive domestic political issues and therefore you have to be worried about whether over the lifetime of the project you are going to continue to be paid remunerative fees for the infrastructure that's been built.

And then finally I will just say in passing a word about energy. Energy projects and their construction, engineering, and operations are extraordinarily sensitive domestically and rate higher risk factors.

In addition to the traditional industry risks, the risk of terrorism has been with us for a long time, but now we know that the Department of Homeland Security has identified twelve sectors of critical infrastructure in the United States that cover roughly 25% of our economy and that we need to take particular care to protect from terrorist attack. We know that pandemics pose more of a risk than we used to think and can be particularly dangerous when one is talking about large construction projects that bring people from many different parts of the world that transit many different national borders. We know that there are significant safety risks in the projects that you operate in and those risks can pose issues for workers and for the users of the projects over their lifetime. We have lived through several financial risks, financial crises, in the last decade, and we see anew the particular types of financial risks that many infrastructure projects place on large international capital requirements; revenues that often are earned in local currency thereby exposing the project to significant currency mismatch and financial risk. There is the traditional list of political risks—terrorism, war, spread of weapons of mass destruction—and the more traditional ones that we have worried about for years like expropriation, government regulation. We focus a lot on the environment in these big infrastructure projects. The impact that the project has on the environment requires management in a way that takes those environmental concerns into account. We know that some of our projects require the displacement of people that can raise tremendous political concerns as well. Because of the risk of terrorism, many of our projects require extraordinary measures to make them secure, but that creates a new set of risks. Are we violating human rights in the way that we have engaged security forces and in the tactics that the security forces employ to protect the safety of our workers and the safety of the project?

Some of the projects that we work on are now increasingly seen as private sector projects, but still are in a space that many people regard as "public goods" and thus are subject to political trends. One of my clients is a company in a formerly communist Eastern European state that acquired railroad operating rights, rolling stock, and rails. Now the government thinks: "Why isn't this a government-owned entity? Why is some private company, let alone a company that's foreign, involved in operating this?" So it's a risky world.

At the same time I think it's a world with lots of opportunities. I agree with one of Phil's messages that there are tremendous needs and opportunities, and our industry should be more deeply involved in them. So what I would like to do is describe briefly three categories of things that companies could do. They could be considered best practices. They could be considered ways of forming networks, and they could be considered ways of informal modern governance. But each of them offers perhaps something that can be learned by those of you who work on big infrastructure construction and engineering projects.

The first example I will give is work that my law firm has been doing in connection with an international pipeline project. This is a pipeline that is tremendously expensive and is a very important part of the international energy infrastructure. It's one that benefited from a great deal of government encouragement and support. I will confess that being an internationalist with expertise in energy, I never thought it was actually going to be built, but it was. And now the project operators, which include British Petroleum, have formed a development advisory panel to advise them on economic, social, and environmental impacts of this pipeline. We have been involved because one of our partners is an advisor or commissioner on this independent panel, and we serve as the secretariat. It's an interesting experiment because the client basically is going to the private sector and saying: I will pay Washington lawyers to help operate this panel, but it will give me independent advice that will help me better manage my political relationships along the length of this pipeline. So far, again I think it's actually worked. The advisory panel has been able to engage with governments on a set of issues, including the so-called Dutch disease; how are you going to actually manage the significantly increased revenues that you are getting and do it in a way that is economically sustainable for your country?

The panel has been able to advise sponsors like BP about the way they could engage with the local communities. Against the instincts of many, I am sure, they suggested engagement with civil society NGOs, like Transparency International, along this pipeline to develop a sense of greater citizen involvement and participation in issues that were seen as affecting those communities significantly. The advisory panel also made the recommendation that focused emphasis on the project's benefit to the communities along the pipeline, both short-term and long-term, so that there was a continuing sense on the part of the community that this is a project from which we are continuing to derive benefits and to have a chance at being engaged. Our sense is that this exercise has been very helpful—it's been an experiment—but it's been helpful in establishing a new approach to how big infrastructure projects interact with the communities that are affected by them.

We also have had a chance to have input on one of the big international initiatives of the era; the British-led Extractive Industry's Transparency Initiative (EITI). This has been responsible for important transparency slogans like "publish what you pay." If you are going to be making payments to a government as an oil producer, you should make it clear how much is going into the government and the government should publish what it receives, all in the interest of transparency. But we have said, wait, that's fine as far as it goes, but what about publishing what you spend. What about governments taking on the responsibility to be more honest with their citizens about how the revenues from these big projects are being used, hopefully to make life better for the people in those countries? I think this is all part of something that can improve the political risk environment for investors and operators of big infrastructure projects.

The second area I want to talk about is a bit more diffuse, but it's how you engage in and shape regulatory risk, not only in the international environment in which you are operating but, frankly, the regulatory stance here in the United States as well. For better or worse, there is a significant relationship between the two. I have mentioned already the Dubai Ports World project. With a colleague at Covington, this summer, I published an article for the Council on Foreign Relations on CIFIUS, another one of these little known organizations in Washington that reviews proposed investments in the United States on national security grounds. It was CIFIUS that actually approved the Dubai Ports World transaction, but when this was announced, and given the fact that the administration has not had great relationships with Congress on this or other issues, the announcement came as sort of a surprise. There was a political whirlwind that caused the transaction to be killed. We said in our article what the government has been doing through the CIFIUS process has actually been operating pretty well. There are issues that need to be fixed like communication, but basically this is a sensible government-run program. The Dubai Ports World case was one where you could have, if you wanted to, negotiated an even tougher agreement with the investor that would have gone further to strengthen port security, which is admittedly a very serious problem for our country, but it was a missed opportunity because the transaction was driven away. I think this is important for our country. It's also important for companies that want to build construction and infrastructure projects or operate those projects abroad, because other countries follow our example, and it will be harder to get contracts to operate an airport, a pipeline project, or other project to the extent that countries take seriously what we did in this example.

Let me give you another example that's of interest to many of you and that's the way in which we regulate nuclear power plants. Views on nuclear power differ a lot. I happen to think it's a necessary part of our future. I think that some of the initiatives that the Congress has taken in the last two years, hopefully, will create a more certain regulatory environment for the nuclear power industry so that there is greater ability to get licenses at once, including operating licenses, rather than living with regulatory uncertainty over ten years during which more and more money must be invested in the project.

Let me turn to the third and last issue; that is the issue of international corruption. Transparency International is very much a global network of the type that Dean Slaughter was talking about. I am the chairman of the U.S. chapter. There are over ninety chapters around the world. We have a headquarters in Berlin, but we believe that the strength of the organization comes from the ninety chapters that have a local identity and are very much involved in local transparency and anti-corruption issues. Here in the United States TI has been a supporter of the Foreign Corrupt Practices Act (FCPA). We very much support the efforts of the private sector to develop stronger and effective corporate compliance programs for things like FCPA. One of the things I have learned in the few months that I have been Chairman of the Board of Directors of TI is that even though we have had the FCPA for a long time, there are many corporations that have a long way to go in developing a corporate compliance strategy or code. They may have a one paragraph statement, but only a smaller number of the very best firms with the most experience internationally have taken the time to really help their employees understand what the FCPA means and to set up the corporate systems to make sure that people play by the rules.

A second thing that Transparency International has done in league with the business community is to try to internationalize the Foreign Corrupt Practices Act. We succeeded ten years ago in getting the Organization for Economic Cooperation and Development, the OECD, to sign a treaty that gave national governments an obligation to have in place an FCPA. It hasn't been perfect. The bad news is that after ten years, all the governments have put in place laws, but some of them are not as strong as they might be. The U.K. law, for example, is a weak one. Our best estimate is that only a third of the countries have really been serious about enforcing domestic obligations. The good news is that a third of them are. Whereas, ten years ago, not only did Germany not have a law against overseas bribery, but a company got a tax deduction if it paid an official abroad to get business. So change has come.

Another area of emphasis is the development agenda. We have worked closely with the World Bank on the strong stance that Paul Wolfowitz, President of the World Bank, has taken on corruption. The basic principle has been fought out, and Paul's position has prevailed. They are going to have to make sure that country managers are integrating this into the country strategies at all levels. They are going to have to make sure that the sectoral parts of the World Bank, like the infrastructure sector, really integrate this into the ways of doing things. The Bank is very proud of its voluntary disclosure program and debarment program; if we catch a company involved in bribery on a World Bank project, we are going to debar them and they are never going to do business with the World Bank for a long time. That's fine, but it's locking the barn after the horse is out. We need to get them to integrate more integrity into all stages of their lending practices, and we are going to be very engaged in doing that.

I think the private sector has a very important role to play in promoting transparency. A number of you have been involved in industry-specific efforts to strengthen transparency principles. There has been an initiative that has

been undertaken by the World Economic Forum in conjunction with Transparency International. TI has worked with the American Society of Civil Engineers as well as with the World Federation of Engineering organizations on a code of conduct on this issue. I do think that this is an opportunity for the private sector to create its own network; create a network nationally, but arguably internationally, so that you set your own standards about how to make this part of the economy work the way you want to see it work and not have government in some hard-handed way come in and regulate it.

So let me sum up. In the world of international engineering, construction, and infrastructure projects, it is very important to assess risks, mitigate them, and shape the environment. I think those are three major tasks.

Risk assessment—there are lots of ways to do the risk assessment. There is no substitute for obtaining that basic knowledge and know-how before making an investment; doing real due diligence.

Mitigation—I have given the example of the Pipeline Advisory Panel as one way to try to mitigate risk. I will also mention in passing the way that you can engage the Overseas Private Investment Corporation or World Bank to be involved in the projects. Although capital is abundantly available in the private sector, you may go to them because they can provide a quasi-insurance framework that can help. There are times when it is very useful to say that the U.S. government, through the Overseas Private investment Corporation, is our "business partner" in the project. You can tell a foreign government, if you effectively expropriate us by not letting us receive a new rate of return on our pipeline, it's not going to be just me coming and knocking on your door. You are going to have the United States standing behind that client because they are our insurance agent. It's not necessarily the way to go on every project, but there are times when that is a very valuable approach. And finally,

Shaping the environment—We think that it is enormously important for you to be involved in shaping U.S. regulatory practice. At Transparency International, we would welcome any of you that want to work more closely with us on shaping the international legal and regulatory regime on anti-corruption because we think, first of all, it would make it a more level and predicable playing field; and secondly, we think it will make a better place generally for you to do business in. Thank you very much.

PHILIP BRUNER:

We continue our morning session by hearing from Bill Hellmuth, who is president of HOK in Washington, D.C. He is regarded as one of the world's finest architects with projects worldwide, and he brings us an extraordinary breadth of experience in design and construction of international projects. He received his architecture degree from the University of Virginia, and then came here to Princeton to earn a master's degree in architecture. Bill, we are delighted to have you with us this morning.

WILLIAM HELLMUTH:

Thanks Phil. In thinking about global trends and our construction industry, I don't think we can possibly not talk about sustainability. I think this is probably the number one issue, and I am not a big green guy; I am not an evangelical green person. But looking at what is happening to the world and our built environment and how we are building, it is pretty amazing. The good news is that the people in this room have the ability to change the course of a lot of the bad stuff that has occurred over the last 150 years and more specifically over the last twenty or thirty years.

We talk a lot about sustainable design these days, and I think a lot of people think that what that really means is "I'll go buy a Prius, and I'll sell the SUV;" or "I'll buy the Prius and I'll separate my cardboard from the bottles and put it out in the trash." Those are all worthy things to do, but the real issue is building energy consumption and its environmental impact. If you look at global warming and you look at energy use in the United States and CO2 emissions which are directly connected to our energy use, I was shocked to find out that 48% of all the energy use in the United States is due to the building of buildings or the running of buildings. In contrast, transportation—our little Prius and all that—is only 17% and industry is only 23%. We are 48% of the issue. So we, everyone in this room, have the ability through the building process, through passing laws and regulations, and so forth, to affect 48% of the energy usage in the United States. That is pretty amazing. But it's not just energy usage; it's how we use the land; how we find a beautiful landscape; and then what we do to it. And that has to do with our resources of water; our resources of open space; our resources of critters and things that live in the whole network. Now we are talking about an ecological network—it's not just finance ministers talking to finance ministers—but it's bugs talking to mold; talking to all of us which is the network that we live in.

There are all sorts of issues directly connected to building. Whether it's the use of our forest, the use of our rainwater, the use of our energy—you can see it in the urban sprawl and what is going on in the cities. Some of the biggest issues are ozone depletion and global warming. We have gotten pretty good at air pollution. All you have to do is to go to a South American city today and breathe and you realize there is a big difference between Buenos Aires and Washington DC in terms of air quality—you don't need a meter to tell you that. You can tell because you're not coughing and hacking. But what we're not so great at is the C02 admissions and the ozone depletion. Of course we have to work on all the other pieces but those are the big ones. And those are the big ones that the construction industry can deal with.

Now Anne-Marie talked about getting more global agreements and understandings and laws and trans-governmental networks. As U.S. citizens we have a right to be really scared, because, if these ever come about in any meaningful way in the environmental field, look at who is at the top chart in energy use per capita. For example, each person in the US uses 2½ times more energy that a person in Japan, and they have a pretty good quality of life in Japan. They figured out something that we haven't figured out. Now if you

look at water usage we have three times the water usage of the French. They have pretty great civilization. It's gone on for a long time and who thought that they would get it right. They also get about 70-80% of their energy from nuclear. I agree with Alan. I do think nuclear—if we can figure it out—might be one of the solutions. Technology can be our friend here.

If you just look at landfills—just the stuff that the people in this room are responsible for from demolition of buildings and construction—fills 40% of the landfills in our country. Now a lot of that stuff can be ground up and reused. A lot of that stuff can remain on site. A lot of that stuff doesn't have to happen because we have done an adaptive reuse of the building. It's not just energy. It is a lot of different things working together. Now on Earth Day 1971, we all put on our Birkenstocks, went out into a field—the whole environmental movement in the United States. We kind of thought, well that's nice, they're hugging trees. You know, they'll get to heaven soon and certainly more assuredly, but we didn't take it all that seriously here. That's changed considerably. It had to change. Things like hurricane Katrina. There was an article in National Geographic talking about the devastation of New Orleans, and it went on and on about all the horrible things that happened in New Orleans as a result of global warming. That article was written a year before hurricane Katrina. That was the prediction of what was going to happen because of global warming. These events are predictable. Our best scientists are working and looking at what the effects of these environmental problems are, what will happen in the future, and how we can avoid or reduce the impacts.

Now this year, perhaps in the post-Katrina era, everything has gone mainstream. Brad Pitt, George Clooney, everyone is an environmentalist, and it's not just that guy hugging the tree with the flower in his hair, but it's our mainstream media which has become aware of sustainability as the issue. The Time magazine article that I mentioned had photos, touched up photos, that showed what happens if the globe warms four degrees centigrade; the water will cover Central Park in New York. They were pretty spectacular images. I can't attest to their scientific veracity, but the issue is there and the issue is very, very real.

As a society, we love disasters. Disasters cause us to move into action. The Chicago fire was really the disaster that caused us to think about fire separation and build into our codes and decide as a society that we were going to build differently. We were going to do fire separation by physically separating the buildings or putting in fire walls; a whole series of things. And it happened many, many years after, but that was sort of the impetus. The San Francisco earthquake—we didn't have earthquake regulations until forty or fifty years after the earthquake, but it was the memory of those events that caused us to put them into our codes. It caused us as a society to say these are things we have to do in order to create a civilization and place that we want to live in. Hurricane Katrina may or may not prove—only history will tell—to be a similar kind of wake up call.

Now the premiere measurement of whether a building is sustainable is the LEED (Leadership in Energy and Environmental Design, a program of

the U.S. Green Building Council) rating system. You go from certified all the way up to platinum. Now by and large this is a voluntary system. Many governments are requiring it in their buildings and that's appropriate, and the GSA won't rent a building that doesn't have a LEED certification. I now have LEED developer clients—who by the way are all dear friends—that come to me and say Bill we have got to have a LEED building or we can't rent to the GSA. Well that's great. The next step is going to be how do we find other ways to increase sustainable building. We are way behind Europe in this. Germany has had day lighting and ventilation and sustainability controls. The EU has laws in place in how you build. Now their buildings are more expensive than ours. I'm always jealous because our London office gets to spend about twice as much per square foot than we get in the United States, but it also lasts longer and they have great payback.

The buildings which respond to this challenge—and this is a series of what I would call deep green buildings—are different. They are interesting and they are really two kinds of buildings out there that are regarded as "sustainable." These deep green buildings wear their sustainability on their sleeve. You can see it. You look at the building and say, wow, that's an odd shape or that's an interesting shape or that's doing something different. These tend to look different because they must behave differently, because of the way they accept day light, because of the way their envelope works, and because of their ventilation systems work. These tend to be very interesting to look at and frankly a lot of architects right now are intrigued by them. There is a movement right now for buildings to be as affected by the mechanical engineering as the Sears Tower and the John Hancock building in Chicago were affected by structural engineering. There was a whole era of buildings in the 60's and 70's, when tall buildings were all about the marriage of architecture and engineering. We have the ability now to build through sustainability. And sustainability will connect to a different kind of engineering: our mechanical engineering and our environmental engineering with architecture will produce some pretty amazing and wonderful results.

The old approach, the traditional way, was you figured out a building and then you threw systems into it. You threw lots of duct work. You threw lots of wires. You threw everything into that building that you needed to and it all worked. It worked just fine, but you really needed to make that next leap and that next leap is taking a base line of our buildings and reducing the energy they require by 50%. That sounds like a lot, but people are doing it. It's a more integrated approach. It's an approach where the engineering and the architecture are a lot more hand in glove. It's not just slapping on applications of engineering systems after the building has been conceived, but it's the idea of having a skin which is an intelligent skin that works and is part of the mechanical system. It's about an atrium that might be in the center of it to allow day lighting to get into the space. The studies that show the increased productivity of humans in day lit space are a great selling point to our clients. People who are within forty feet of source of day light are fifteen percent more productive. Absenteeism is less. You go to corporations and this is regarded as "cool stuff" because that's bottom line dollars for them. It's also sort of

a wonderful environment for these buildings and it's a more inclusive, more networked approach, how you design and conceive these buildings.

Day lighting is just one example. People don't really realize that about 60% of the energy used in a building has something to do with lighting. It's either turning on your lights or it's cooling down the heat effect from the lights or some other portion of that lighting. The world is around for a pretty long time and is basically a solar powered unit. The entire world is solar powered, photosynthesis and other things. If we can just harvest natural day light in our building, we can cut out the electric company. We can make a better place, and we don't have to air condition it as much.

So there are a whole series of evolutions where limited day light goes to lots of day light. You know, I remember when I first started working in the Middle East and there was the energy crisis and the energy companies over there had to pretend that they were responding to the energy crisis because they sold the oil. I didn't really understand why they were pretending to do this, but they had these big concrete buildings with little slits for windows. That was their way of not having to use too much energy. And they were terrible buildings. Terrible buildings to be in, but they didn't require very much energy because you had practically no windows. We have now figured out orientation of buildings to have great big windows that are wonderful, allow lots of visible transmittance in and solve the problem in a completely different way.

Now a lot of what we need to look at is "vernacular architecture." The building and environmental problems that occurred in the last 150 years arose at a time when we have had the ability to change how we did stuff. Over hundreds of years, by trial and error, society has figured out how to build these buildings which use practically no energy, maybe a little pile of wood to warm it up in the winter, and use solar orientation, outdoor arcades, and a whole series of architectural devices. They are different in different parts of the world to deal with the local environment. And we can learn a lot from all of that.

A couple of examples. A lot of people worried about whether sustainable design means very expensive. A building completed about three years ago for a big association that had no money was an absolutely ordinary building on the Dulles Toll Road. It was costing $65 a square foot, and they wanted a sustainable building with a LEED rating for $55 a square foot. So we had to look at some pretty common sense ways of devising a building that would do that. We first had to suspend the client's ideas of what the appropriate materials might be. We talked instead about profile panel and split face masonry, which was basically corrugated metal and split face concrete block. We created a building that was very simple and very shallow. It had large windows facing the north, from which you have no solar heat gain, and on the south there is a green screen where we took a page out of what the old farmers did. They planted deciduous trees around their houses. And this screen facing south has vines that leaf out in the summer time. They don't allow the sun to come in. The leaves fall off in the winter time, which is when you want the sun to come in. Very simple. Very inexpensive and creates sort of a wonderful environment for the building. As it's oriented north/south, the ends—the east

and west—are really the tough way. You can almost never deal with solar heat gain on the east and west because the sun is so low in the sky. It's very hard to shield against that so we just eliminated it. We have solid walls on the east and west. It's a skinny building. No one is more than thirty feet from a window. And it has the most interesting parking lot in northern Virginia. We used bio-retention swells with butterfly bushes and different plant material to make the water cleaner—the oily water that comes off of your car in the parking lot, before it gets into the Chesapeake Bay, and this does a better job of it than the mechanical separators that we have been putting into parking lots.

Another example is a new headquarters, which is going to be constructed in College Park, Maryland. It also employed similar kinds of ideas about orientation, has big windows facing north, and has lots of louvers which act as light shelves and light reflectors facing south. There is a vegetated roof—a green roof. There are plant materials that, when it rains, the water stays a little bit before it enters the system. It gets cleaned by those materials and then reenters the water table system. But before it does, there is a little spout off one of the roofs that creates a waterfall into our courtyard fountain and charges all the bio-retention swells. These guys are weather guys and they love that sort of thing. You can sit in the atrium and look at the waterfall and the building is shaped like a wave; same idea on a building in Buenos Aires. Now it's a tall building. Because east and west is very difficult for solar orientation this doesn't have an east or a west side. It comes to a point on the east and west. The south side has horizontal light shelves, which is very effective because the sun is very high, actually I should say it is down there so it is the north façade has horizontal light shelves and the south façade is all glass.

We are also talking a lot about wind power and a lot of people say wind power really isn't there yet. It still costs thirty percent or fifty percent more depending on who you talk to. I'm a great believer in demonstration projects. And I put wind power a little bit in that demonstration category.

Solar panel arrays using photo voltaic technology was used fourteen years ago on a building we did for Sun Microsystems—it powered one clock and two light bulbs. And we were really proud of them. We had little plaque saying this clock and two light bulbs were powered by electricity from this photo voltaic array. That led to other projects like it and investment in the photo voltaic sort ideas. Looking at that research, we did a building, completed about a year and half ago, in San Mateo, California. It was a forensics lab and labs are energy hogs. They are energy hogs because you have to have a lot of air going through their ventilation. Eighty percent of the power for this building comes from photo voltaic in the summer time. In the winter time it goes down to sixty-five percent. That is astounding. When we were doing that little clock at Sun Microsystems, we never dreamed that just ten years later we'd be able to do something like that, but it's the demonstration projects and the willingness to get into them that really helps all of those technologies along.

Now, of course, when we are in London we get to spend far more money on these things. In the Darwin Center of the British Museum of Natural History there are little jars of mineral spirits where Darwin had little eye balls and

frogs and all that sort. It was really important to have temperature and humidity control just right. What we were able to do is create a beautiful wall. The architectures expressive of what we are doing from an environmental point of view and from a mechanical engineering point of view. This double wall which both shields the building from the sun light acts as an air cushion. The air moves through that wall in one direction when it is hot and another direction when it is cold, which lowers the energy budget. It keeps the humidity in check and creates not just a wonderful environment for this building that uses less energy, but creates a pretty beautiful curtain wall.

At the Winrock Headquarters in Arkansas, we did a lot with rain harvesting and using the roof for the great capture of water. The architecture is a whole lot more interesting than the days when we were putting domes and hats on buildings and thinking that was just the bees knees, because this is an intrinsic form of design that comes from solving a problem and making a place, which is much better to be in, much better citizen of the environment that it sits within and there just sort of a lot of fun and the right thing to do. Thank you.

PHILIP BRUNER:

Thanks Bill. Our final speaker this morning is George Conniff. He is an engineer by background. He is with the company that is America's largest engineering construction contractor, Bechtel Corporation. He has been involved in developing the information technology and communication business units for Bechtel and just prior to his present position, was in charge of Bechtel's Global Engineering Procurement Function overseeing some 15,000 people. He has had extraordinary global experience and is someone who knows of what he speaks. He has both a degree in Civil Engineering and Master Degree from the Washington State University and is on the University's Engineering Advisory Board.

GEORGE CONNIFF:

Thank you. It's really my honor to be here. I came barging in last night late to the speaker's dinner not knowing quite what to expect. I, however got comfortable very quickly when I discovered that many of the people around the tables had worked on projects with me going back a long way. We also knew a lot of the same people. Many of them were certainly characters. I won't name any names. I also found out that we have been through many cases together. Some of us as adversaries and some of us are allies. So, we had a nice trip going down memory lane, but it also reminded me just how long I've been around!

I am here to discuss significant trends that impact delivery of major projects. As I reflected on this topic and discussed it with my colleagues, a couple of dominant themes begin to bubble up. I call them dominant because I really think they are about survival.

First, the rate of change in the world is accelerating. Second, we have already heard several times today that the world is flat. Friedman defines that as

the playing field is leveling. This flattening results in all types of new competition being created and enables entry of a plethora of new competitors.

This focus on a flattening world and the acceleration of change may be a little bit surprising coming from Bechtel. The construction business is perceived by many as being pretty staid, traditional blue-collar, and a not very high tech industry. I believe strongly, however, that if we don't pay attention to these trends, our future is in certain jeopardy. So I'm going to dwell a little bit on these first two concepts, then bring in some other trends, and finally draw some conclusions from cumulative effect of what I see as the major drivers affecting our industry. I hope you will find this journey interesting. I found that putting this together, trying to prioritize these trends and link them together, was stimulating and a challenge.

The rate of change is increasing. Engineers and physicists would call this phenomenon acceleration. Friedman points out that the factors that picked up the pace came together about the year 2000. There is lots of computing power out there. We talked about the network a lot this morning, but bandwidth is virtually unlimited right now and it's essentially free thanks to the likes of the Global Crossing, MFN, and many others. The protocols and the software—the Microsoft and the Netscapes—let us connect everything to everything and everybody to everybody. What this creates is a world where knowledge is ubiquitous. There's essentially instant communications around the world. There's unprecedented collaboration amongst the most unlikely of players creating new forms of competition, creating new competitors and new sources of supplies. In this environment of ubiquitous knowledge, it is hard to keep a secret and therefore it's very difficult to maintain any type differentiation for any substantial period. People are effectively using this new environment of unlimited bandwidth, ubiquitous information, and the ability to collaborate to do things cheaper, faster, and better.

On to the second major theme: the world is flat. This is a little different take on the pace of change, but, the same drivers that are making the world flat, leveling the playing field, are the same that are picking up the pace. The broadband network, computing power, and the collaborative software are the enablers introducing a whole new set of players. We've got small groups, even individuals entering into the market now who could never have been players before. They are able to do business to business transactions and business to consumer transactions without middlemen that were previously impossible to even contemplate. It is interesting that Wal-Mart makes nothing. They source their material from all over the world, and they manage logistics, and they do it through this magnificent "world is flat system" that exists out there, taking a full advantage of it; making it work for them and using very few middlemen in the process.

In this environment it's very hard to anticipate exactly where the world is headed and to know how to stay ahead of competition. It's hard to really understand where you are going to get bit with the introduction of all these avenues for potential competitors. The players have all this knowledge of what everybody is doing, which helps them kick your behind. I would propose that

if you don't strategically anticipate where they might be headed and tactically address it, you are going to be left in the dust.

Let's go back and forth on these themes for a minute and talk about pace of change again. I want to elaborate on the obvious because I think it's important and powerful. If you accept that the rate of change is increasing, it logically follows that you need to pick up the pace just to stay even. If you are going to get ahead, you have to move faster than the rate of change. I'm going to repeat that. If you are going to get ahead, you have to move faster than the rate of change. I think the rate of change is becoming blistering, so it follows that if you are going to get ahead, you have to really turn up the after-burners. And I think getting ahead is what we all want to do.

From an organizational structure and operational mode, I think those concepts have some pretty significant implications. To survive in this brave new world, you need to embrace change; be receptive to it. Be flexible and above all be adaptable. It's a given that you can't always anticipate and develop perfect strategies in today's dynamic environment and the predictions of your market are often not going to be on target. You can't predict exactly what your competitors are going to do; nor can you know when new competitors are going to enter into the market. Being able to correct and redirect your company quickly is becoming more and more critical. I think this has really powerful implications for large bureaucratic static organizations that resist change. In particular, these companies should take heed because again, this great new world has a real probability of eating their lunch.

So what does all this have to do with trends and project business and companies like Bechtel? For Bechtel, some might feel that we are at a little bit of a disadvantage. We have been around for 108 years. We are pretty traditional company. It's been said by more than some that we are a bit inflexible. It's my way and that's the only way, etc. But I would say that in spite of this we have done an okay job of addressing this flattening world, probably been driven out of necessity and maybe a little bit of genius, probably more of the former. We have been moving fast; taking advantage of the leverage that this flattening world makes available to us.

In the mid 90's, I was in Boston attending a center for telecom management board meeting and there was a keynote speaker there by the name of Chris Meyers, who really had a jump on this accelerating pace trend. I was President of our new telecom business and was trying to build the business from scratch. Frankly, I was struggling with the fact that my strategies were tanking about as fast as I could develop them and my projections of the market were usually off target. So I came back and said: "you know it doesn't do any good to plan for the long term. What we need to do is be flexible, adaptable, try to figure out where the money is going and follow it. So let nimbleness be our by word." We started on a program where we were a little akin to water on a skillet. We started out doing wireless work for Lucent, and we all know where Lucent went. But as Lucent tanked, we noticed that there were a number of young entrepreneurs out there who were out raising billions of dollars to build fiber optic networks on a fairly feeble business plan. I called these plans

"concepts," but they raised a lot of money on concepts. These entrepreneurs needed a reliable company to build fiber optic networks for them. So we did billions of dollars worth of work for the XOs, the Viatels, the MFNs, and the like, and they kept encouraging me to spend more money faster, saying that if I couldn't spend billions annually they would find somebody who could. I kept reassuring them that we were just the company that could do that.

But then Poof: No more, broadband, fiber optic entrepreneurs. You know what happened to Global Crossings and all of the rest. But we had anticipated their downfall to some extent and following the money; transitioned to targeting the traditional telecom companies who had balance sheets and plans to complete the work these failures had left behind. We signed up some national contracts with AT&T Wireless followed by Cingular. Even to this day, those companies provide a revenue stream and are the back bone of Bechtel's telecom business, which, by the way, has been the number one telecom business on ENR's list for many years now. So this strategy of nimbleness and adaptability enabled us to survive the whole dot.com/telecom's crash quite nicely.

Moving to our power and petroleum businesses, in the mid to late 90's, we determined that we could no longer compete by doing our design and engineering in the US with $60/hour help. So we started an office in India, which employs about 1,000 engineers today during work for initially $16/hour. A very competitive strategy consistent with the world is flat principles. But we have now moved way beyond that simple strategy. I think a good example is what we are doing at the Reliance Refinery Phase II, the world's largest refinery. Its schedule is very, very short, and we are designing that project concurrently in seven different offices around the world. I think most of you are familiar with our business, but the network capability, the computer power and the collaborative suite of software it takes to do this effectively are the kinds of products that are making the world level and creating real differentiation for us in terms of delivering our services with a shorter schedule and lower costs. Probably most importantly, this approach enables us to obtain enough scarce resources from around the world to do what historically would have been impossible to coordinate. In today's world, resources from around the world can work on the same design models and computer files simultaneously. This approach is the only way we could have addressed such a massive project. But you can't just rest on that capability and say your set for a while. Our India office, for example, is seeing 16-20 percent wage escalation per year. The differential wage rate advantage there is disappearing. So we have already moved on, opened offices in China and actively seeking lower cost design offices in various other places in the Pacific Rim. We have to expand that design concept model now. We are moving from doing work in seven different offices to doing work around the clock—24/7. It's around the clock, around the world. This gives us a significant schedule advantage in terms of the tremendous pressure that's on us to deliver projects more quickly and that schedule advantage is a very significant differentiator.

Moving to the material side: We are buying steel in China for delivery in the US for about $1,500 a ton. Trying to buy here in the USA now costs us about $4,000 a ton, primarily because the shops are full. One project, the Elm

Road Power Project, in Wisconsin, uses 30,000 tons of steel. At $2,500/ton differential times 30,000 tons results in an additional cost of $75 million for U.S. steel, so that our competitiveness is significantly enhanced by being able to source steel internationally.

So to be able to compete, we need to source material from around the world. We need instantaneous information on price; on shop availability; on quality of the supplier; on the freight costs; and on the delivery times. It's only possible to track all these issues through use of this grand network and the rest of the enabling system that is leveling the playing field.

Now let me talk a little bit about pace and the fact that it's increasing. We built a Motorola plant on which I was the manager in Tianjin. A very sophisticated plant—had to be highly reliable and Motorola insisted that all of the sophisticated parts for that plant be sourced out of the USA. In the three to four years that it took us to build that plant China had come so far in their quality program that for the second unit, if it had been built, Motorola was willing to source their rotating parts: their compressors, their valves, their diesel generators, etc. from China. So that's what's next for us. It's moving from steel, to valves, to diesel generators, to compressors, to pumps, and I think it will eventually move to steam turbine generators and even more sophisticated parts to the point we are sourcing the whole system internationally. The Chinese are learning how to do this at a faster and faster rate. It is scary and has some very significant implications to our economy in the US on top of the impact on the construction industry.

I'd like to talk about six sigma for a minute in terms of a thing that we have done in Bechtel to drive our pace more rapidly. We adapted Six Sigma to a services business—the construction services business specifically. Six sigma is usually thought of by most as a program that is designed to reduce defects in a manufacturing environment. But for us it's providing an extremely structured way to map our processes. We have mapped many thousands or work processes. Anne Marie talked about horizontal versus vertical work processes this morning. We are mapping these processes, not vertically, but horizontally to deal with the interfaces between engineering, procurement, construction, and our vendors. This process mapping smoothes those out, simplifies them, and expedites them. In the seven years that we have employed this program, we have saved ourselves and our customers literally billions of dollars. Each improvement doesn't have to be massive. When I was in the Telecom's business, we were building up to 10,000 cell sites a year. If we could save $1,000 a site on 10,000 sites that put ten million dollars in our pocket. It's those kinds of incremental continuous improvements that add up to make a huge difference. Six sigma drives continuous improvement; it's a very good way to embrace, rather than resist change. The Six Sigma process includes an excellent mechanism for locking in those changes, not only for what you're doing now, but pushing it forward and institutionalizing it for all who follow. I think the Six Sigma approach is unique for Bechtel amongst the EPC competitors. It's a relentless search for defects, waste, and rework and the interesting thing about it is we have now got it permeated from the top to the bottom of our organization around the world. Saves time, cost, and money, but mostly of all

it forces us to move fast and keep changing, which is in line with move faster than the rate of change; the principles I am discussing here.

By these few examples, I think you can see that we are attempting to embrace and leverage the capabilities of this flat world and to move ever faster. I'd like now is to move on to other trends. Alan covered a lot of the trends that we see in the business, but I am going to highlight and focus on a few.

First of all, we see more projects and more big projects than for many, many years. This has been alluded to in a number of ways this morning. Maybe not since the nuclear business have we seen such a trend and that era was a series of power plants that were being built primarily in the US. We now see projects in all of our businesses, a lot more of them and a lot larger, and we see this sustaining itself for at least ten years looking forward and it's now pretty much worldwide. Some of the drivers of this plethora of projects have been mentioned, but I'll mention a few more.

I think China is a big driver. They were a big exporter and now they are becoming a huge consumer. Their consumption is requiring them to seek resources from all over the world—gas, oil, commodities. And they are taxing the world's ability to supply that in terms of the demand/supply curves. They need material for the products they are making. And they need material for the factories they are building. And they need material for the utilities needed to drive their economy and that growth.

Secondly, I think that there is a huge effort to seek an alternative to oil particularly Mideast oil. So we are going to see revitalization of nuclear. China's got a huge number of nuclear power plants planned. We are seeing a lot of coal being deployed in the US and around the world. We are seeing additional exploration for oil that's going to drive pipeline work. The high cost of natural gas is another driver. It's also driving coal, nuclear, and LNG plants. And there is a very, very high level of profits being experienced by the oil companies and they are reinvesting those profits in capital projects, principally refineries, and we will see this level of cap expenditures continuing for quite some time. I think long term global warming's been mentioned; we feel ultimately that global warming is going to drive ocean side cities to create sea barriers and other protective dikes etc. Global Warming will ultimately be a big factor in driving capital projects.

In the US we are seeing a large number of coal plants being built and planned to be built. There are multiple refineries under construction and planned. There is LNG receiving terminals being built, and we see the nuclear power, which has been mentioned, in no less than four to five years. Internationally it's the whole gamut of things. We see refineries, LNG plants, some of them in ungodly remote places, but nevertheless attractive financially. The pay back on them is so short that they are going to be built. The five billion dollar LNG plant has a 1½ year pay back. It's unbelievable. China will build twenty to forty nuclear power plants. Forty is the number that you usually hear. A lot of pipeline work planned around the world. And a lot of mining units, aluminum, copper, and nickel will be contracted.

So what does this all mean? How is it going to manifest itself in the project builder world? Well let me tell you what I think the really big trends are. We are going to have an extreme shortage of people. We are already well down that road. It's going to be worldwide. There is going to be tremendous shortage of craftsman. It's going to be difficult to get the people to do the work. We are going to have a tremendous shortage of design engineers and non-manual people to design and oversee the work. Just as one example, we now have a significant amount of work booked in the Ohio Valley and Texas area. That work alone, given that Katrina put us in the hole to start with, is going to create a 20,000 person shortage in craftsman above and beyond what's available. We have looked at the work our competitors have booked, and we feel they are going to be about 20,000 people short in the craftsman they need. That is 40,000 craftsmen that we need to do the work just in that small area in the US. That's going to require 8,000 non-manual field engineering types to support the work at the job site and thousands and thousands of engineers. This imbalance in supply and demand is going to drive wages up. We are going to have to pay tremendous incentives. We are going to have to up the per diems. That's a given. But we are very concerned about competencies, about the availability of the craftsman, how well they are trained; what's going to happen to schedules. What's going to happen to quality in that environment?

Internationally we have the same issues. We are already having to hire non-manual other company nationals out of the Philippines, Egypt, Lebanon, Poland, and elsewhere and train them to do our non-manual work internationally. And we are recruiting heavily for craftsman out of the Philippines, India, and so far doing okay there, but the system is beginning to get strained and our competitors can't find the people to do the work. We are doing some work on Sacklin Island with Enka, a joint venture partner. They have always supplied Turks to do the work. It's been their job. They have never failed. They can no longer get enough Turks to go to Sacklin Island to do the work. For the first time, we are supplementing their efforts with Philippines and trying to staff the work.

How important is this? Our number one corporate initiative is people. We had our annual global business meeting, assembling all our key managers, vice presidents, principle vice presidents around the world and the whole three day seminar was focused on one issue—people. Adrian Zaccaria, our President, assigned a special team and they are developing a massive program to recruit, develop and retain people—certainly our number one issue.

Another impacting trend of significance is volatility of commodity pricing. It's all about supply and demand. Since '04 copper has gone up from $1.15 a pound to about $3.50 today and is stabilizing around that number. Nickel is 2x. It went from $6.50/lb in 2004 to $13/lb today. Stainless steel plate in 2003 was about $2,000 a metric ton and it's $5-$6 000/metric ton today—3x. These are exacerbating the challenges of labor and material I just discussed.

I want to introduce still one more important trend. Our customer's are aggressively trying to pass additional risks to us as contractors. More and more lump sum, which is fine, but the terms and conditions make us nervous. We

see many customer's trying to say there will be no, or very limited liability caps, no indemnifications. Everybody is liable down to every craftsman on the job. No waiver of consequential damages. Typical owner risks such as property damage are being pushed down to us rather than owner's taking them. Willful misconduct and negligence terms are onerous. We are being asked to accept significant LD's with no offsetting opportunities for incentives. So we are aggressively, and hopefully, trying to deal with these issues to keep the risk reward equation in balance. Trying to offset LDs with incentives, for example, in a lump sum environment; carve out labor wage rates and productivity from risks we take as contractors in this uncertain environment; and pushing risks back to the owner. We are telling owners that they have to take wage risks; have to take per diem risks, even have to take productivity risks. We also are trying to tie material escalation clauses to indices to give some protection in this highly volatile commodity environment.

Finally, quite frankly we are walking more and more to avoid risks when we can't come to terms. It's not worth it to have a bad job. One bad job taking these risks is worth several good ones. In some instances, you are going to risk the company, and we just won't do that. Besides that, these issues take too much management time and effort and have reputation risks when jobs tank or we get into lawsuits. So saying no thank you is a more and more frequent thing that we are doing.

We are also focusing on initiatives to try to reduce these labor and material risks. Things like modularization, where we try to build major components in factories or low cost places where there is low cost of labor, and we can bring large pieces in truck or barge or train. We are also focusing on training. Upgrade our supervision and craft capability try to improve productivity. We are using all of the advance construction techniques that we can think of and enhanced design software. RFIDs so the material tells us where it is at and we can find it. Improve integration of software so we can work better together horizontally. Automatic welding, digital radiography—all of those things are being applied to try to address these risks. We are even going down to the point where instead of trying to weld pipe, we are buying more screwed pipe and bending pipe just so we can reduce the number of welders. We pulled out all stops to try to address these problems. So there is a mixed bag. There are lots of projects but there are a lot more risk, and a lot of competitors.

The one thing that scares me the most is that the Chinese are coming on strong and learning fast. Remember the world is now flat and there is ubiquitous knowledge. There are no secrets, and these guys are eager and hungry. So if you look at that top international contractor list, there are like twenty Chinese companies on it and it grows every year. And there are the Japanese, the Koreans, the Spanish, the French, the Italians, and the Germans and on and on the list goes. So what conclusions can we draw from the environment that I have described? I don't mean to be a pessimist, but I think we are going to see many companies struggle, and I think we are probably going to see some failures. I don't think they are going to anticipate and cover the risk. I think companies are going to accept the bad terms and conditions being pushed down by the owner and/or they will fail to recognize the world is flat

and that they will not leverage the resources and the technical capabilities the flat world can offer them. Many will move too slowly. That will ensure their downfall.

So we at Bechtel are doing quite a bit to develop an environment for change. I think I have given you enough examples for you see that we are trying to leverage the world is flat principles to our advantage, but this is a world that's moving very fast and frankly, I worry about us in terms of whether we are really on top of this and doing all we should to make sure we are around for another 108 years. We will continue to reinforce what we need to do, and I hope that some of you will do the same, but my final words of advice would be to kick in the after-burner.

Thank you very much for your "paying attention" and good luck out there in this brand new world.

PHILIP BRUNER:

Thank you very much George. It is now time for our engagement. We have an extraordinary panel. I'd like to ask George a question about mergers and acquisitions. Usually people want to enter different markets in other parts of the world by using acquired companies or maybe starting out in a joint venture. How should American companies go forward if they are seeking international capabilities in the global engineering and construction business?

GEORGE CONNIFF:

In general, from our perspective, joint ventures are fraught with risk. You have to have the right partners as you are usually in a JV with joint and several liability. Working in a JV is complex because you have operational differences in terms of how you approach projects. The advantages you get from using your own proprietary integrated software are often lost with a joint venture partner. We find that all too often, these relationships go sour over time. There are times when there is considerable compatibility and synergy between you and the joint venture partner and it does make sense. We enter these relationships with extreme caution, trying to anticipate the downside, and make sure we address them up front. We do them when we don't have the resources, technical capability, or local relationships to go it alone. It is sometimes worth trying to make it work.

PHILIP BRUNER:

With regard to outsourcing engineering capabilities or architectural design, Bill, does HOK engage in that?

WILLIAM HELLMUTH:

That is a good a question. Much of the outsourcing we have done, and we have found it to be pretty effective, is with our other offices. For example we have an office in Mexico City that has a different cost structure that we are able to work within. We are finding that it is more beneficial to us in terms of quality to keep our design work within the HOK culture. There are shared values, shared detail assistance, and so forth that allow us to maintain better

quality. We have tried some traditional out sourcing, and it has not been as good, although we can get great very inexpensive, very quick architectural models out of China. It's certainly amazing what we can get from there.

AUDIENCE:

I am Richard Newton, the Dean of Engineering at UC Berkeley. I had a question for Anne-Marie. You talked about all these informal networks which we see emerging across the spectrum. One constituency that seemed to me that you left out was civil society as an informal network and as a kind of respondent to a lot of what is happening. I am wondering what you think about that? Alan mentioned the attempts that BP was making with their pipeline activity to engage with, not only the governments, but also the various participants in the project to mitigate the potential risk that is going to come back from civil society in general. I think we see a lot more on the Internet with a lot more transparent information out there. We see a lot more constituencies getting together, self organizing, and making potential difficulties for some of these projects.

PHILIP BRUNER:

So what about civil society as a player in this in a self organized way?

DEAN ANNE-MARIE SLAUGHTER:

Thank you. I thought you were going to say that the actors I left out were educational institutions. Because one of the things that is very striking, if you look at all of these networks, is that you are still seeing the same density of networks of educational institutions. That is in part because we can't figure out whom to network with. But on civil society, let me say that that is what I meant when I said NGOs—non-governmental organizations.

AUDIENCE:

But NGOs are not synonymous with civil society. They are very different. They have their own kind of whole community thing going. I am talking more about grass roots things. The Sunshine Foundation and other groups like that are building up from the bottom and are populated by the general public; not necessarily by some kind of organizational high rocket structure.

DEAN ANNE-MARIE SLAUGHTER:

No, that is very important and you are absolutely right. You are seeing the growth of those networks, either the social networks for any of you who have children on Myspace and increasingly networks of people who are interested in the same issue coming up from the bottom. I would say borrowing George's point, that it is changing fast and growing faster than you can get a handle on it. The focus of my argument is to distinguish government networks from larger civil society networks. In around 2000, the Secretary General of the UN started talking about organizing global governance in terms of broad policy networks. What he meant was anybody who was interested in a particular policy area—for example global warming—would be linked into the

network. So you would have scientists, corporations, architects, civic groups, and environmentalist groups of all different kinds all connected together with national and international government officials. I look at that, and it worries me, because I don't see anybody who's directly accountable.

I am all for civil society, but sometimes, as one of my colleagues once put it, you don't necessarily want the person who is most fanatic about something making the decision. What we expect out of our government are people who will balance the interests; who will consider the environmental interests, commercial interests, and the larger social interests. So what I argue is that the government networks ought to be the spine of these larger civil society and corporate networks.

If you recognize the value of government networks and you harness them, then you can say to all these civil society networks: "look, it's great you are energized about this—just like the commission that Alan was talking about—we want to harness you and work with you, but you really ought to be connecting up to some network that we have some control over." Government officials are directly accountable for how they make decisions, and that to me is a more positive networked model than the sort of amorphous network where everyone can hook on. You have to use the government network as a tool and as a specific element of larger networks.

AUDIENCE:

I am a lawyer, and I represent contractors who sell steel in competition with China. I had a question for Bill and George. Obviously, both of you are doing work on an international basis, and I wonder if you could comment to the extent to which you are making use of some of these networks and NGOs that Alan and Anne-Marie talked about?

WILLIAM HELLMUTH:

I think it makes a lot of sense, and they do help and will help in the future. It is a complex world and those organizations will help. And we will utilize them.

AUDIENCE:

We are all talking about how the world is flat. I was at a Ramadan dinner. I was invited. I was a little apprehensive. I had never been to one of these dinners before. It was a big honor for me to go there, and I thought it was going to be just awful because there would be all these people that I had nothing in common with. And I walked into the room and, just like when you walked into the room last night at our dinner, it was amazing that most of the people in that room had some common experience with me or knew someone in common with me or knew, either through real estate or through building or through some other connection, someone that I knew, and that sort of network on just a human level. Figuring out that we all had some basis of understanding. There is a lot we didn't understand, but there was a basic connection that as you move through you can be half way around the world, and we are still connected. And those networks are probably more powerful than we can

imagine in terms of leading the projects; in terms of problem solving; in terms of how you deal with a problem you run into and get through it.

AUDIENCE:

I am the Director of the Construction Industry Institute at the University of Texas. I have a question which I think applies to all of you. And this is sort of a macro question. When I came up through the military I spent a lot of time in Europe and dealt a lot with the NATO nations. During that time period, everyone knew that the American military and the American business were the big dogs on the street. But we spent a lot of time working with all of our allies to find common purposes, common procedures. With the fall of the Soviet Union in 1989 and the fall of the Berlin wall there was a lot of discussion about how everything would change in the new dawn, a new era. But then of course we saw in 2003 with the War in Iraq that the moral leadership of the United States seems to have diminished in world's view. So, as we have developed what might be seen as a unilateral foreign policy, it strikes me that it has a lot of impact on what we do internationally, with the moral leadership of the United States being diminished. It certainly seems to be a trend that the world looks at us now a little differently post-2003 than they did before then. And that moral leadership being diminished seems to have implications across the board, both in terms of how we network horizontally and vertically and in terms of our corporate relations; in terms of our corporate opportunities world wide as we talk about other firms. Other countries now look a little differently at U.S. firms and how we operate. So my question really is this: given this change and dimensional opportunities, what should we be doing? Do we need to operate a differently than we have in the past?

PHILIP BRUNER:

Well do we start with our diplomat, current ambassador?

AMBASSADOR ALAN LARSON:

Big question, very good question. First, I think it's important to recognize that in many places in the world today, they will say "America go home and take me with you." There is still an attraction for the American experience and idea, for Americans as individuals, and frankly for the desire to get Visas and be able to come and visit the United States. That is an interesting dilemma.

Second, there has been no time that I can think of where there is a greater need for the types of informal cross-the-nation networks of the type that Anne-Marie was talking about and beyond even what she was talking about. The most discouraging meeting I ever had in the State Department was when about eight or nine Arab people, roughly my age, said: "Over the years we have studied in the United States. We have lived with you. We have worked with you. We understand you. There are some times we really get irritated with what you do, your policy, but for us there is a reservoir of trust and good will, because we know who you are and we know what drives you. Our kids don't have that, because, either they can't get into the United States and go to school or they don't want to." And that is I think part of what we have to

deal with as Americans. Our government has a role to play through the type of work that Karen Hughes is doing, but frankly the most effective things are going to be the people to people contact.

DEAN ANNE-MARIE SLAUGHTER:

I could spend another hour on this, but I won't. I think you are touching on an absolutely key issue for not only our government, but for all American leaders. And I would have said as Alan did—three or four years ago—that it was our policies rather than our values. I would still say that, but every time I travel now, I am listening. I was in Berlin yesterday and was told "look you are talking about finding a better way to express American values, but you don't realize how much capital you have lost." We are really now in a situation, as Alan said, where young Koreans are going to be educated increasingly in China. And similarly in my business, I am looking at all the European schools who figured out that they can teach in English too. We are seeing a lot of Middle East kids go to Oxford or Cambridge or now Science Po or the Hertie School in Berlin. So we are beginning to lose the one thing that I think many of us absolutely took for granted: that people would want to be educated here.

I think part of the response is to think about how we lead and to lead horizontally in the same ways that all of you do through these networks, which means leading more from the middle than from the front. It's not about announcing what we want to have happen. It's about linking people up and working with them and deploying all our competence and our energy and frankly our adaptability and our flexibility to bring others together so that we are conveners and collaborators and facilitators. We will then still get outcomes that are much more in our interest than the outcomes we are getting when we try to dictate from the top and create a backlash.

The last thing I'll say is that for the last 2½ years Princeton has brought together almost 400 people on a national security project under the honorary leadership of George Shultz and Tony Lake. I'll make the project report available for anybody interested. But what we argue is we need a new set of institutions, ones that are much more flexible. Our national security strategy should look a lot more like what George was saying Bechtel's strategy has to look like, which is that we figure out how to adapt to change through the government, rather than prioritizing threats. So for anybody interested in national security reading, I am happy to provide a copy of our Report.

PHILIP BRUNER:

Let me ask our two international designer and construction colleagues here to address the issue. Have they been told "American go home?"

WILLIAM HELLMUTH:

Well actually no. If you are an American firm with three initials and fly many places that is like having a calling card for doing business. They love the people, dislike our politics. That's what you get over and over and over. But you both just talked about getting more people to come over here to school.

We are an isolationist country. We have an ocean on both sides. Our kids don't get out. We can't be the conquering hero any more where everyone has to come to us. We have got to send our kids out. We have got to send them into situations where they can understand that there is a point of view—a good point of view, a moral point of view—that is different than our point of view. They don't get enough of that. If you are a European county you at least can cross a border and find yourself where they speak another language and you have to figure out how to adapt. You don't have to travel that far. We have to cross an ocean for that to happen. So we really need to focus on how we get our kids educated over there and over there could be anywhere.

GEORGE CONNIFF:

I think we as construction companies are looked at as different from government. For a while, our long relationships will sustain us. We are welcome. They know what we can do. They know who we are. But when we as a government don't let people into the U.S. without extraordinary efforts to get Visas, and we won't let them come to get an education, we create a lot of resentment. We also make them provide a level of security for us when we work in their countries far beyond what they provide for anyone else. I think that, with these types of issues, even our relationships will begin to deteriorate. We can't do these things and maintain our capacity to be welcomed. The amount of work we will do there will begin to diminish. I agree with Bill totally. We have got to get out of this isolation, this shell, because we as Americans have no idea what is going on in the world and how to manage these issues. We have got to fix that. We cannot sustain our position in the world, even in our business, without enacting some changes. It is okay for now, but a lot of our relationships are strained.

AUDIENCE:

I have a question for Alan. Alan you talked about the World Bank and their concern with bribery and corruption. As we know they have just come out with a statement that says zero tolerance. My question to you is your response to that statement that has just come out. And specifically since this is an engineering and construction congress here today and we are talking about global engineering and its impact on infrastructure and the fact that we are losing billions of dollars a year due to our refusal to engage in to bribery and corruption. I wonder if you could comment on the recent response that DFID has made to the World Bank in that they don't accept the zero tolerance statement. And what is your response to that in the global engineering and construction arena?

AMBASSADOR ALAN LARSON:

When I worked in government we had a lot of deep conversations with the British about development and development assistance and for the most part we agreed. We had many common interests. We were serious about it. We at least wanted to have this produce results. I think where there has been a big separation between traditional American thinking and more recent thinking is

that we have gone in a direction where we want to demonstrate that these are investments and that you are getting a return and therefore the United States launched something called the Millennium Challenge Account. There is lots of focus on how do you get in—very selective. There is a focus on corruption. If you don't have a credible anti-corruption policy you simply aren't going to participate in the program. There is a revolutionary idea for my colleagues at the State Department: "you mean we can't have political factors determine who gets the money." No. And we stuck to that. The British on the other hand have had a tendency to think that developmental assistance is great, but we should just give them the money and they will use it more effectively than we can. So a lot of this resistance to the World Bank anti-corruption focus, in my judgment, is based on this philosophical difference between "do you just give them the money" or do you try to shape and structure something that you think you have some expertise. I disagree with the different approach but I understand these roots that it has.

I think the test of whether the World Bank fight over this issue, because it has been a fight, ends up being a productive fight, a fight worth having, will be whether the World Bank can integrate into its lending programs approaches that go beyond cops and robbers. They have a group called the integrity group, which seems to be designed to go and track down instances of corruption after they happen. Then you can look at debarment of suppliers. They have the voluntary disclosure programs so that if you think something went wrong somewhere among one of your employees on a World Bank project, you can take the initiative and disclose it and maybe you will get a certain amount of grace for the commitment to take steps to remediate the problem. I think it has to go way, way beyond that so that the anti-corruption focus of the bank is built into the way that they do business. They are looking harder at the outset to see that the companies that they want to do business with have made serious bona fide efforts to have integrity and compliance program incorporate level. This doesn't mean that something bad won't happen at some later point. Systems aren't perfect and people aren't perfect, but it seems to me the way you tackle a problem is to be more proactive rather than to have a strong stick or a strong rule to hit the fingers when the kids misbehave.

AUDIENCE:

I practice law in Washington DC mostly in government contracts and construction. I wanted to pickup on George's comments about risk shifting and negotiating contracts and focus on the public owner for a minute and ask you and Bill and others whether or not you think the public owners have gone far enough in changing their methods of procurement. For example, the use of design build or the use of public/private partnerships or through negotiating construction contracts through best value notions. Have they gone far enough to allow contractors to bid on some of these jobs that you identify as problematic because of the risk shifting? I mean in resolving disputes I think many in this room probably find that some of the worst jobs we see are those that are let to the low bidder through seal bidding by public owners.

GEORGE CONNIFF:

You know I'm not real close to our government business, but we are seeing more and more use of public/private partnerships. I think it is a positive direction. We see evidence of not awarding to the low bidder and getting some credit for value added and ability to meet schedule and some credit for having a track record of delivering certainty, etc. Bid tabs are getting more comprehensive, enabling the weighting of these less tangible issues in the evaluation. But I still think it is a fairly structured environment, and I'm not confident that the best suited contractor always wins the work, as there still is a predominance of low bid mentality. It is almost always perceived as the safest way to award.

PHILIP BRUNER:

Let me call on one of our audience who now is in the private sector but in his prior life he was Rear Admiral and Commander of the Naval Facilities Engineering Command and was head of construction in Iraq. Would you comment on this question?

AUDIENCE:

As a former senior naval officer, my sense is that the government is moving along very nicely, and it is very hard to change the government but it has changed a lot over the recent times. I know that when I was involved, it was very difficult to come up with best value and design-build because of the traditional perception that you always got the best if it was the cheapest. I think you are seeing the United States government, particularly DOD, moving ahead very, very rapidly, and I think they are to be encouraged. And I think in some ways, they lead the private sector in terms of being willing to take a risk.

I was going to try to answer a little bit of what the private sector is doing better than the government, maybe what the government is doing better than the private sector. I get involved in a lot of the design-build for the government projects. The ones actually most interesting are those where you know what the monetary answer is going into it. There is a stated rent or there is a stated price and the design-build team comes up with the best building. We have done a number of projects under that and you get the most innovation in a competition format for how you get the very best building and the very best environment for the government employees out of a given amount of dollars. It doesn't ever give you the rock bottom. You can always take any project and skim it further, but that one of all the different formats, and I've worked in all of them, is the one that has born the most fruit. What the private sector is doing that the government can't do is to pull in the contractor at the very beginning. They are part of the process. They do sort of open bid at the end, and it involves something called trust, which is something government can't do. I understand why government can't do it because of all the regulations, but that trust between a contractor and an owner and the architect is in there somewhere can produce some pretty terrific results for less amount of fee dollars or construction dollars and so forth. And in that really ends up becoming the delivery method of choice in the developing community.

AUDIENCE:

I am a construction lawyer from New Jersey. I was listening to your comments, particularly George's about moving faster than the rate of change. And I think a lot of companies are trying to do that, but at the same time I also heard your comments Bill, and I saw your visuals of a lot of these exciting projects that are moving very quickly towards whatever the new order is going to be in building. We see as construction lawyers lots of projects where things go bad. And I am wondering if the speed to which we are trying to beat the rate of change is resulting in us going good in some directions, mainly moving towards greener buildings and the like, but at the same time moving in a bad direction in terms of quality. It seems as though, to many of us, we are dealing with buildings that are being built for the first time, something new, never been done before. That the rate of change, specifically the rate of design change, is not keeping the quality up to the quality it used to be on the traditional buildings. And that the contractors—because of the lack of people or perhaps because a lot of the people who have been doing the work for many years are now retiring and the new crop is lacks the knowledge or dedication of the older crop—are finding it difficult to adhere to the quality standards that we use to see at traditional brick and water type of masonry construction. How do we reconcile moving forward so fast at the same time that we seem to be getting pulled back by quality issues and issues of lack of adequate personnel?

WILLIAM HELLMUTH:

Lou Conn, who was a pretty terrific architect, said in each building you do one new thing. And I think you will find in most of the buildings that I showed you each of them did one new thing, not five new things. And if you stick to that as a policy—you can break it to maybe two new things—it becomes something that you can build off of your best practices. You can learn from the mistakes, and we have all made mistakes, but you don't change everything. In fact, on most of the projects that I showed you everything was not changed. They were either made out of stock parts or whatever, but if each one is taking one major new thing and moving it towards the advancement of sustainable goals some other architectural goals that is a terrific way to proceed.

GEORGE CONNIFF:

I think you have to be very careful in terms of what you pick as a target for introducing change and not bite off too much or, if you do take a big bite; you have to invest in managing it well. This will avoid chaos. You have to introduce many of these changes in a disciplined pre-programmed way. For example, the first batch of steel we ordered from China was for Elm Road—33,000 tons. We spent 2½ million dollars on a quality program there to make sure that the steel was manufactured and fabricated to meet our specs. We started with the shops that were supplying the raw steel and made sure their processes were in place. Then we monitored the fabrication and shipping processes. We saved a lot of money, but we invested to ensure that we got the right outcome and if we had not, we would have suffered dire consequences.

A lot of the things we do, when we are trying to take advantage and leverage this flat world, are to make sure that the standards, the procedures, processes, and divisions of responsibilities are well defined before we end up in chaos. So the pace of change has to be managed to achieve these advantages. The approach has to be well structured, otherwise it creates disasters. We have seen our competitors fail miserably by not making those investments or anticipating those problems. So you can't go to fast and get ahead of yourself without thinking all those things through. You are exactly right.

PHILIP BRUNER:

We clearly owe a great debt of gratitude to these four extraordinary people who have shared their time with us this morning. Thank you!

The Strategic Global Road Map

Thomas P. M. Barnett, Senior Managing Director, Enterra Solutions LLC, Vienna, VA

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PHILIP BRUNER:

Our keynote luncheon speaker, Tom Barnett, is well known as a strategic planner. He has written highly recommended books entitled *The Pentagon's New Map* and *War And Peace in the 21st Century: A Blueprint for Action*. He has been a strategic planner for the Department of Defense and other government agencies for at least fifteen years. He has been a Professor at the Naval War College. He is currently a Baker Center Distinguished Scholar at the University of Tennessee's Howard Baker Center for Public Policy. His education includes a Ph.D. in International Relations and Political Science from Harvard University. US News and World Reports' Michael Barone described Tom as one of the most important strategic thinkers of our time. On top of that, the Washington Post's David Ignatius has cited him as a combination "Tom Friedman on globalization and Carl Von Klauswitz on war." Please welcome Tom Barnett.

THOMAS BARNETT:

It's a pleasure to be here. I had a chance to speak at the Woodrow Wilson School a couple of years back, and it is great to return. It is always great to talk to a crowd of engineers, lawyers, and business executives.

I am going to give you a brief overview of my first book, The Pentagon's New Map, which really was sort of a memoir of a couple of years I spent working in the Office of Secretary of Defense under Art Sebrowski, who headed up an office called the Office of Force Transformation. It was created under Secretary Rumsfeld to look at the future of world conflict and to ask the question of how should we change the force structure of the U.S. military, it's organized in terms of divisions, all that kind of stuff for the future of warfare.

My second book, *Blueprint for Action*, came out about a year ago and really drills down to the level of nation states and becomes prescriptive; institutions and relationships that need to be built between nations. I also am going to give you a brief argument on something we call Development in a Box. It's something I am working on in my current incarnation as a Senior Manag-

ing Director of Enterra Solutions. By looking at how we get better at creating operable interfaces focused on information technology between countries post-war, post-conflict, post-disaster, and the outside global economy. It is not something we are particularly good at. We do not get the private sector involved in reconstruction very effectively. And the sad thing is you put the U.S. military, which has no business acumen, together with the U.S. Agency for International Development, which has no business acumen, in order to try to build an economy.

So, let's discuss the Map. I'm going to give you a sense of where I think my books lay in terms of the big debates across the 1990s. Berlin Wall comes down in 1989 with seemingly everybody on a new page. Francis Fukuyama's brilliant book, The End of History and the Last Man, asked the essential post cold war question: "After ideology what are we going to fight over?" Not too many people actually read this book because they can't get past the title. If you did, you discovered his answer at the end was a really good one. It's not going to be fighting over stuff, its going to be wars of identity. He called them "wars of spirit."

One of the first guys to try to answer that question was my old professor at Harvard, Sam Huntington. Sam's view of human history gets increasingly darker as he gets older. His basic take is that people got together and then they learned how to make war. They got organized into bigger packages and made bigger wars. So at the end of the Cold War he saw just a bigger package of further iteration of this process of integration and even more intractable conflicts on that basis. So he gave us a point to debate. That debate was joined most famously by Tom Friedman, New York Times columnist.

Friedman, if I can summarize his book, Lexus in the Olive Tree, says this about globalization—some people get it, some people don't, very soon everybody will be forced to. If you have taken a course on Marxism you should recognize this. This is basically Marx on steroids. And if you read The World is Flat, he is still hard charging on that subject.

Sam has a much darker view on globalization, some people get it, some people will never get it because they lack the democracy gene, they lack the market gene, just never is going to happen. That is the basis of your intractable conflict.

What I tried to do in my books was basically to add the third leg to this stool to give you a sense of space. You get the economic determinism from Friedman, you get the social Darwinism from Sam, what you get from me is the political-military implications of that yin yang like struggle. Globalization is not a binary outcome. It disintegrates and integrates everywhere it goes. My description of globalization is that some have it now and some don't, but the spread isn't inevitable, it can be stopped, it was stopped at the Berlin Wall for fifty years. We can map the process of that spread, which tends to occur in spasms. I'm going to show you a map that I think describes the frontiers of globalization today. I'm going to tell you where conflict is going.

Here is the map we drew up for Esquire, March 2003. About 150 times we sent U.S. military forces abroad since the end of the Cold War. All I do is

draw a line around 95 percent of it. My argument is that you are looking at the frontier of globalization. On the outside of this line is the functioning core, not just North America, Europe, and Japan, but the New East (3,000,000,000 people in Russia and China), South Africa and the ADC countries, Argentina, Brazil, Chile—roughly two-thirds of humanity, 90 percent of the global GDT. Internal rule sets cause these countries increasingly to synchronize with an emerging global rule set, which I shorthand as free trade, free markets, collective security, transparency. I do not include the term "democracy." Why? Most states when they globalize rapidly do so as single party states. That's how Mexico accomplished it for decades. That's how South Korea pulled it off, that's how Japan pulled it off, that's how Singapore still pulls it off, and China will do it for many years more.

The chunk in the middle—inside the line—I call the "non-integrating gap." How do you measure positively in a global economy? It is thinner inside this shape, thicker around the outside—foreign directed investment, goods, services, shirking of DNA research, however you want to measure it, and it is thinner inside that shape. In some cases, I think you can shrink this map. Sometimes it will take the use of military force. The Balkans were shrunk and integrated through a painful process across the late 1990s. We were told they would be fighting there forever—that's how Bob Kaplan scared Clinton from going in there for a long time. These people will fight forever and yet ten years later we have the remnants of Yugoslavia in a contest to see who can join the EU faster, who can integrate with NATO faster.

I spoke at a conference in Dubrovnik, Croatia, in June. I sat at a table with the seven prime ministers of the surviving countries and surrounding countries, and I saw all of them stand up one by one and brag they were going to be the best EU member, they were going to be the best NATO ally, and the president of Albania stood up and said: "I want to make Albania the most attractive target for foreign directed investment in the world." Okay, this is ten years later, after the Dayton Peace Accords, so this gap I described can be shrunk, but it will take military power on occasion.

Here is the mantra from my first book: Disconnectedness Defines Danger. Show me a part of the world that is less connected and inside this shape. Since the end of the Cold War, inside the non-integrating gap have been all the wars, all the civil wars, all the ethnic cleansing, all the genocide, all the mass rape as a tool of terror, all the children lured or forced into combat activity, all the UN peace keeping missions, all eight (I count Iraq as three, one good, one bad, one ugly) U.S. nation building missions, plus ninety-five percent of the terrorism since the end of the cold war. People subscribe to this picture because it matches their career experience.

Here is a typical presentation from the Office of the Secretary of Defense. I like to call it the Arc of Instability, but it is a familiar shape. Here is the new national military strategy, comes out of the Canadians, sort of the cool Americans. Same basic picture, I like their term for it better. Now why is it that Canada found they went all the same places the Americans went? No surprise.

I argue for a national strategy out of this picture with three prongs. First, you have got to work across the entire core to improve its ability to withstand and mitigate shocks to the system, like 911, like avian flu. My definition of crisis in a connected world is a vertical shock to a horizontally connected system. You can't stop vertical shocks; God will deliver most of them. You've got to get good at resilience, keeping things moving, because most people's definition of crisis is stuff is not moving, people are not moving, goods are not moving, electricity is not moving.

Second, we are going to have to firewall off the core from the gap's worst exports. No surprise what those are: the list is headed by pandemics, narcotics, and terror. You are watching this right now on avian flu.

Third, most controversial, you have got to shrink the gap by exporting security to the worst situations. My argument is that you will need two different forces to do that: the regime changer, the war fighter. That force we have. I call it the Leviathan, right out of Thomas Hobbs. This force has an unparalleled capacity to wage war and decide when other countries wage war. That is an amazing power. No one is seeking to counter that, which says the world has a lot of trust in America, which I would argue is dissipating at a very rapid pace right now.

The second force is the nation builder, the peace keeper, the disaster responder, the crisis responder. That force I dub System Administrator. What I am reaching for there is an image of a force that ultimately will be more civilian rather than military, more U.S. government than DOD, more private sector than public sector funded, and more rest of the world than U.S. driven.

The argument about two different forces requires some explanation. What are the fundamental differences between the Leviathan and the System Administrator? The Leviathan is going to work with traditional partners to make war. They are all going to look suspiciously like the Brits and their former colonies. The System Administrator is going to work with everybody, international organizations, private volunteers, non-governmental, contractors galore. The Leviathan's about joint operations, making the military services cooperate with one-another. We are there. The System Administrator is about interagency jointness, and quite frankly, we are not there. Interagency today is what military jointness was sixteen years ago when I got in this business. Basically, the tee shirt with the arrow that says: "I'm with stupid."

The Leviathan, I call it your dad's military; young, male, unmarried, pissed off. The System Administrator, I call it your mom's military it's everything your dad's military loathes and fears. It is going to be more gender balanced. It is going to be older, it is going to be more educated, and it is going to have more children. Here's the toughest part, it is going to be more expeditionary. Those guys and gals will go and stay. They will stay out there all the time, rotating in and out. You will see migration from the Leviathan to the System Administrator. How do I know? Check who works for private security firms, they are all former military. So, one force takes down networks, doesn't hold press conferences, and one force has to be a very open source, explains everything, no secret prisons.

So the argument is that we must think about the difference between war and peace and everything in between, because we are going to spend more and more of our time in between war and peace. More and more companies like Bechtel, like Halliburton, and others who do post-war reconstruction, find themselves operating under fire on a consistent basis, which is why you are seeing the rise of industry associations, like the International Peace Operations Association, people trying to define a field, set standards before the government is forced to. Asymmetrical war just means we are going fight a thinking enemy. He may not be as powerful as us, but he is not dumb. So asymmetrical just means he is not dumb, that's the code inside the Pentagon. Talk about the first half being war, talk about the second half being peace, and make the distinction between the two, because we tend to confuse them in our culture.

Everything in America is a war; business is war, sex is war, everything is war. This war reality is going to be the opponent we face time and time again around the world. For some reason this guy doesn't want to take on our Leviathan force. For some reason he considers it an unfair fight, so he basically sits out the war. He will go, quite literally, underground, which is what Hamas did most recently. Then they wait for the crazy Americans to declare victory, pass out the medals, write the memoirs, pose for the photos in Vanity Fair, then they will send in the "B" team that is under equipped, under funded, under trained, under prioritized, under authorized, under the gunned, then they go after them. Their goal is to kill two or maybe three guys a day. That gets you 800-900 at the end of the year. This opponent will throw unlimited labor to accomplish that very simple goal. So, either you disrupt his game plan or you are going to see it time and time again. I believe the Israeli's just got a good taste of it in Lebanon. So, we can understand there is a very profound scene between war and peace.

This is a stupid question I get asked on CNN a lot: "Why are we losing the war, who lost the war, when are we going to win the war in Iraq?" I'll tell you we won the war in five weeks with 137 combat casualties in a brilliantly waged war. It was basically "just cause" like the campaign we used to take Noriega and Panama in 1989. It was "just cause on steroids." It was a big U.S. Marshall snatch and grab looking for a deck of cards. The problem was we had no plans for the peace. We had no desire to engage in the peace. That was a brilliantly waged war. If you keep calling what we are doing in Iraq now a war, I guarantee you are going to come up with more fire power as the answer. That is not the answer for what we are doing.

Army Chief of Staff then, Erik Shinseki, was right about the footprint for war. Not a lot of people want to hear that or that he wanted 300,000 peacekeepers. So, we have a department of war and a department of peace. The department of war is my bad cop—he's stuck working the gap, he dreams of the core, wants to get it on with China in a very bad way. The department of peace is my good cop—he doesn't know his ass from his elbow inside the gap. Don't get me wrong, I love the bow tie crowd. State Department and 50,000 Marines and you've got a party.

What we do not do effectively is "the middle." We don't study it, we don't war game it, we don't exercise it, and we don't have doctrine for it. The department of war has plenty of war games. The department of peace has plenty of seminars. What I don't see are exercises to explore how you get countries from the gap to the core. How do you get them out of war to stability? How do you increase their situation from disconnectedness to deep connectedness? We must master the middle or its "drive-by regime change" from here on out. The American public won't stand for it and our Allies will not pay for it. Eventually we are going to have to create what I call a bureaucratic center of gravity for this. I call it the department of everything else. I call it that because I am not quite sure of everything that has got to go into this department of everything else, but I do know this, if you are an American general right now in Iraq and you are pushed to the point of saying there is no military solution to this political problem whether you realize it or not you are working for the department of everything else. Because, when you come back to Washington, the Department of Defense does not want to hear about it, they are busy plotting their brilliant wars against the Chinese on the streets of Taiwan. If you go to the State Department, you can't find anybody who understands what you are talking about. Crazy idea, I know, except it addresses a mission gap which is profound, between the force we have and the force we do not have.

In the Cold War, if we were going to wage war with our Leviathan force, it was a huge footprint. If we needed to do follow-on nation building effort, we had lots of boots on the ground, so the handoff was easy, and a classic, paradigm. Normandy, June 1944, massive invasion force and a massive civil affairs force right on its heels. It was a heyday of civil affairs, whose motto was "secure the victory."

The problem we have today is the problem of success not failure. Our Leviathan is so lethal, so fast, so agile, it can come and be gone before we bother mounting the System Administrator. All the books you read, Tom Ricks, George Packer, they all describe the same lost year. Basically, June 2003 to April 2004, a lost year that has cost us about 2,200 in combat casualties.

So, here is the essential rule set that we have got to get used to: wars have gotten a lot shorter, the average war today is about fifty days; the peace has gotten a lot longer, it is recognized as encompassing about ten to fifteen years of recovery. Life has gotten a lot easier for the U.S. military. There is nobody that we can't wax. You've got to raise very different soldiers for war and peace. For peace, the paradigm is not the nineteen year old on instinct; it is the forty year old cop with wisdom. War has gotten very cheap, $130 billion to take down Saddam. Securing the peace is about $300 billion and counting in Iraq post-war. You could do war with a small footprint, but you cannot escape the body requirements for peace over here. The better we get at this, the more the requirements are driven up over here. That is the fundamental dynamic the Pentagon has had a hard time adjusting to, because it is very uncomfortable with post-war. It's not sexy, it's a political bitch; they don't want to do it.

Who sizes our forces? The essential question is who are we sizing our forces against? During the Cold War we sized our forces against the Soviets.

We let the Soviets size our force. The question is who sizes that System Administrator force today? Who has the best System Administrator force out there right now? I would argue Hamas does. If we are smart and we are watching Lebanon right now, that process should be sizing this force, because Hamas is going to own the future if we are not careful.

The Army is ambivalent about the System Administrator concept. They fear they are going to lose their war fighting ethos, but we know from re-enlistment people that they like doing this stuff, they enjoy it. So, we are watching the U.S. Army move from its position as the main war fighting force in the U.S. military, which it has held for the last century, and it's going to eclipse the role that the Navy glommed onto in the post Cold War world and it's going to become the main force for peace; a huge, once in a century, shift.

What is the key indicator here? Supplementals. The Defense Department goes to Congress to pay for actual operations, we don't budget for operations, and we just budget to have a military, not to actually use it, so when we use it we have to ask Congress for more money. We have asked for a lot of money since the end of the Cold War, and when all that money, almost half a trillion dollars, is broken down, it turns out that 80% is post-war and only 20% is war.

New counter insurgency doctrine coming out of Leavenworth is going to be dual-designated by the Marines in Quantico. First time in history Army and Marines are going to say, "We fight the same way," because if you know anything about the Army and Marines, that's pretty hard for them to admit. The new counter insurgency doctrine says: successful counter insurgencies are 20% kinetic (blowing stuff up, putting holes through people), 80% non-kinetic (political, economic development). Where do they get those percentages? They get them from the last sixteen years of experience. So, we are watching the Army shift to an ethos they haven't had since the settling of the American west in the second half of the 19th century. You have got to all the way back to Dances With Wolves to find the sort of structure that we are going to see again, because we rolled everything up into huge divisions, between 20-30,000 men and now you are watching Pete Schumaker, current Army Chief of Staff, bringing everything back down to 3,000-5,000 man unit brigade combat teams. He has to do this for the rotation. So, you will see the System Administrator function grow inside of the Defense department, and you will see the Defense Department try to shove it out the door just as quickly because they don't like doing it. It will be like watching Halliburton trying to get rid of Kellogg Brown and Root. It's not that KBR does not make money; KBR makes a ton of money. It is the same reason why Lockheed Martin just bought PAE, which is basically the KBR for the State Department. This is the future of warfare. This is the future of operations

So, I offer an argument about how the force is going to breakdown in terms of its function and its use and how we can texturalize the employment of that force within a larger global rule set. I am going to make an analogy here to economic bankruptcy. If you are a state and you experience economic bankruptcy you go to the International Monetary Fund. They have a system

for processing you. Why? Because they want you back on the field. Russia went bankrupt 1997-98, paid 50¢ on the dollar, got back on the field. Argentina two years ago paid about 30¢ on the dollar, allowed back on the playing field. Why? Again, we just didn't want to keep them off. No point in that.

What if a state experiences political bankruptcy? What is our system for processing a politically bankrupt state? Let me give you two definitions of political bankruptcy. First, it is too little government in a failed state. One third of the governments inside of the gap can't keep a leader four years on average. Business hates this because the investment climate is constantly shifting. Almost two-thirds of the governments inside the gap can't get rid of a leader in less than eight years. Business hates that. Why? You're going to bribe that fellow and his brother and the idiot cousin and the mother-in-law and the stupid son who is going to be the next leader five years from now.

So what would a system for processing politically bankrupt states look like? I'm going to describe a first half, where you better have allies and the second half where you better have investors, because if you don't, you don't have a solution. I'm going to describe a six part system. We have three of these parts now. We have the UN Security Council at the beginning of this process. What is it good for, it can indict you, it can observe your bad behavior, invent new words to describe it, debate it for months, have a vote, write it on a piece of paper, mail it to you, and say in no uncertain terms, Buddy, you'd better cut that out. What this says to Robert Mugabe, Kim Jong Il, Saddam Hussein is we are going to talk about this for another six to seven to twelve months, then we are going to get even stronger language and we are going to send you another letter.

Downstream we have a U.S. enabled Leviathan force, which is unparalleled in its capacity to wage war. If we allowed it to talk it would say: "You want me to take that guy down? I'll be happy to take that guy down. I'll take him down on Tuesday, and it will cost you $43 billion, but I want to be home for the weekend." It would come and go just like that. This force is built to do essentially U.S. Marshall snatch and grab jobs.

Way downstream we have the International Criminal Court, which is basically created to put bad actors from the gap on trial. If you have a functioning legal system you are not really subject to the ICC. That is basically the core. It is the countries inside the gap that produce these bad actors. Now, what is so sad about the ICC is that while it has a credentialed system internationally for adjudicating and imprisoning bad actors, it doesn't have a system for getting any of them.

What America has is this amazing capacity: give us a deck of cards, we will get fifty-two for you, go in and snatch anybody you want, any time, anywhere, but we don't have a credentialed system for adjudicating or imprisoning them. Instead we have secret tribunals and secret prisons. You don't have to be a grand strategist to realize their chocolate; our peanut butter would make sense.

We are missing three parts. First, we need a functioning executive to translate will into action. With NATO both times in the Balkans the assumption

was that those crazy Americans, if they are going to do anything they have to convince themselves it's an imminent threat, because that is how you define war to the American public: It is an imminent threat, I tell you, either we get him or he gets us. The Bush administration didn't make that sale the second time on Iraq, so as they geared up for the invasion they screamed he's got a gun, just as they broke down the door and they shot the place up and then we searched the coats for the gun and we found an old rusted cigarette lighter in the front pocket.

The French gave us a hard time, so we said to the French, do you want to break down the door next time. The French said no, but we like making fun of you when you get your story wrong. Now, to say it was a bad take down to get rid of Saddam when we did, is like saying unless we catch him actually making weapons of mass destruction with Osama Bin Laden the minute we break down the door, it is not a good take down. You get that argument, which is absolutely ludicrous. That is like saying I can't arrest Ted Bundy unless I catch him actually raping and killing a woman in front of me. Ok. So you amass evidence. You indict and then you take the bad actor down at his worst moment, preferably 3:00 A.M. buck-naked in bed, which is how the U.S. Marshals prefer to do it. It is not about fair fights.

What we are also missing is core-enabled System Administrator force on the far side. Frankly, maybe we should have turned this over to the Chinese. Why? They would have done it under budget and on time. We need some sort of permanent international financial institution to make this sort of effort, so we don't pass the hat each time. The World Bank toys with this idea on a regular basis. You would think Paul Wolfowitz would do it, you are going to get this functioning executive out of the current G8. That's who meets at the summit level right now. It is moving towards the G20. As a concept over time, it was Clinton's creation near the end of his second term. The G20 is basically my entire core.

So I'm with John Kerry. I want a global test for the deploying of U.S. military power. But I'm a realist. So I am going to ask the G20 with the money. Not the 175 other countries in the U.N. I'm going to ask the twenty with the money who control ninety percent of the global GDP. Because if they are not interested in helping me resurrect this country post-war, all I am doing is just scheduling the next crackdown, which is what the Powell Doctrine did for us across the 1990's. Here is the challenge: We have to deal with a lack of capability for connecting countries post-conflict, post-disaster, post-whatever. We are not serious about it. We haven't made serious attempts to adjust our policies or our approaches. We haven't created the institutions to make this a possibility and yet everybody tells us we are going to be dealing with failed states from here on out, because danger doesn't respect borders in the globalized world. This is the concept we call "development in a box." Let me explain it.

The concept is that peace is the ultimate aftermarket. George Lucas makes money on movies. George Lucas makes a lot more money on the merchandising. Others do it too. I'll give you the cell phone so I can sell you a subscription, I'll give you the razor so I can sell you the blade. This is not a new concept. But

we have got to start looking at these so-called quagmires as emerging, virgin market opportunities, because that is how the Chinese look at it. So what we are talking about is the ultimate push package for any kind of post-whatever situation you can dream up. It is what we should have had for New Orleans. It is what we should have had for Iraq and what was so sad, was that when the Baghdad citizens saw what we did in New Orleans, they said, "Oh, now I get it. You guys are pathetic at home too." What were we thinking? We should have had it for Afghanistan. We did a slightly better job with the Pakistani earthquake. Best job recently with the Aceh Tsunami.

What we are searching for here is sort of an ISO 9000 standard for an emerging market. Give them the rule set that says this is how you connect up, meet these standards, and we will connect you up. So it is all about processes that can be measured and metriced. You go into any node, any country, and the first order of business is establish trust. That's been our big failure in Iraq. Second order of business is to connect that node to the larger network, which we call globalization. Our argument is they have to be able to plug-to-play. And that means an interoperable interface. This is standardized for the world over. If you are going to connect to the Internet it is going to be TCPIP; already decided. If you are going to have a central bank, this is how you move money; already decided. There is no sense in asking them to start with DOS, just give them Microsoft Word, where 80% of the rules are already incorporated. So, why not provide it up front and get the private backbone providers in this process as early as possible? Treat them as virgin markets; create the connectivity as quickly as possible.

What kind of standards should we apply to this? It's no big mystery. Talk to international investors; ask them what they like about a country. A lot of foreign direct investment goes into China and Singapore. China is actually the biggest target right now; passed the United States two years ago. What threshold have they passed that would allow money to come to these countries? Let's walk the dog backwards. First, they have a certain amount of infrastructure and economic stabilization in place. They are not totally built out. Otherwise you wouldn't be going there for the economic opportunity. Behind that there is a certain amount of social well-being which is why it is important for Beijing to worry about peasant unrest in China. Behind that, there is a certain amount of legal structure. Does it have to be perfect? Business will go in when it's still mushy. In fact, business likes to go in when it is mushy, because that is when you get about a 20% return. Soon as they get some serious regulation, then you are down to the single digits and it is called Europe.

Behind that is a certain level of state, behind a level of security. All I have done here is taken Massel's Hierarchy of Needs and tipped it on its side. Here is the myth. We say if we go in and create a military and sort of a government, we are done. And then we pretend we built a state, we have built a government, we have built an economy, resurrected a society, when in reality, we have got a long way to go. So if we don't certify people for foreign money to come in we haven't accomplished anything.

No country has ever developed economically, historically, without access to outside capital. America sure didn't. The number one foreign direct investor in America across the 1800s was the Dutch. What did they do? They exploited our cheap labor, and they bought our cheap natural resources. Same thing the world is doing to China today. We got really rich in the process. Just like China is doing today. So, how do you get a less-developed country to the magical status of a "low cost country?" I don't want to invest in a "less-developed country," but I can't wait to exploit the cheap labor of a low-cost country. Viet Nam was the less-developed country five years ago. Viet Nam is now a low-cost country. Why? Andy Grove of Intel says so. They put a $5 billion chip plan in Saigon to prove it. Now, what do the Vietnamese do? They basically filled in these categories enough, so they got out of the foreign aid and into the Foreign Direct Investment and then you are a business proposition outside of US aid or the US military. That's a good, good thing.

So, my argument is a four part process that we have to get serious about. First, we have got to catalogue the best practices for how you connect countries up to the global economy. All these rules are out there; they are just not codified or understood. Second, you have got to give them the hardware and the software, make it easy. We shouldn't be fighting about whether a Dubai Company runs port operations in America. We should be giving scanners for containers to every port in the world that does business with America. Our only price for giving them that kind of technology should be "you let us see the data on a real time basis" so we will know what's coming into our country when it embarks, not when it debarks. There are rules for all of this. Some of it is going to be standard for the world, a central bank is a central bank everywhere, but if you do it in an Islamic country, for example, you are going to have to respect Chari on terms of interests. Then there has to be an upfront educational process to turn the stuff over to the locals as quickly as possible and empower them as quickly as possible.

An argument for the Middle East: What the Bush administration sought to do by toppling Saddam was effectively create a big bang in the region. Their argument was that the Middle East was never going to connect in its current condition, and until it joins the world it is going to be subject to the sort of endemic conflicts and the sort of terrorists that are spawned by those endemic conflicts. Prior to 9/11, as long as you just sent the gas and kept it cheap, we didn't care. But after 9/11 we decide danger respects no boundaries, and we care about that. As we try to connect the Middle East's very traditional societies to the outside world, three key scenes appear in this process. First there is a tactical scene running down into sub-Sahara and Africa, which is basically becoming Cambodia to Iraq's Viet Nam. It is where Al Qaeda hides its guns, its gold, its people, its training, its networks, and its future. To the extent we drive out the radical jihad movement in the Middle East, this fight heads south in the sub-Sahara and Africa over the next ten to fifteen years, which is why there is discussion now inside of DOD to create an Africa Command, which is going to be a stunner when it happens because it's going to say America is going to Africa militarily in a big way.

Second scene operationally, lies to the North. We went on the offensive against transnational terrorism, largely centered in the Middle East, and they are back to the same pattern of the 70's and '80's, which was, you can blow stuff up throughout the Middle East, but all terrorism is local and with some effort they can reach into Europe and now into Russia. So, think about the disasters since 2003: London, Madrid, Mumbai, and Bali. They can't get all the way to America, but they can create ricochets throughout all the neighboring regions, which is the key thing that the Bush Administration has not been sensitive to it. You lay a big bang on the Middle East, and all our allies nearby are the ones who are going to catch all the defected bullets.

The third key scene is a strategic scene and that lies to the East, not well understood. Two-thirds of the oil that comes through the Straits of Hormuz today goes to Asia. Only about 15% of that oil comes to America. In twenty years it is predicted that we will be taking out about 13 to15% of the oil, but Asia may be taking out 80% at that point. Basically their oil is our blood. There are three key players in this process. First, there are the Iranians, sort of the axis of oil and gas. They have two brand new big friends: the Chinese and the Indians, where energy requirements are doubling in the next twenty years. There is no chance we are going to economically isolate Iran. These guys need the energy, so Iran is the key, an argument that I have been making for a couple of years now without much success with this administration, because they decided to rerun the whole WMD drama with Iran, just like they ran it on Iraq. For some reason they thought our allies were going to buy it better the second time.

Iran can veto our efforts towards stability throughout the region. By toppling Saddam, we created a Shia revival. Iran is the head of the Shia world. They desire protection from a U.S. invasion and by God they believe a bomb is going to get it for them.

I walk up to three guys sitting on a park bench. I shoot the guy on the right through the forehead. I double tap the guy on the left. In the meantime the guy in the middle reaches for a gun. I ask you is he irrational, or did I make that choice for him?

Iran looks at the Taliban on their left, bang. Looks at Saddam on their right, bang, bang. They reach for the bomb in the meantime. Are they deferrable? Are they strategic? I would argue what we just saw them do through Hamas and Hezbollah in Palestine and in Lebanon was a classic asymmetrical strike against our allies in the region; in effect, an effort to forestall an American invasion or a strike against Iran before the end of this President's term. It was a brilliantly strategic deterrent act. So, can these guys be deterred? I think they are very strategic. All the reasons why Nixon wanted them as a pillar in the region are still there. They are Persian, not Arab; they are Shia, not Sunni. The Jihad movement is exclusively Sunni, and we consistently confuse those two things, which is sort of saying Bear fans and Packer fans are really alike because they are in the same division in the NFL.

I look at Iran today, and I see the late Bresnevian Soviet Union—a very tired form of authoritarianism, 70% of the population under the age of thirty,

they want their MTV, they want their options, they want their future. That kind of regime you kill with economic connectivity; just like we took the Soviets down without firing a shot, through détente. You cut deals with hard-liners. Only Nixon could go to China. Frankly, only a guy like Amadinejad could come to Washington and sign a deal the Mullahs will respect. So think about how we are going to connect this Middle East and realize this big bang strategy. America has key relationships with certain countries. The Europeans are crucial for places like Turkey, Syria, and Lebanon. You need the Russians for what happens in the near abroad, Central Asia. You need the Chinese for their special strategic relationships, with Pakistan long established and merging with Iran. You need India for its relationship as elder brother to the Iranians and key Gulf states.

What we are missing right now is some sort of regional security dialog that starts to knit together these countries over time. Nobody is talking about this, except a recent Washington Post editorial. That's about it. Yet, the Middle East is the region that is dominating the global security agenda. We need something that creates connectivity between these players and among the interested great powers. As I like to say, connectivity requires code. You want to connect, there has to be code attached. We are not creating the security code that allows the economic connectivity to emerge and, until we do this, the Middle East is going to be an economic underperformer like it has been for the last thirty to forty years and that is a problem. Why? Well, the long-term solution set here is already in the works. Our purpose is not to screw it up in the meantime.

There are four key dynamics that work here. First, in the Middle East there is a demographic time bomb working its way through the system. There is a huge youth bulge centered on the ages between ten and twenty-five. It's already been cut off on the far side, people are not having babies like they used to, which means the Middle East is going to middle age in twenty years. Secondly, there is going to be a religious reformation, centered in North America, headed by American and Canadian Muslim women. Not well covered in the press, it is already unfolding. Third, there is going to be a political reformation centered in Europe. You will see the rise of Islamist parties inside Europe just like we had Marxist parties inside of Europe during the Cold War. It will connect disconnected disenfranchised minorities currently ghettoizing these countries, because, if they are not connected, you are going to see more Paris riots. Fourth, there is going to be an economic reformation led by key Islamic countries in the East. People forget there is a chunk of Islam here. There is a many that live in our connected world, then there are a lot that live in the Middle East. But the biggest Muslim countries are actually in South and East Asia. Countries like Singapore, Malaysia, and Indonesia are showing that you can be roughly pluralistic, market oriented, and retain Islamist culture, just like we have a Judeo-Christian culture in our government.

The quick argument on the East: What we are looking at is a choice here, historically not unlike what the Brits faced at the beginning of the 1900's. They could see their economic empire settling, they could see a rising power in the West, and they decided to hitch their star to that rising power. On that basis they fought above their weight for decades, basically the entire century.

So, you can describe their choice as deciding to mentor this guy and fight that guy. The Chinese are very aware of this choice. They spent a lot of time studying this historical period because they want themselves to be interpreted as a rising America and not be assumed to be a rising competitor in a zero sum contest with the United States around the world over things like natural resources and energy.

I say we are making a very similar choice here. We are peaking economically because the rest of the world is catching up, which is a very, very, very good thing. Militarily we will still be strong, but if we want to play that Leviathan role there is no question we are going to need somebody to focus on being the System Administrator to lead the second-half effort. It just so happens the Chinese love to do that all over the world without even being asked, which is why they are all over Latin America, all over sub-Sahara and Africa, all over Southeast Asia, all over the Middle East. So basically we are not going to see and we are going to require lots of new cooperation between the United States and China, because we have the unprincipled Leviathan over here willing to invade any gap country you can name and the unprincipled U.S./Chinese System Administrator willing to invest in any country you can name. Eventually we are going to have to get that chocolate and that peanut butter together, which is a life purpose for me.

The concept of the theory of a peacefully rising China is not so much China's promise as its request, but the rest of the world should not assume its rise means a zero sum loss for everybody else or that if they get powerful we must get weak. We want to be recognized as an asset. I argue that this is going to be the most important bi-lateral relationship of the 21st Century. Yet, when the President of China came here, he was lavished with meetings and praise and all sorts of opportunity on the west coast by our business community. Then he went to Washington and the White House couldn't get the name of his country right—introduced as being President of the Republic of China, which happens to be Taiwan, which didn't go over well.

We are stuck with the leadership we have on both sides. With the Chinese we have Hu Jintao, the President and Wen Jiabao, the Premier. I like to say that in China "we know the who and the when." We are trying to figure out "the what and the why." On this side we have a bunch of retreads from the Ford Administration that were given to Bush to keep an eye on him and make sure he didn't do crazy things in foreign policy across his two terms; good in theory, hasn't worked out so well in practice. He is gone in January 2009. You now are looking at a different generation, because the Cold War generation of strategists are dying off or retiring and at 44, I say thank God, because new blood is required.

But, you are also seeing something very different emerging in China. The fifth generational leadership, so called, is going to be named next year. They are going to come on line over the next three to four years. What is important about this? First generation, Mao. Second generation, Deng. Third generation got educated in the Soviet Union in the 50's, Jiang Zemin, ran China in the 90's. The fourth generation running China now never went abroad for their

education, because that would have meant they would have gone abroad during the cultural revolution, and therefore they are very cautious homebodies. They are going to be replaced by the fifth generation.

Where did the fifth generation go to school? Right here in America in the late 1970's and early 1980's with me. These guys have a very sophisticated understanding of globalization. The American political system, in their view of the future of international relations, is amazing. They see connectivity and peace naturally emerging. They are amazingly naïve. China is hard to understand. Here are a couple of thoughts to give people a sense of what China is all about. I say, what if we invited everybody in the Western Hemisphere to come and live in the United States, nine hundred million people, come live in the United States. That would get you roughly an India population range. That wouldn't be enough to equal China. You would have to invite everyone in Europe to come live in America too, 400 million more. That would give you a comparison to 1.3 billion Chinese living in America but you can't stop there. You would have to ask most of them if at all possible to live on the coastline, just like we do. That would be basically China as America. You say that is an unfair comparison. We are exactly the same size geographically 9½ million square kilometers, which is stunning when you think about it. They have seven major languages in that country with more linguistic differences than there is between French and English. Yet we call it a nation.

The other key thing to understand about China is that it is changing so rapidly that depending where you look in China today you can basically find the last 125 years of American economic, political, and social development. Their foreign policy right now reminds me a lot of early 20th century America, roughly around the time of Teddy Roosevelt. They have a space program that I think is absolutely cute. They have an investment boom that looks like our 1920's, which is scary because that was followed by our 1930's. In sports they are going to win the most gold medals in Beijing, 2008. Watch the U.S. Senate launch an immediate investigation into this tragedy. They have a sexual revolution going on right now in China, mostly on line. They have a movie industry to die for. Like post industrial, they still like to break heads. They have got women joining the labor force like you wouldn't believe. All of this is happening at the same time. Everything from our late 19th Century robber barons to the go-go entrepreneurialism that Tom Friedman likes to focus on. The best capture right now is the mass media of America. What is it like to be a capitalist in China, watch HBO's Deadwood. A lot of revolutions are going on in China at the same time. What kills me about the hawks in the Pentagon is they say, I don't see enough change happening. China is not doing enough, pick up the pace. Chop, chop.

Here is the most important revolution going on, demographic revolution. China and the United States are both going to hit the floor to mark 20% of their population over 65, the so called Geezer economy, at roughly the same year, 2036 when I retire. The thing is the United States will have taken over six decades to go from 10% to 20%. China is going to do it in about a generation. Europe did it in a century. We have never seen a country age that rapidly. So, does China get old before it gets rich, before it gets threatening? I am going to

bet on old, because that's the one I think they can't stop. Think of China as a giant balancing act. It has been the biggest target for foreign direct investment in the world. It also has one of the most opaque decision-making systems. Nobody knows when they are going to convert to a more transparent system. But when they do it will change global economic history that moment.

They are becoming a manufacturer and final assembler of note in the global economy, and they are the country most likely to experience great power over the United States. I would argue never has one country presented so much promise or peril at once than China does today, unless you look at the Americans around the time of McKinley and Teddy Roosevelt. So, I argue, lock in China at today's prices. We need strategic partnership as quickly as possible.

The opening bid is a simple one. We take off the table the defense guaranty on Taiwan, which I argue is a blue law from another era. Taiwan was producing two-thirds of the world's motherboards. In 1999, it suffered an earthquake. Did they rebuild, no, they moved all that production to the Shanghai technology corridor. What exactly are we fighting to protect here? My argument would be I would spend exactly zero American lives to prevent the economic integration of Taiwan. The Brits gave back Hong Kong, now all business in China is written according to Hong Kong contract law. Why? It is a very good law. The Portuguese gave back Macau, which is a fabulous place to gamble, and I've got nothing profound to say about that. My point is this: Inside the Pentagon, as long as you have the Taiwan street scenario, you will continue to overfeed the Leviathan, you will continue to starve the System Administrator. Why should you care? That will be U.S. lives every year from here to that mythical, imaginary scenario of great power war with China. Those lives will be the Army, the Marines, and they will die needlessly because they don't get the stuff they need, they don't get the alliances they need because they are sent out under intolerable situations like what we have in Iraq right now. So that is why it matters.

The other reason why it matters is that we have to settle the question of North Korea as quickly as possible. Kim Jong Il is a very, very bad actor. I don't believe he can be tamed with connectivity because if he allows economic connectivity he doesn't have a reason for existing anymore. This is the last pretend state from the Cold War. This guy will sell anything to anybody. He let two million die in the late 1990s in an unnecessary famine in that country, preventing aid to get in. Why? He preferred to stay in power more than to see those two million of his own countrymen die. So, you think we are going to squeeze him hard enough with sanctions? He has the bomb. I say we have to get China's buy in. There are three ways to do it. First, it would be nice if they got rid of Kim for us. His train goes to Beijing, it comes back empty. I was in Beijing last week talking to the PLA, and they were like, "comes back empty." That's pretty good. Second, you basically pull off what the KGB did with Chouchesku. In late December they wanted him gone. The KGB, basically from Moscow, operated through the security systems there to make that little demonstration happen. Then all of a sudden the Emperor had no clothes, they took him out back and they shot him. All indications are that the Chinese

are actively studying that option. They have actually interviewed the current president of Romania as to how it went down. They don't like to talk about it in public though. Third version is, there is going to be some sort of final straw. They are going to end up with the ROK invading from the south, China invading from the North. I would rather not see it come to that, because then you have Chinese, Americans, nuclear weapons, in a small space and it's called war. That's a very scary scenario as far as I am concerned.

Well, we have to promise China security, and this conversation has already begun for an East Asian NATO, make China the main stay of that, lock down the possibility of a great power war in Asia and shift American troops and tap Chinese troops for the long war that is going to be centered in the Middle East, Central Asia, sub-Sahara, and Africa over the next ten to thirty years.

So think about the countries we have brought together to make that Leviathan work in the Cold War. Many of them are going to be key players for that System Administrator work, but we are going to have to tap a lot more countries that are closer to the problem. When you talk about that System Administrator being a body intensive function, you need a lot of bodies to do it. It only makes sense to me that the strategic player in that System Administrator function globally in the 21st Century is going to be the United States with its million man army, China with its million man army, and the Indians with their million man army. You locate the bodies where the problem is because the Indians are all over the Indian Ocean rim that is where all the nuclear power stuff is happening, the Chinese are all over Africa, and we are going to Africa.

The other thing I want to mention about these countries is they are going to give us a strong sense about how we need to do the post-war reconstruction and the development. Americans when they come into any sort of situation, post-disaster, post-war, come in and price everything out about six sigmas at American prices. It always gets inflated; sometimes quite often absurdly. In reality, most of these situations need a one or a two or maybe a three sigma solution. So, keep it simple, keep it sweet, keep it on time, keep it under budget, jump generations when you can; simple stuff. Again, if we had given the reconstruction of Iraq to the Chinese, we wouldn't be in the mess we were in. Guess what? It's going to be their oil anyway.

We talk about bringing, for example, Africa up to American standards. People say it will never happen. It will bankrupt the planet. I say, relax. Africa is going to be a knockoff of India, which is a knockoff of China, which is a knockoff of South Korea, which is a knockoff of Singapore, which is a knockoff of Japan, which is knockoff of America. The American integration model is about 100 years out of date.

Last point, designed to infuriate people over a certain age: I was born in 1962. I like to say, if you are older than me, I am not even going to try to convince you of anything. Frankly, most people's morals and their view of the world is imprinted on their mind about the time they turn about thirteen or fourteen. Best example, name your favorite musical genre. I guarantee you it is basically what you listened to at age thirteen. You try to hold on in your twen-

ties, you try to be hip. Maybe in your thirties, you could listen to some popular music. Then about your forties, you said this stuff is crap, I can't believe my kids listen to it. They start calling you an old foggy. How we got input in the Cold War was we thought if you were like us, politically you had to be our friends. The French were like us politically, therefore the French were our friends. If you weren't like us politically then you had to be our enemy. That sort of made sense, when you looked at the Soviet Union, because politics and economics came together in models. Most people born after 1960, especially the eco-boomers that follow me, are a very different imprint, because they grew up in a different world. I came of age in 1973. My kids came of age in the late 1990's. They don't remember a world without the Internet. They live in a very integrated diverse community. Frankly, in their age range, whites are a minority. They can barely remember back to the Soviet Union.

Here is what I think we are moving towards. The old view was that if you are like us economically that is going to be the true basis of friendship in the future. You ask Don Rumsfeld about China, this is the China he knows because that is the China he grew up with. I only know China since it has been opening up to the outside world. So, I have a very different appreciation for China. I could say China and not put the word Communist in front of it. In the future we are going to have a lot more in common with China than Japan. Not just a little bit, a lot more. Say that in Washington and you are a nut. Say that on the West Coast, they can't believe they just paid you money for the speech.

We are going to have a lot more in common with India than with the Brits. We are going to have more in common with those gangster capitalists in Russia than with those ten weeks of vacation crowd in Germany. After we co-op the Iranians, we are going to have more in common with them than with the French. Actually, that is pretty easy to imagine. Or, as I like to say, the Muslims aren't revolting in Tehran are they, just in Paris.

The abstract painter Pablo Picasso was asked to do a portrait of the novelist Gertrude Stein. This is what he drew for her. When he presented it to her, she said I don't like it. His rather impertinent reply was, "Relax baby." I believe the job of the grand strategist is essentially to point out inevitabilities—inevitabilities in the future—which is why I focus on things like demographics, energy, who has the biggest gun, and foreign direct investment, so that I can give you a sense of those inevitabilities and how they are going to force decisions in today's world, most of which when first confronted seem inconceivable. Strategic alliance between the Chinese and the Americans, weren't we going to war over a spy plane just five years ago? Impossible. Not so impossible.

I would be happy to take questions.

AUDIENCE:

What about Pakistan?

THOMAS BARNETT:

I mentioned India but I didn't mention Pakistan. Pakistan is a problem much like Iraq is. Yugoslavia was a pretend state. It went away. When the dictator fell, within ten years it just came apart. Now there are seven states where Yugoslavia used to be, because it wasn't a real state any more than Sunday Communion was a real state. Which is why when you take down the secular dictator in Iraq, you're looking at three states. Is Iraq a real country? It was created by the Brits, basically by Churchill, covering their tracks eighty years ago. There is no reason to call it Iraq or to put these three units together except the Brits wanted it that way. The French created Lebanon to give a little slice of the Middle East to the Mennonite Christians. This has no basis in tribal loyalties. Pakistan is very similar. Most provinces where you see weird lines that don't make sense, were developed by a British cartographer about 100 years before. We are dealing with those problems across the 21st Century.

Look at the United States. I like to say if you look on the East Coast you see all squiggly lines. Then we started integrating westward and the lines got a little straighter. We had to have a Civil War to figure that all out. Once the Civil War was done, notice how the lines get really straight from the Mississippi over. We just went in and marked Dakota swish, swish, swish, nope, North and South, getting rid of the Sioux nation basically in the process. That's how the Europeans basically did the Middle East. Notice a country like Jordan, it's a weird bunch of straight lines. Who made that up? Or Africa where the lines don't correspond to tribal loyalties whatsoever. You are going to see this process time and time again. Pakistan may be the worst situation you can find, because it has 171 million Muslims. I would argue that when that state opens up to globalization, you will see it come apart.

We are going to see this in Africa time and time again; just like we saw Yugoslavia come apart. Slovenia basically said right off the bat: "I'm out of here" as soon as they had a chance. They said: "I am cutting a deal." Croats wanted out, then the Bosnians started making noise, and all of a sudden a war dismembered that country. Milosevic was just too stupid in fighting. We cut off various limbs from his body. Then he got put in the docket in the ICC. You are going to see that process time and time again where you are going to see a dictator on top trying to hold together a country that is going to naturally split apart and devolve down into its constituent parts. We are going to have to manage that downward spiral. We are going to have to be there with packages that allow these countries to build themselves back up, first in their constituent parts, create economic connectivity where they start to see the logic of coming together and bonding with one another naturally, because of proximity. So, we are going to see these states come apart and come back together again. Just like we watched Europe basically does that for a massive civil war that raged from 1914 to 1945. It eventually didn't get settled until you got all the way to the end of the Cold War. There are now twice as many states in Europe than there were at the beginning of the Century, and yet we just call it the European Union, and it is modeled after the United States now. We are going to do that in Africa, we are going to do that in southeast Asia

less, because that process is being driven by China's economic integration. A certain amount of it will probably happen in Latin America.

AUDIENCE:

Do you think we have to keep Iran from having nuclear weapons in order to get the integration that you are talking about. How can we tolerate Iran with nuclear weapons when we have an unstable situation there and when the bomb will make them pervious to our military influence.

THOMAS BARNETT:

I don't think it is hard to deter Iran. I'll give you a bunch of reasons why. I think the situation we have in the Middle East now is unstable. As far as the Arabs and the Muslims are concerned, Israel has had the bomb for what, thirty years? America stands behind it willing to use the bomb. As long as they had the Soviet Union they felt a rough equity. Soviets go away, what has happened since? American invades whenever it pleases, all the while muttering under its breath, "thank God they don't have any nukes," no matter what we say to the public. As far as they are concerned there is a pretty obvious fix: get myself a nuke and the Americans won't invade. What Iran is basically doing is petitioning for big boy status in the world of global power. It is doing it in a very traditional way. One, I can't be invaded because of my nukes. Two, I am really important economically because of my relationship with Russia, India, and China. We are not happy with that because they still have a very theocratic government, but frankly, all the governments in that part of the world have a stronger theocratic element than we care to admit.

AUDIENCE:

But where does it stop?

THOMAS BARNETT:

I have been confronted with a long list of countries that would join the nuclear club for the entirety of my career. I was confronted with this massive list of about twenty countries that were all going to get the bomb by 1995. Now we are down to, India has had it for a while, Pakistan has it, North Korea has it, and Iran is in the process of getting it. That list of twenty has boiled down to the same bad guys we have been talking about for the last twenty years. Meanwhile, there are a bunch of countries that said no to nukes, South Africa, Argentina, Brazil, and the former Soviet Republics. So is proliferation increasing? No, I am looking at the same three or four. Now, there are two I am really worried about. Iran, because I got it integrated in a regional security scheme, but can I deter them based on their experience as promoters of international terrorism? I say absolutely, because as they promote international terrorism in a special way, they blow up things they can blow up without getting in trouble and do not cross lines they cannot cross. They consider what they do, and they have been very strategic in their application. American Embassies in Africa, fair game. American military anywhere in the world, fair game. Across the 90's, nobody went war over that. You come to America and you level a

couple of buildings and kill 3,000 people on national television that is a whole different ballgame. But that whole different ballgame is a radical Sunni based movement. That is not Iran. They frankly hate each other. Left to their own devices Sunni and Shia have been killing each other for centuries, and one of the biggest problems we have in Iraq right now is the sectarian violence. Basically the Kurds have decided they want out and are like the Croats, they have already built a nation in last the twelve years. We have been giving them air cover. The Shiites have the oil as do the Kurds. The Sunnis are basically the Serbs. They are the ones who lose. Someone has got to own that baby, because that is going to be a source of endemic conflict and that is going to give Al Qaeda a chance at really running the state.

There is no way you are going to get peace in Iraq unless you accept Iran's role as the elder mentor to the Shia population. What is so sad to me is that people say, we go wage war in Iraq, Iran gets the bomb, and they're going to control the region. I say, we were smarter in 1942, because we looked at Uncle Joe Stalin, we didn't like him much, but we were fighting the Japanese and the Germans, who were right on his border and we decided to make him our friend for a while. When we take down the Taliban, the Iranians offer to help. That's how much they hate them. When we take Saddam, you think they don't hate Saddam based on the war they had across the 1980's. They are happy to see him gone. The end result is the same as with Uncle Joe. He ends up with the bomb and half of Europe at the end of it. The Iranians are going to end up with the bomb and half of the Middle East at the end of it. We don't get anything out of it, because we haven't sought them out as an ally. Instead they put them on the axis of evil list, right at the beginning, which was a huge mistake. If I make this country that happy by taking out its two worst enemies, I want something in return, because I am not stupid enough to believe that I am pulling off an Iraq war all by myself when historically all the conflicts in that region had been endemic because everybody in the region around that conflict uses it to screw each other. That is how they have been doing it in Palestine and Israel for the last fifty years, which is why getting a peace plan for Palestine and Israel is sort of a joke. You have got to get everybody around them involved, otherwise whatever plan you put on the table they are going to use to screw each other ad infinitum to continue the conflict. Why? Because it is the best game going. Now, Iraq is the best game going. You want to settle Iraq, you had better figure out how to co-op Iran. If that makes you queasy and unhappy because they have the bomb, well, you made those decisions, so live with it. You started the board pieces moving, either you play the board or the board starts playing you. That is the situation we are in now, which is why I would like to see a big Democratic victory on Tuesday, because if we don't get one, it is stay the course and that is going to hurt.

AUDIENCE:

Will Israel exist in thirty years?

THOMAS BARNETT:

Demographically they are going to have a hard time because they are not having babies in the numbers they need to. Hamas likes to say that the seeds of our victory lie in the wombs of our mothers. So, how are you going to deal with that? Well, you have to create economic opportunity in Palestine, if you want to bring that population down. People have babies as long as they are not developed. When you get them developed they tend to lose the desire and the willingness as most of us learned as we got older and wealthier, to have babies. So, you have to do something about Palestine's economic situation. If you are going to wait on it politically forever and hope that somehow the political situation is going to develop in lieu of an economic connectivity strategy, you're going to be there forever and eventually Israel is going to be so outnumbered it is going to be a real problem.

Yeah, I think it is going to be there, because they have nukes and they are in the club and they are wonderfully globalized and they are respected by a lot of the world's nations for what they do. They are second only to the United States in terms of their risk tolerance in the business culture and that tends to mean really good things to you over the long haul as it has for America. So, I am pretty optimistic on their score, but I think we are not going to get them safe until we accept things like Iran having the bomb. What happens when Iran has the bomb? Well Iran and Israel are going to have a conversation right then; just like America and the Soviets had to have a conversation when we both got the bomb. Wherever that has happened in the world, wars have stopped. Pakistan and India get the bomb and there hasn't been a war since. They talk a lot, they bang their spears on the table, and whatnot, but they have never actually had a war since they have both had nukes. I don't see the spread of nukes to be the real danger there. I see the lack of a security regime really holding off the economic development that deals with that youth bulge, which we have about twenty years to solve.

AUDIENCE:

What is going to happen with Saudi Arabia?

THOMAS BARNETT:

Saudi Arabia has a huge youth bulge that is working its way through its system right now. The Iraqi Al Qaeda leader, Al-Zarqawi, did us a big favor when he held the knife up to the Philippino truck driver, remember that, in Iraq and basically talked the Philippinos into pulling their troops out, which was a totally meaningless gesture, because they only had fifty-one troops in Iraq.

What you may not know is that most of the moveable labor that will come into the scariest world situations right off the bat are Philippinos; up to about fifteen percent of their labor pool lives abroad; in effect, a global commute. So what Al-Zarqawi was really saying was, Philippino workers get the hell out of Iraq. When the House of Saud saw that you could scare off the Philippino labor force just by threatening to cut one throat, that is when they immedi-

ately announced a new plan to swap out jobs in the private sector from guest workers to actual Saudi citizens and hopefully end the trust fund state mentality they have had for the last thirty years; sort of a Beverly Hillbilly affect. We saw the most amazing thing, an actual Saudi citizen working as a bellman in a hotel, which is like the equivalent of a white guy in reconstruction south in 1869 doing a job that was a slave job prior to that. It is that stunning for them. That change has to happen dramatically because you can't have 80% of the population living on 20% of the economy, it just won't work. You either give them jobs, or they are going to find something else to do with their time. They are traveling to Iraq and coming back and blowing stuff up. I say, fine, because that solves our problem for us.

Thank you. I've appreciated the opportunity to talk to you.

PHILIP BRUNER:

Tom, we most appreciate your sharing with us your perceptive insights about the world. Our understanding of globalization has benefited greatly from your incisive analysis of strategic military, economic, and political issues. Thank you.

Shaping the Future: Global Talent and Leadership in Engineering

Moderator:

Katherine Hope Gurun,
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Panelists:

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KATHERINE GURUN:

Welcome to our afternoon session. We start this session on a great footing because of the context and insight shared with us by this morning's panel: the pace of change, the reality of global networking, and the enormity of challenges confronting our industry. We turn now to the fascinating issue of how we create leaders to effectively address these challenges.

Let me share an example of one such extraordinary challenge. In the Spring of 1990 it was particularly hot in Kuwait City. It was hot not only because the weather had turned, but it was also hot because 600 oil wells were blazing. Hostilities had just ended after the first Gulf War and the civil reconstruction of Kuwait was about to begin. The challenge for the engineering and construction team that landed there, in the spring of 1991, was how and how long it would take to put the fires out. The managing contractor met with the best firefighters in the world and they explained to him that it would take about five years. Five years—at $120 million dollars a day going up in smoke was a dire prognosis. There were other problems. How on earth would the contractor get to the fires in the first place, because of the unexploded ordinance in the sand of Kuwait? In addition, fires were traditionally fought with water. How in earth would they get water to the fires? Only when all that was done and all the fires were out could they begin the reconstruction.

Not surprisingly, the contractor had no blueprint for this work. They put together a small interdisciplinary team of people who were clever, innovative, and very driven to succeed. And what they did is this. They first put together a tremendous team of ordinance experts to clear the oil fields. To what level, to what standard the fields of sand had to be cleared was uncertain. There were no textbook standards. Then they decided the fastest way to get water to the site was to reverse engineer—to take the exiting oil pipelines and just reverse and flush them with water, which sounds easy now but was complex. This created huge reservoirs in the desert. And then they put together a team of people to decide how to fight the fires and to find technologies beyond the proven methods. We do have with us, today, someone who had that job, my husband. And they said to him, oh you're a clever man, go off and talk to everyone in the world about how to fight fires.

So this little team, sitting out there in Kuwait, did an amazing job. Instead of five years, the fires were out in six months due to the leadership, drive, and innovation of the team. They fight fires with jet engines, new high pressure nozzles, methods of capping wells, and incredibly with cannon fire. So, although that was a terrible time and an unusual situation, I think it does tell us a little bit about the kind of leadership, ingenuity, and talent that we need in engineering today.

I am delighted to introduce our panel to you, because they all share those key characteristics. They are all in their own way educators, and they are all in their own way creators, inventors, and entrepreneurs. While we have both industry and academia represented, I'm not sure the line is very bright among any of them; moreover, they all share a huge passion for what they do. We are going to have some initial questions posed to the panelists, and they are going to give you considered answers. After that we are going to open the floor up completely, to all of you and to the panelists. Those are the only rules. So we really hope, today, we can talk about what are the key factors that we need to help grow and develop the best industry leaders.

Let me introduce our panelists to you. Vince Poor is Dean of the Princeton School of Engineering. He has only been dean for four months, but he is al-

ready at ease with his new role. He has won numerous awards for his wonderful teaching and scholarship and that is terrific.

Next to him is Rich Newton who is Dean of the School of Engineering at the University of California at Berkeley. Like Vince, Dean Newton has many awards for teaching, has a great passion about it, and is a great supporter of a world that looks different and diverse, a world that has women and minorities in positions of leadership across the board. He has a very interesting background.

My friend Pat Galloway and I have known each other for a long time. I think that I have every right to say that she is a trail blazer. She is an educator and a business woman. She is CEO of the Nielsen Wurster Consulting Group, a very distinguished group. Pat also has many, many other arrows in her quiver and has recently been appointed to the National Science Board. Pat has a wonderful book in review on engineering in the 21st Century which you are going to want to buy as soon as it comes out.

Bob Bruner is also great educator. Bob is the Dean of Darden School of Business at University of Virginia. He also is a very noted scholar; noted for his teaching credentials as well with special expertise in mergers and acquisitions. I recommend his new book called Deals from Hell.

And finally Peter Beck, Managing Director of the Beck Group. Peter and I did not meet until last night, but I felt from the first phone call that we have been friends for a long time. He is very talented. The Beck Group has the marvelous portfolio in that they take projects beginning at the development stage through the construction stage—integrating all of the functions. The Beck Group has marvelous landmark projects like the Museum of Modern Art in Los Angeles on its list of accomplishments.

So with that I would like to set the stage here. I would like to ask Bob if he would open up the discussion for us on leadership. This is an area of your special teaching expertise, and we would like your views on the role of leadership especially for the leaders of the future.

DEAN ROBERT BRUNER:

Leadership[1] could occupy days and days of conversation so I will boil it down to five minutes. First, I assert to you that leadership is the constraining resource in the world economy as we seek to grow. The world economy today is growing at a real rate of about five percent, which is simply astonishing. That was about the rate of growth during the industrial revolution, the last prolonged period when human welfare grew so dramatically. Whether this can be sustained is I think not a matter of technology. I think you can license or buy the technology you need. It is not a matter of manufacturing capacity as the United States has admirably demonstrated we can find the capacity most anywhere in the world that we need to make the good that we want to

1. See Robert Bruner, Leadership Managers and the Millennial Generation (Appendix A hereto).

buy. And I don't think its money. The markets each day tell us that there is more money in the world than people know what to do with. You could go all the way down the list of possible constraining resources, and I think the one we would probably converge on is leadership.

The dictionary definitions of leadership are dry and uninspiring. I will not read to you the most prominent ones, but they say virtually nothing about the things we focus on most as we think about how to develop leaders and leadership.

Instead I think we could focus on what leaders do, and I'll offer six requisites. I think that distinctive features of leaders are:

First, they recognize problems and opportunities. They have an eye for the anomaly and the main chance.

Second, they have a bias for action. Leaders stand apart from analysts, which is what business schools are famous for producing, because analysts are happy to tell you how many railroad ties there are between Chicago and New York, but they won't tell you whether the railroad will survive and/or what the CEO ought to do about that answer. We need leaders. People who will do things based on the analysis they receive.

Third, leaders have what we would call social awareness. They understand the changing nature of attitudes and composition of a group in which they operate, and I think they also have a genuine affection for the social setting.

Fourth, leaders are especially capable in enlisting others. Drawing people into a set of actions and motions based on their strategic analysis; based on their bias for action, etc. Lyndon Johnson is one of the famous people in history for being able to form coalitions in what was otherwise a very fractious U.S. Senate.

Fifth, leaders are exceptional communicators, not merely with the spoken word but the written word. With all kinds of ways in which one might want to touch people.

And finally, leaders are exceptional at building trust. Trust grows from many things. We ask ourselves why does trust matter and the answer is simply this: Conferred authority in a position, for example, the CEO or division head of some operation, is simply the power to do things. Hire and fire people, direct budgets, and the like, but that doesn't guarantee that you will get the organization forming lines behind you and marching off in the same direction. The only way you win the allegiance of the people in your community, in your sphere, is by first a great demonstration of competence in our field. Second I believe by great determination, not accepting no for an answer. Margaret Thatcher's famous words during the start of the Falkland War, when she was at a low ebb in her polls in Britain, were "failure is not an option." She simply determined that Britain would win back the islands simply on principle. That stance completely changed the nature of her political standing in Britain at the time. Finally, we build trust as leaders through integrity, simply through fulfilling promises, through demonstrating fairness, and through taking care for the larger community. All of this is to suggest that leadership is messy. As we

like to say at my school managers, don't solve problems, they manage messes. They deal with the contingencies, the gray areas, the difficulties in the world in which they operate.

I tell you all this because this notion of the messiness of leadership matters greatly for how we prepare the next generation of leaders. The schools represented here all have views about how to carry the torch. How to pass the flame to new generations, but in part this is a matter of how receptive the new generation is. There is research data on what is called the millennial generation; people born since the early 1980's. They are populating our Universities and Colleges right now. Consumer survey research indicates that they are very different than you and me. Their attitude is that they are a special generation. They have felt sheltered. They are very self confident. They are much more team oriented. They are highly achievement oriented. They feel greatly pressured in striving to achieve those ends. And their attitudes are very conventional compared to the two generations preceding them especially, my generation the baby boomer generation. This is a very different generation facing the United States. Some believe that it is an attitude at least the equivalent of the famous best generation ever, as Tom Brokaw called it; the generation that survived the depression, World War II, and the Korean War.

All of this is to say that the standard frameworks for leadership development and training, both in the academy as well as in corporate and professional setting, is perhaps worth holding up to a clear light, reexamining, and rethinking how we carry forward the tools and skills that are necessary—those messy attributes that I outlined. How do we develop leadership in the new generation? I will have more to say about that in response to questions. Let me close there.

KATHERINE GURUN:

Thanks Bob. Peter gives us your perspective on what you think the trends and issues are which are going to drive us toward different skill sets, particularly leadership skill sets, in our people?

PETER BECK:

Thank you. I want to borrow from a few comments that were made this morning by George and Bill and others and talk about a few trends that I think will have the greatest impact on our industry. And when I say our industry, I really mean our whole industry. And then I will try to translate that into what kind of leaders will be required, and what kinds of challenges that both corporations and institutions might face. I'm going to try to do all that in five minutes.

So I am going to hit just the tops of the waves. I would like to start with what I think is the most important trend that we are now seeing; the demographic trend. Starting about four years from now, about seventy-seven million people are going to start to retire and there will be approximately thirty-five to thirty-seven million people entering the work force. And for the ensuing eighteen years we will lose about forty million people in the work

force. To put that in perspective, that is equivalent, if it was just flat lined, to about two million people a year out of the work force. When you put it in perspective with similar experiences in the past, you can see the problem. Remember the criticism that the current administration received when there were job losses a third of the magnitude that will occur in the future. But this will be a different situation in that it won't be a lack of jobs. It will be a lack of people to fill the jobs. Now off-shoring and part-time retirement and immigration and productivity improvement will all work to mitigate this trend. And I think that the industry at large will probably have serious problems. I'm talking about the economy as a whole. We will all complain about it. We will be worried about it as we've expressed here, but I think that's a different story for our industry.

The issue is that if you look back at a trend that's occurring in our industry and continues to occur, it is actually on a collision course with this huge retirement of the work force in our country, because of the declining productivity of our industry. If you look from 1964 to 2004, the non-farm sector increased in productivity around 110 or 115 percent. The AEC productivity dropped fifteen percent over the same period. Now there is no question buildings are more complicated than they use to be, so the lag behind the rest of the non-farm sector is certainly not as great as that, but it is significant. If you have any questions about it, I encourage you to do several things. I like to walk with some of our superintendents and project managers on projects and those that are most honest with me will confirm that forty to sixty percent of their time is spent fixing, checking, and documenting things. All of which are non value added work. There are other kinds of examples. I love what any self-respecting general contractor includes in their subcontract agreements. It says something like "your scope includes, but is not limited to the following." That is a way of adding ten to fifteen percent to the cost of the job. Because basically what that is telling the subcontractor is that if the plans aren't right—they're not properly coordinated—it's going to be an argument between you and me and by the way you are responsible for the cost of it. And the subcontractors respond accordingly.

Architects do something similar in their specifications. If it is shown in the plans and not in the specs; the prime contractor is responsible for it. If it is shown in the specs and not in the plans; the contractor is responsible for it, and if any reasonable person could have inferred that it was in either one; the prime has it. That is basically a way for a general contractor to look at that and say, I will just add time and money to the price. So all the time, we are pushing the risk down to people who have less and less control over the risks. Less and less control over those aspects of the job causing the cost and schedule to increase. And that is one of the reasons that why you are seeing this huge decrease in productivity.

I was looking earlier for the sprinkler heads in this room and I noticed that we have no sprinkler heads, but I am going to use sprinkler heads as an example. A subcontractor in the southeast can install sprinkler heads all day long at seventy-five cents a square foot. As a general contractor, we would never price them to an owner for anything less than a $1.75 a square foot. You say well

why is that? Well part of it is that clause we have in our subcontract agreement, but part of it is that there are no plans that define the plenum; between the ceiling and the structure that shows the duct work, the electrical layout, or the sprinkler system, etc.. Nobody produces those plans. Architects would go out of business if they started producing those plans, because they are not paid sufficiently to do it. So what happens? The subcontractor prices them at $1.75 and that's the way we price them as a general contractor to the owner.

So what does that mean for us as an industry? How does that affect our educating and developing people for the future? In every one of those examples I gave you, it was not about becoming a better engineer or a better contractor or a better architect or a better business person. It was all about issues surrounding two or more disciplines. And typically you are going to find one of the disciplines is in control of the problem, but it's not motivated to change anything. Typically that motivation is either fear or money; while someone else is absorbing the cost of the problem and will continue doing just exactly what they have always done. And there are thousands of these examples in the delivery of projects today.

Consequently, what happens here? Well I think we are going to have to develop people who are good engineers, but more importantly, people who clearly understand how to manage multiple disciplines. I don't think we even stop there, because those same individuals will not only have to understand how to manage the design, how to manage construction, how to manage the engineering function, but also will have to have an understanding what is happening internally and be psychologists. They are going to have to be business people. They are going to have to understand the motivation behind what people do. You always love to say what can be done better, cheaper, or faster…then why aren't we doing it? Well, whether it is in the retailing industry in the 70's or other examples, I have never seen change occur because something is better, faster, or cheaper. The only reason change occurs is there is some pain, some fear, some driver, typically enabled by some technology or tool to create some process change and then it happens, but not simply because it is possible.

I close in saying: so what does that mean for us? We are going to have to become more accountable—all of us. Somebody is going to have to take responsibility for the total delivery of the product, of the building, or whatever it is. And they have to be held more accountable. As architects, we are going to have to draw correctly. We are going to have to coordinate documents. As general contractors, we are going to have to buy into that same responsibility that the documents actually are correct. We are going to have to change our contract language at some point if we are going to try to get to that ten to fifteen percent that those subs are putting on their projects. We are going to have to change the way we have typically done business in the past, but as we take on more accountability and more risk, we are going to have to be given more control and that is one of the things that is most difficult for owners to give up. I can go on at length about why that will evolve, but individuals that will be following in our footsteps will be very differently educated. They will have a much broader array of talents and experiences than we did. And, we will

have to make extraordinary improvements in processes if we are going to attract people into this business as this work force begins to retire. Thank you.

KATHERINE GURUN:

Before we take this discussion any further let's talk about our definitions of engineering. We turn to Dean Newton.

DEAN RICHARD NEWTON:

Obviously a really important question. I am going to reflect upon what my predecessors have said. I would like to begin with just a couple of comments reacting to some of the things we heard this morning. One of my most distinguished alumni, Andy Groves, a former CEO of Intel, founder of Intel, is most well known for his slogan *Only the Paranoid Survive*, the title of the book that he wrote. I had the opportunity to sit to down with Andy about a year ago, and I asked him about globalization and what he thought I should do as a Dean of Engineering. And he said Rich, my shareholders know that I have two vectors in my life and they are totally aligned. One is my Intel vector, and they know that every decision I make will be along that vector. I will act in the best interest of Intel shareholders. And if I need to build (as we heard today at lunch time) a fab line in Vietnam and that is the right thing to do, I will do that. The other vector is my personal vector. He said I am a Hungarian refugee. I was educated in New York City. I came to Berkeley for my Ph.D. I received a great public education at both institutions that gave me the foundation I needed to start my company and to be very successful. So I have a very personal motivation around making sure that the United States continues to be successful in creating new industries, creating high paying jobs, and leading the world. He, however, expressed some frustration with that particular vector. Only three weeks ago, he said, Rich, for you those two vectors are totally aligned. You don't have the luxury of those vectors being unaligned. You are the Dean of Engineering at a public institution. Public taxpayers from the United States are paying for the work that you do, and you need to take that perspective when you think about this. So in the remarks I am about to make, I would like to think about that vector, not the globalization vector as expressed by Tom Friedman in his book that we have talked about. And I think we really need to clarify the interpretation of that book, because Tom Friedman's view of the world is a corporate view of the world. If you look at the people that he spoke to and interviewed in his book, he didn't talk to me. You weren't involved, I don't think. None of the other leaders of the great research universities in this nation or any other nation in the world were consulted. You would think that as dean of engineering of a college that has produced over $250 billion dollars worth distributed value in this country, alumni, students and faculty and probably saved millions, hundreds of thousands if not millions of lives through the innovations that have been invented and distributed, we would care about this kind of flat world concept and clearly we do. What I am going to say to you know is I think is as relevant to, Chinghua, Bejing, and China as it is to Berkeley, the Bay Area, California, and the United States.

From my perspective of Friedman's flat world says never before in the history of our nation has the way you live been more important than it is today. In fact, it is the exact opposite of what the corporate view is. I have to compete a lot harder to make sure that the corporations like Beck and others are interested and willing to invest in my ECO system around my university and keep me competitive in the world. So in fact I would argue that it is kind of flipped the whole picture. The local region today is a lot more important than the state, and the state is a lot more important than the nation in this so called flat world.

In fact, this gentleman by the name of Richard Florida wrote an article called *The World Is Spiky* in the *Atlantic Monthly*, and I totally agree with his conjecture. It is not about China; it's about Shenzhen; it's about Bejing; it's about Shanghai. It's not about India; it's about Bangalore or Hyderabad. The world is very spiky. And my job is to make sure that my local region, my State, ultimately my nation is a much higher bump on this flat world as it can possibly be. If you take that perspective on the problem and translate that to what I should be doing, then as an educator, as a producer of talent, I take a very different view. Should I be out there partnering with institutions around the world and exporting my expertise to Singapore or to Switzerland or to other parts of the nation? Quiet the contrary. I think I need to be an acquirer of talent. Now before Bill gets too upset, I am going to come back to the fact that we still need to reach out to the world in that regard so that's kind of phase two.

Phase one is really back to the point that was made this morning, you know, my number one corporate initiative is people, just as well as Bechtel's is. So my job as a dean, as a university administrator, is to identify, attract, and recruit the very best people in the world I can to my institution. To bring them to my institution and educate them in my institution, immerse them in my culture. That's my job, because my culture is what I am about. I am not about my content. You can get my content off the website, if you want. That's no problem. Anybody in the world can get our content. Berkeley, Princeton we are about a culture and that culture is critically important to what we have to fight very hard to develop and continue to extend and this relays directly to the question of leadership as well.

So I need to recruit and retain the very best people, students as well as faculty and not just engineers. I want lawyers. I want business people. I want social scientists. I want public policy leaders, all of these people in my ecosystem, because then I can do horizontal collaborations. The first person I heard use that terms was Carly Fiorina many years ago when she was talking about HP and the challenges it was facing. That's my job as I see it.

Once I get them here and into my system, the first thing I should do is mix them all up. I'll send them out into the world to have that experience that they need to have. And that's the kind of thing that we are doing, and many other people are doing as well. In fact, I think it was Tom Kelley from IDO and Stanford, who was the first person I heard talk about what are called T-shaped engineers. T-shaped engineers are engineers that have some strength and some

discipline, very deep, very basic analysis and design skills, the kind of skill sets that engineers can use in their career. By the way, it is about education, not about training. It's about, what were your terms again, Bob?.

DEAN ROBERT BRUNER:

It's "know how" versus "know what."

DEAN RICHARD NEWTON:

Know how versus know what. We're not about the data. We're about the tools and that's really important in terms of what we try to convey.

Because the engineer today is not at all like the engineer of thirty years ago, certainly from our point of view, in terms of a person we are trying to educate, we have added a center for entrepreneurship and technology to our undergraduate program. This teaches the students about business and about project management. It teaches the students how to work in teams, uses a case methodology, as much as it does a traditional engineering methodology. Many schools are doing similar sorts of things, but that's been very important to us. We have an executive in-residence program. We are bringing executives to our campus from industry, integrating them into our programs, having them work with our students. We ran the first public policy course for engineers last semester, which didn't draw as many students as I had hoped, but we are going to continue it. Intellectual policy for engineers, joint with our Public Policy school and the law school is a course that we have also developed. We started out with a course on understanding poverty. This is relatively important for our American engineering students. The teacher of this course started out with room for 100 students. The course was completely overenrolled. We had a room for 200 students, and it was completely overenrolled. Got a room for 300 students and she is teaching 300 students about how to understand what poverty means and how we can work with that. A very large fraction of those students are engineers, and the reason that is important. Sixty percent of the students at Berkeley are children of first generation Americans. A lot of people don't know that. We are a big public institution. A third of our students, roughly, come from families that earn less than $35,000 a year. So a lot of our students are motivated by economics. They want to do well. They want to create wealth for themselves and for their families.

But the American kids that come in with a heritage are okay. These millennial kids you were talking about, they are motivated by the challenges that we were discussing this morning; the energy problem, the environmental problems, green technology, etc. Students want to contribute. And by the way that's attracting a lot more American kids into science and technology. So we are doing all these things as service learning. We are sending our students out. We say they need to go into a culture that is radically different than the one they grew up in and spend some time in, become immersed in it. It doesn't have to be overseas. It could be the Central Valley of California, which is a radically different culture for many of our students. But the point is they have to contend with a different social norm. Understand how to live in that environment, work in that environment. Hopefully on a technical problem, but

it really doesn't have to be that way. So, one goal is to educate those students that Tom Kelley calls T-shaped engineers, and that is what we are trying to do in terms of developing more of these leadership skills and keeping our students competitive.

Just let me finish up by saying that Bruce Chizen, who is the CEO of Adobe, was on a panel that I organized for the Engineering Deans Council of the United States, sponsored by the ASEE last April. And he looked at me and said, Rich, your product, your students, cost me tree to four times as much as a similar label product cost me in India today. Tell me why I should pay three to four times more money for your product than I should for that product. That's the kind of the question that educators and deans are struggling with, and we are doing everything we can to demonstrate that value.

Ed Richardson from Bechtel had a conversation with me recently. He said to me once again, Rich, Boy I hire engineers in London. I hire engineers in India. I hire engineers in China. I will take as many of your engineers as I can get, even though they cost more, because those engineers and the kind of education they have is absolutely at a premium right now. He also points out that it is true right now, but it might not be in the future. Our job is to keep ahead of that second derivative that we heard about and run faster in our own educational programs as well as in industry. Thank you very much.

KATHERINE GURUN:

So, Vince, tell me are you and Rich running in parallel paths, in collaborative paths or do you take a different view?

DEAN VINCENT POOR:

In my view pretty much all of the American academy is on the same page here. A lot of things that Rich said could be said about any leading institution of engineering. I will mention a few examples in a minute. But let us first step back for a second and look at the larger picture about universities in general and their role in society. The role of universities has been fairly constant over the years, even going back into classical times. The role of educational institutions has always been to engage the next generation. That is, to bring them along and help them learn and move them into leadership positions. So universities or equivalent institutions have always trained the leadership of society and that really is no different today than it was in classical times. So our mission is more or less constant. Of course, times change and the subject matter that we teach certainly changes. Definitely in a field like engineering, the subject matter is constantly changing, as do the types of teaching modes that we use, even the way we view our audience changes.

For example today I think it would be very hard for someone to consider themselves to be an educated person if they did not know something about science and technology - not specialist knowledge but some knowledge of science and technology, a recognition that science and technology flow throughout our culture and are very dominant parts of our culture.

So, for example, at Princeton, although we spend most of our time teaching our own engineering students, more than 60% of the Princeton students outside of engineering still take an engineering course. This includes the philosophers and classicists and others. So even the humanities students recognize the need to know something about technology regardless of what job they think they might have in the future. This particular meeting is a very good example that justifies this viewpoint. This is basically a convocation of lawyers, but all of you work in a technological field. So, I think it is clear to this group that technological literacy is a necessary part of becoming educated.

We would like to make the number of students taking some kind of engineering subject matter closer to 100%. We feel that all students should learn something about technology and that all informed citizens and educated people should have some basic knowledge of the key technologies of society.

I hesitate to mention strategic planning after Tom Barnett, the master strategic planner, gave that talk at lunch, but I would like to bring up something. Like many institutions Princeton Engineering recently underwent a strategic planning exercise, very extensive and inclusive. We brought in people from industry, other universities, and other parts of campus, alumni, and so forth. To start with, we looked at what comprises a traditional engineering education and what should an engineering education be. We used this comparison to shape our planning process.

So I thought I would share with you some of the things that came up in this planning process. These are really generalizations and as Rich's comments made clear, many of these are disappearing from the engineering academy even today. But I think these will ring true to those of you who have studied in the past few decades.

First of all, technological problems are inter-disciplinary, particularly the kinds of problems that you are familiar with. Large scale construction projects are truly inter-disciplinary. Engineering education tends to be disciplinary. We have electrical engineering, chemical engineering, civil engineering, etc. It is a very disciplinary type of educational process. Of course, technological needs arise in the real world. Technology and engineering really span the so-called two cultures of science and society, since it is concerned with the real world, whereas research and education really take place in the academy. Also, going back to what I said at the beginning, technology affects everyone. It doesn't just affect engineers. It really affects everyone and that is something that engineering schools need to recognize; yet engineering schools traditionally have been focused on educating engineers.

Another interesting point of view, and this echoes what Anne-Marie Slaughter said in her introductory comments, is that good technological solutions really require engineers with multiple perspectives. And that means that we need people with all kinds of backgrounds. We have already heard from Peter and Rich today that engineering problems are not really simple problems that one person can solve with one perspective. This also means that we need people from all aspects of society. Engineering traditionally was a male dominated field. Today there are many more women and minority students

entering engineering, but still it tends to be dominated by the majority who are male students. This is something that is certainly changing and needs to change more.

Another point is that society needs creative leaders and team players, whereas engineering schools tend to educate individualists. In fact all universities tend to educate individualists. These are things I think you can see reflected in other disciplines as well, but certainly they are true about engineering.

Finally, good solutions tend to be collaborative, but the reward structure in universities, and in fact in general, tends to reward individual accomplishments. When Katherine introduced us, she said something about our individual accomplishments, and that is really the way that society tends to reward people. But really good solutions are collaborative. You need people with different skills involved, and you need somehow to give credit for to each.

I would like to mention a few other things that we are doing here at Princeton. Like Berkeley and many other institutions, we have focused increasingly on issues like policy, entrepreneurship, and technology for the developing regions. We have a center here that is focused on those activities. They are very similar to what is being done at Berkeley and elsewhere, and so I won't comment on those further.

Even at the freshman level there is a lot that can be done in engineering education to start building the kinds of engineers that we need. In fact, that's the place where we should start. One of the things we have done here is to create a new integrated first year engineering program. Anyone who has studied engineering as an undergraduate knows that the first year is a bit like a boot camp where you learn physics, math, chemistry, and so forth. We have tried to get away from that approach by integrating these subjects together with engineering subject matter. There are two benefits to this. It shows freshmen the relationships among the sciences and engineering. It also shows them the relationships among the different fields of engineering. So it immediately creates broader engineers, engineers who see things from a more interdisciplinary point of view.

Another point, and this also reflects some of the things that Rich mentioned, is that the boundaries between the ivory tower and the outside world are breaking down. We have tried to do more and more to cross that boundary and to send our students across that boundary. For example, we have created an internship program so that every rising senior can have a summer internship in industry. It sounds like a fairly simple idea, but it is actually something that can be very powerful in helping students understand how technology fits into the real world.

Another thing we have done goes back to the diversity of the student body. We have worked very hard to increase the representation of all elements of society in our student body. And one of the things that we found that works quite well is to introduce a greater recognition of social relevance into the things that we are doing. That is, we try to cast what we are doing into the context of the real problems that society is trying to solve. Housing is one

such problem for this particular group, but we also have a need for a cleaner environment, sustainable energy, and so forth.

I would like to end by going to I back to my original comment that whatever happens in the world, whatever changes come about, universities will always have a very specific role and that is to educate the next generation of leaders. I do not think that role will change no matter how the details of how we do so change. Thank you all.

KATHERINE GURUN:

Pat, I now want to turn to you, with your perspective of both academia and industry. I would love it if you could talk to us about what happens when we take the concept of an engineer and a leader as an engineer globally? And when we look at this new kind of engineer, what does he or she look like to you? And what's the context of globalization and what's the impact?

DR. PATRICIA GALLOWAY:

I would love to answer that question and I need to give a little backdrop just so that everyone understands the perspective that I come from.

In fifty years I have traveled to ninety countries. In my business I have worked in sixty. As President of ASCE, I traveled to about thirty nations visiting with prominent engineers all around each country, including some that were from government and some that owned their own businesses. I have had the opportunity to work for governments, for international corporations, both private and public, and contractors. So I come from a very interesting perspective of seeing what works, what doesn't work, and especially what it takes to succeed in today's 21st century global construction environment.

I don't have to tell anyone in this room that today's constructed project is no longer domestic. In fact, they are hardly domestic. I think as George was commenting this morning, projects today are truly global, whether from your equipment to your materials to your labor force to even your consortium members, because the mega projects of today are so large that typically not one company can afford to build or construct the project on its own. The world has changed more in the last 100 years than it has changed in all previous years together. I don't need to talk about all of the trends and globalization which have been more than amply talked about this morning and at lunch today. Rather, I would like to address what it means to survive in today's world. As a company employing engineers, you have to do a whole lot more than hire technically trained people. Because, if that continues to be your mind set, you will soon no longer be able to survive and succeed as a company, even if you stay alive as a company.

What we need to look at is capacity. We have heard the concepts of brain drain, but my view is that we need to look at brain gain. There is a fallacy among U.S. companies that think only U.S. engineers can perform the managerial and senior position jobs. Today there is a great talent pool of engineers from India, China, and the Philippines that work a 24-7 work week. These have great design houses where they take advantage of these low wages that

they are enjoying for now. But what then actually happens? I have to tell you about these foreign engineers that I have met. These are not uneducated people without management skills. India and China's number one goal in their engineering universities is to make sure that every engineer walks out knowing what project management is, what management is, what business is, and what financial implications and economies are.

Knowledge, learning, information, and instilled intelligence are the new raw materials in the International Commerce today and learning is an indispensable investment, which is going to be required to succeed in the 21st century. Engineering education needs to change dramatically in the U.S. I am very excited about what Princeton and Berkeley are doing. Having traveled to fifty different universities in this United States, I will tell you they are not all as progressive as Berkeley and Princeton. The one thing that concerns me about engineering education is it will continue to teach more and more about less and less until eventually it teaches everything about nothing. That is because engineering changes so dramatically today. Technology is changing every ten years, which is expected to reduce down to every five years, five years from now. Unless we change and teach our engineers more than technical information, engineers will become commodities and technicians on the open market and no longer professionals.

It is important that engineers learn that the world economy is tightly linked, which has been primarily triggered by technology. It is important that engineers understand the different cultures and multi-national teams that they are working with. We have been involved in so many situations where we have been brought into a consortium just to try to figure out how the consortium can communicate and talk to one another to get the job done, because they don't understand the way the different countries work or think, or how the different engineers work or think. Japan is just beginning to learn about project management. When you sign a one page contract domestically in Japan and the government writes you a check for your cost overruns, why would you care about cost management or time management? It is a concept which is very difficult for them to understand. Put them together with aggressive Americans, which in parts of the world have become the ugly Americans, only compared to the Italians who waive their hands at everything and yell and shout in the meetings, you have trouble on your hands. But in the Asian culture those antics and aggressiveness are disrespectful. If you're working together in a multi- national team and you don't understand what is disrespectful, it will breed discontent.

You have to teach your engineers how to communicate. Engineers are the worst communicators that I have ever met. I have a little joke to tell. Do you know the difference between an introverted and extroverted engineer? Since the majority of you are lawyers, maybe you haven't heard this. Introverted engineer looks at their shoes when they talk to you. Extroverted engineer look at your shoes when they talk to you. Engineers just feel uncomfortable communicating, yet it is critical thing to a successful business.

Sustainability—we are living in a smaller and smaller world, which is becoming more and more fragile. We must understand the critical aspects of what sustainability means. How do we build more green buildings that you heard about this morning? How do we make sure that we don't damage the environment with these new mega projects that we are doing today. It's not only how do we manage the environmental aspects of the planet, but as someone said, it is how we manage the displacement of people and their way of life, which can have a major denigration on the company and the country.

Public policy issues—engineers complain to me that they just don't understand why our government doesn't get it. Why do we have these transportation bills which we can't pass? Why do we have an aging infrastructure? Why can't we get funding? My response is how many engineers are in Congress? Engineers simply don't know how to become involved in politics or don't want to be, but it is what makes the world go around. Until engineers understand public policy, not only in the United States, but within the country they are working, they will continue to have a very difficult time in making the team run effectively.

You have heard enough about project management and risk management. It's very critical. It needs to be understood as well as corporate governance. I don't need to raise that issue among this group of how important that is.

We must learn to work in teams. We have to understand intellectual property, political and economic relationships, and cultural diversity. All of this will drive the engineering practice of the 21st century.

In the 70s and 80s the World Bank was concerned about how the mega-projects were going to affect our construction industry over the next decade. The mega-projects are absorbing enormous amounts of capital over long periods, reducing flexibility and development, and are extremely complex to manage. How many people can say they have managed more than one mega project when it takes twelve to twenty years to complete a project? The management people available to manage the mega-projects are far and few between. The shear size of them is mind boggling. Ten years ago we would have laughed if we had said there would be more projects like the Three Gorges Dam, the Boston Big Dig, the Dubai off-shore man-made islands, or the London Channel Tunnel, but the projects are getting bigger. Look at the Panama Canal. Look at Brazil. Petrobras plans on spending more than fifty billion dollars in the next five to six years. To do this, they are going to train 70,000 people in order to build one of the largest offshore oil drilling platforms in the world because there simply aren't enough people to do the work.

So if you are going to be successful, I will give you one word of advice, use your world wide resources efficiently and effectively. Train them. Advance them. Someone said people are the number one resource, the number one concern. It should be your number one concern in your company, but don't limit it to the United States. Look at your rising stars around the world. Recognize the difficulties of working in multi national teams. Recognize that mega projects are more than just engineers. They involve countries, government, and financial institutions. They require different laws, understanding different

procedures, different standards, different rules, different regulations, and all of that requires a different training of our engineers today.

So I applaud Princeton and Berkeley for what they are doing. Engineering education is near and dear to my heart, and I have a passion for what I do because I am very proud to be an engineer. But we must recognize that quality of life is more than here in the United States and more than just U.S. engineers and more than just technically trained engineers. I will be more than glad to take questions later.

KATHERINE GURUN:

Well it seems to me we have heard from a set of extremely effective communicators, many of whom are engineers. We would love to have your questions now.

AUDIENCE:

I am in-house counsel with General Electric. I am also President of the Construction Users Round Table and, for those engineers in the room, a recovering architect. My question goes to Mr. Beck. You said something that caught my attention more than anything else. You made the statement that owners need to relinquish control and that sounded to me very much like the old school of contractors who took the position that if you just get out of the way and let me do my work, I will call you when I am finished. And it seems to me that you would be pushing more towards integrated teams and highly collaborative teams that integrate contractors, engineers, and owners that will drive away the type of tendency that Patricia was referring to a second ago. Did I misinterpret your comment?

PETER BECK:

No. I'd rather emphasize the part that says that we hold those contractors and architects accountable for what we should be doing. Because to a large degree I think today we are not held accountable. The system allows us not to be held accountable. And when I talk about control what I am really getting to is that because owners have been beat up so much over the years by poor performance and unpredictability of the delivery process, they felt the need, justifiably, to control everything, as much as they possibly could through the supply chain. And because of that, we have set up a competition between generals and subs and vendors, etc. Personally I feel if architects and engineers are held accountable for their drawings and contractors are held accountable for organizing the site, the subcontractors will be able to provide much better pricing. But it can't be accomplished in a hard bidding environment. Personally, I believe we are going to play a major role there in getting the information from the subcontractors back up into the design process so that we can design it properly the first time. So I don't mean to over emphasize control. It needs to be a team approach. The owners absolutely have to play a major role in the process, but hold the generals, architects, and subs accountable for what they are supposed to do. And then give them the opportunity to manage it. Have I answered your question?

AUDIENCE:

I am with the Washington Group. I wanted to ask each of the deans what do your students think about the engineering and construction business? And what do you think about large engineering and construction companies and what they are looking for?

DEAN VINCENT POOR:

From a fundamental point of view, this industry relies on a lot of the things that our students are interested in, materials notably. From the point of view of professional practice our students, the students who are interested in this field, are primarily concentrated in civil and environmental engineering. And the main discipline that our students are educated in, aside from the environmental side which may also be relevant, is structural engineering. There is a very close connection between the structural engineering program at Princeton and the architecture school. So the students that we have tend to be fairly broad and many of them do wind up in architecture, but also many of them wind up in design. I do not know how many of our students wind up in main line construction industries and that would be something interesting to find out, but it is not a large program at Princeton.

DEAN RICHARD NEWTON:

I was talking earlier with some people at Bechtel, and I think there has been a really big change. We are finding the number of students applying to our civil and environmental program going up very significantly the last three or four years. I think you can divide this up into two categories. You can divide it into technologies and there is some interest there. And then you can divide it up into large complex one off projects that were referred to earlier. And as a result of interacting with a variety of companies and partners, we have started to develop discussion within the college around how do you build what I call large hairy one off projects and how to do that reliably and manage the risks.

We are just about to start a new center for risk assessment in our college that is funded by a couple of founders of risk management companies that have been very successful. They say that they think every engineer needs to understand risks, at least know what it's about. We don't teach it explicitly, but it's implicit in a lot that we do. That's another important area that we need to teach and connect it to ethics and society. But, what the students are really getting caught up with, are the opportunities to look at infrastructure in a very different way than it has been traditionally. If you say to the students we are going to build, ho hum, get another bridge or get another building, it's not that interesting and it doesn't attract the students. But if you say we have this whole new generation of sensor technology so you can measure all sorts of interesting quantities in a construction project and use them to optimize the dynamics of that project that would save huge amounts of materials or other things that is really interesting and intriguing to the students.

I will give you one example. I sent a business plan to John Dore. I don't know how many of you know John Dore, but John is the investor in Google among other things. He was the lead investor of Kline & Perkins, and he's an IT guy. And the deal I sent him was about cement. I said I think there are some really interesting opportunities; some basic science coming up around some of these new technologies. This particular cement, it's actually technology that was developed by national labs in conjunction with faculty at Stanford and now we have piled on at Berkeley. It uses seventy-five percent less energy to make. I don't know how many people realize this, but the production of cement contributes seven to eight percent of all the greenhouse gases in the world. By weight we produce more cement than we produce any other material on the planet today. So anything we can do to affect cement production is going to have a profound effect ultimately on our planet. This particular formulation happens to use a lot of fly ash. Where do you have a lot of fly ash? From the coal production in China. So it seems like there is a match. So there are all sorts of really interesting things around this technology that gets the students intrigued, but it's around the consequences, the social consequences of new technologies and their effects on the world ultimately that are the real motivators for the students.

Look at that project. What's missing? It is the distribution of the product. Invent a new cement who cares, unless I can get it into the world in an efficient way because the distribution systems have been set up classically in ways that would be very difficult to displace or even parallel. So there is a really interesting business question. How do you introduce this product into the world? Why? What are the properties that would make it better than traditional Portland cement? Those are the kinds of problems that we would love to integrate into our thinking. In other words, we would like you to engage with us earlier than you have traditionally. I would argue that most of the companies here, particularly in the IT technology arena, would say let's see what we can do with it. So it's kind of like we invented technology, we throw it out there, some industry does, and then the construction industry says well how can I take advantage of that. Rather than saying, let's engage much earlier and present the problem to the research community. This is what we really need. This is what would change our world and let our smart students and our smart faculty work on it so that when we actually invent the next IT technology. I think from my point of view, selfishly from a Berkeley perspective, I want to engage with companies to do that, because I think that adds value to my institution and keeps my students and my institution ahead in this global situation that we are in. So my point, is that the students are very excited about this. They are particularly excited when they get a chance to interact with people from the real world and deal with real problems, particularly when they are new and innovative. technologies.

DEAN ROBERT BRUNER:

May I add another thing to that, just echoing a little bit in terms of motivation of students. I think two of the most exciting things to our students in this general subject area are green buildings and green building initiatives, which

involve civil engineering, architecture, and practitioners. It is a very nice connection. And the other is urban planning. In general, the urban environment involves societal issues just like green buildings. It involves the Woodrow Wilson School, architecture, and so forth.

The kinds of things that the students seem to be most excited about are ones that have this broadness to them. Whether it is broadness because of social relevance, broadness because of entrepreneurship opportunities, or other reason, this is the kind of thing that, across the fields in engineering, seems to interest the students these days.

AUDIENCE:

I would like to address the next question to the two engineering deans and Patricia if I may. Have you considered the effect on engineering practice in the new world of training engineers in a graduate program much as we do with lawyers and doctors for example, and not in undergraduate programs, but using the undergraduate programs to give students adequate background on the things that you are indicating are necessary, including reading and writing, but also ethics. Undergraduates need to think about their position in the world and how the world works and how they fit into it. I take it that both of your programs are chiefly involved in training undergraduates.

DEAN VINCENT POOR:

Undergraduates and graduates—we certainly have both. We have more undergraduates than graduate students at Princeton.

DEAN RICHARD NEWTON:

We are about two-thirds undergraduate and one-third graduate.

AUDIENCE:

My question is to all three of you: has consideration been made to training engineers principally through graduate programs; using the undergraduate experience to give them breadth and grounding?

DEAN RICHARD NEWTON:

At Berkeley as we educate leaders, create knowledge, serve society. That's kind of the mantra of the engineer. I think it's pretty common for just about every engineer to have those three components. We say that educating leaders is our special category. To do that we think you have to be on the leading edge of creating knowledge, a research university. By the way more of our undergraduates now have a research experience at Berkeley than we have graduate students. So, one of the big benefits of being an undergraduate at a great school like Princeton or like Berkeley is that the undergraduates have the opportunity to work with great graduate students and the faculty on research related problems.

What we are doing to further differentiate our students moving into this new era is we are saying that the first degree at Berkeley that you will get ideally will be a Masters degree. We have started it with computer science.

We have just initiated it in mechanical engineering. Civil and environmental engineering will be next. So our goal is to say it's a five year first degree and you receive a Masters. The consolation prize is a Bachelors, if you want to go off and do something else, but we are going to set up our programs for that. In the last two years of the program you will specialize and you will either go in the direction of project management, business orientation, or research and potentially a PhD.

AUDIENCE:

That's essentially 180 degrees from what I was suggesting.

DEAN RICHARD NEWTON:

Well no, really the question is what do we do with the extra time? So the extra time is not used for technical material. To your point, again, the T-shaped engineer. The extra time is used for the breadth and for the integration of the engineering experience. Part of the time will be spent on a project somewhere out in the real world as well. But the idea is to invest that time not in more technical depth to achieve the goal of which you are speaking.

DR. PATRICIA GALLOWAY:

Let me address what the professional societies are doing. About ten years ago, the American Society of Civil Engineer started a debate called The First Professional Degree and whether engineering should be a five year program, or whether there should be a masters degree required before moving into the profession, akin to the medical and legal professions. Finally, about three months ago,. the engineering societies, headed by ASCE, came up with what is called the Body of Knowledge. It is thirty additional credit hours over and above the 124 hours required for a Bachelors Degree in all of these areas that we have been discussing—ethics, professionalism, leadership, globalization, communication, project management, etc. to round out the engineer. I realize they have more than that at these two schools, but for the ABET accredited schools it's 124 hours for an engineering degree. It was a lot more when we all went to school. NCEES, the National Council for Engineering Examiners, is the licensing group that controls what's called the model law for all fifty professional engineering licensing boards. Three months ago they just passed a requirement that an engineer must have thirty additional credit hours in these subject areas to be eligible for a professional engineering license.

It is a subject that's been debated for years. It is growing and the reason the numbers growing is because of the discussion on ethics and professionalism. Engineers are finally recognizing what it means to be an engineer, and they don't want to be a commodity, and if they don't become licensed, they are going to be on the verge of going to the technical side versus the professional side. So more and more schools are encouraging licensure and for students to at least take the PE exam as soon as they graduate and encouraging them to go on, but it starts in the school system to encourage that professionalism when they graduate because if it's not encouraged in the school there is very little motivation unless the employer requires it.

DEAN VINCENT POOR:

Maybe I could also comment on this issue. At Princeton, we view our undergraduate education in engineering as a liberal art. The idea is that what we are teaching undergraduate engineers a certain degree of analytical thinking and problem solving. They are learning, of course, domain-specific knowledge about a particular branch of engineering. This echoes exactly what both Pat and Rich have said, that the first professional degree for an engineer is a graduate degree in these days of specialization. So I agree with your premise that in fact graduate education is really where the heart of the hard core engineering education takes place. I wouldn't want to use that fact to diminish the importance of undergraduate engineering education, which is really teaching students a way of thinking, a way of looking at problems, and a way of solving problems, which goes beyond engineering as a discipline. If they want to practice engineering these are wonderful skills, but these are also wonderful skills for financial analysts, investment bankers, lawyers, doctors, and so forth. I think we can take a broader view of undergraduate engineering education. I think you are absolutely right in saying that we should be looking at the graduate level these days.

AUDIENCE:

To follow up on the conversation. It seems to me that you try to pack in a lot of knowledge in four years of engineering education and now you are going to the fifth year to pack in more knowledge. Would it not be wiser to adopt the format that the business schools adopted decades ago where they encourage their students get three to five years of practical experience and then come back for two years for the MBA. I raise this issue because I have had a number of engineers and architects complain to me that the undergraduate education for engineers and architects may be too broad; that they don't come out with the skills that they really need. The architects say they come out of architecture school and cannot complete a set of documents. So wouldn't it be better to train the engineers the basic skills in the four years, have them go out and work for five years, and come back and get the two years of professional education to fill in the gaps that Ms. Galloway is concerned about.

KATHERINE GURUN:

I would like Bob Bruner to comment as well.

DEAN ROBERT BRUNER:

The University of Virginia has the graduate business school, and it is very easy for me to say that I agree with the idea that only professional training should be done at the graduate level. It also happens that we are one of two universities in the U.S. to have a separate undergraduate school of business so we have the capacity to talk out of both sides of my mouth.

There is an immense pressure on universities world wide, and especially in the U.S., to give more degree programs. This is because they are revenue generators. They help to deepen the resource base available. There's a natural

pressure on deans to offer new programs in ways that expand the reach and activity and impact of the school. The fifth year degree program was mentioned as an example and indeed, even in business, the University of Virginia will begin to offer a fifth year one-year masters in science and commerce even though the same University of Virginia has a separate graduate offering an MBA. It will be a lovely challenge for us to distinguish these two degrees on the market, though truly the fifth year MS in our case is intended to help take liberally trained undergraduates prepare for that first three to five years of work experience before they go to a major MBA program. You should know that one of the characteristics of undergraduates these days is a great orientation toward vocational. They are less prone to say I will study Classics or Egyptology or whatever for four years and then I will figure out what I am going to do. They begin to construct courses from the freshman year on with a view toward how will it help them get a job. This is a challenge for us all.

DEAN RICHARD NEWTON:

Business schools actually fund a lot of their faculty salary differential out of professional fees that typically come from people who have been out, worked, and come back and can pay a lot of money. The fifth year that we are adding on—we get compensated only $30 per student credit from the state for the number of students we have in our program. It doesn't matter what they doing so it doesn't really help us. In fact it hurts us a little bit because keeping them a little longer means, we can't graduate as many. We are looking at ways to try to overcome that, but to your point these are things we wrestle with all the time. There are all sorts of pressures that come to bear and different people will tell you different things that they want to see in the product that we produce. And we continually are trying as a faculty, there are 220 of us, to integrate this thinking and come up with the best things we can do for our students. These things move very slowly. We are prototyping it now in mechanical. I don't even think we will get it for another two years just on the basis of the fact that the faculty wants to make sure that what they are doing is ultimately what they need to do. So we are very thoughtful and deliberate in the changes we make, and therefore, unfortunately, it turns very slowly. But all of the factors you brought up are ones we think about and wrestle with all the time.

KATHERINE GURUN:

What do you think about the idea of actually saying to students—take your Bachelors Degree, go out and work three years, and then come back—which I think was your question.

DEAN RICHARD NEWTON:

The fifth year program is based on the advice of my advisory board. Other than Jim Plummer, the Dean of Engineering at Stanford, everybody is an industrial person. These are very senior people who have thought about these issues and know what they need. I put together a task force along the strategic planning lines that Vince was talking about. I said what do we need to do to

educate an engineering leader for the 21st century? I sent them off for close to a year, with a few meetings in between just to make sure they were tracking, with some of my key faculty. A lot of discussion, a lot of debate occurred. They produced a report and that report had many other things in it, but one of the things that they recommended to me was that we should move to this program. I listen very carefully to my constituency and try to optimize the programs around that input.

DEAN VINCENT POOR:

Maybe I could also comment. Very similar to Berkeley, we have a fifth year option. It follows immediately after graduation from the first four years. It is not a continuous program, unlike that one, but the vision is that students will immediately move into it without practice. I don't disagree with your premise that perhaps it would be more motivating for students to get some practice under their belts first.

I would like to comment on another aspect of graduate education that hasn't come up here and that is the Ph.D. program, which I believe is a quite different kind of education than what we are talking about. The Ph.D. program is really an apprenticeship for students to learn how to do research. In almost all engineering fields engineers go through apprenticeships of some sort, either in industry or in a University, engineers tend not to learn the specifics of their jobs in their undergraduate education. Whether engineers who want to work in industry should do an "apprenticeship" before they get more domain knowledge is not clear. I don't think the field has come to an agreement on that. This is unlike business, where it seems to be a fairly standard thing to work before returning to graduate school. So I think this is a kind of thing that we need to be discussing. But I do believe that regardless of whether students get a Master's degree or not, there is a lot of education that goes on beyond the bachelor's degree for any practicing engineer. There is no way we can teach enough material at the undergraduate level, or even going all the way through Ph.D. level, so that a student can just pop right out and know exactly what he or she needs to know to have a productive career.

AUDIENCE:

I was very interested in Dean Bruner's description of what leaders do, and I wondered are leaders born or taught. Can you teach those qualities in leaders and do you at Virginia and do you the deans of the other schools actually teach leadership? Can it be taught and how?

DEAN ROBERT BRUNER:

The answer is absolutely we do. We believe it can be taught. It's naive to believe that leaders are simply born. Plainly some people come into the task of leadership with attributes that make it easier for them to perform that function, but our mission statement is to better society by developing leaders in the world of practical affairs. The phrase practical affairs come from the writings of Thomas Jefferson whom we hold as an icon. He was the founder of University of Virginia and a person of great vision and action taking. So we aim to

arm students with a competency they need to be able to perform the definite tasks of business administration, but beyond that. Give them great challenges in team based settings. Often these are negotiation exercises or project problem solving exercises. Virtually our whole teaching approach is an interactive experience. We teach by the Socratic method at the Business School. This is the famous case method where the problems are messy. They are ambiguous and the challenge is to make meaning and make sense and above all to take action based on what may be imperfect information. All of these build toward those six criteria that I mentioned. To a large extent, I believe that in the post graduate years our graduates go on to seek a series of assignments that deepen their leadership capabilities.

But our philosophy is consistent with one of the comments made earlier in the day that first leadership knows no office. That specifically means that you should lead from where you are. You should either lead from the front line, the middle, or even the top of an organization. Second, we believe that leadership comes in many packages. The work of Howard Gardner, Professor at Harvard, has illustrated to many of us the variety of way in which leaders lead. They lead in intellectual terms, social terms, in the standard administrative fashions that we all know. Would we say that Gandhi was a great administrator? Who knows? The odds are he was not all that great, but he created a vision and movement out of pure moral example. I think we could point to many others outside of the realm of CEOs or division heads who performed those functions of leader that I outlined for you earlier. So much of the leadership is helping a very talented individual find his or her center. It may be a moral center. It may be an intellectual center or an administrative capability, but a center from which he or she can go into the world and have great impact.

DEAN VINCENT POOR:

I would echo that general analysis. I would say, rather than teaching leadership, I think it is something that is developed in students. And one way to do that is to teach some elements of leadership. Another way is to expose students to leaders, proven leaders. This echoes the case method as a way of trying to teach a complex subject like leadership. Bring leaders in to talk about their experiences. That's something we have tried to do a lot of here, i.e., we have used examples as a way of trying to develop leadership in students. I believe that leadership is innate and educating leaders is more a matter of bringing it out than of putting it in.

DR. PATRICIA GALLOWAY:

I just want to add one more thing as well. I think developing leaders requires building confidence. I see that so many today are not confident in what they do. And if you are not confident it's difficult for you to lead. In order to build their confidence you have to give them opportunities. If you don't ever allow them to take a position to demonstrate they can be a leader and be confident in that role, then they will be hesitant to try to do that. So it's almost a two way street with what you were saying in trying to develop people to allow

them to find their own center. And good leaders will do that. They will train other leaders, because really good leaders don't have a desire to be the only leader. In fact, in our company, we have a practice to always hire someone who is smarter than you because they will always make you look good and they will do the work better. So, it's really important to build confidence.

KATHERINE GURUN:

I don't mean to make you work too hard Dean Bruner, but I have a question for you. Many of us here are lawyers and by and large we write bi-lateral treaties called contracts for multilateral situations called projects, which as everybody here has said have become increasingly more difficult and more complex. Demanding more interdisciplinary skills on the part of all the people involved. And Peter talked about the need for accountability to increase, which of course lawyers will translate into harder language. You just wrote a book about deals from hell. Is there anything in the real world that you could share with us that we could translate into design and construction?

DEAN ROBERT BRUNER:

Thank you for the opportunity to advertise my most recent publication. You can find it down at the book store. So the book in essence flows from what many of you may be familiar with: systems thinking. The complexity theory is now one of the hot frontier subjects in business administration. The complexity theory merely says: we all live in an interdependent system. Anne-Marie Slaughter's notation of a network is entirely consistent with this outlook. The complexity theory then says pay attention to the world around you and the interrelationship of all the pieces. This often flies in the face of the common desire of businessmen or women to make meaning out of a big failure by finding one prime explanation and forgetting the rest. The great lesson of the large mergers that failed that I have featured in my book is to know that there is an enormous web of connectivity and there are many factures that flow into it, and so I describe a perfect storm or convergence of factors in these cases that include great volatility. There's something that is going on in the environment that perturbs the system. There are few buffers, few shock absorbers that protect that enterprise in the event of a really adverse outcome. Managers do things that inadvertently raise the risk exposure even further. Managers and others tend to be overly optimistic. Over optimism is a common feature in all of these large failures.

Finally sure enough something really goes awry. There's a triggering event of some kind and finally the people on the front line do the wrong thing. They delay, they deny, they take the wrong action, or they decline to take action in a way that is meaningful. You can find these footprints in every large failed deal. I've looked at other kinds of large business failures and see the same footprints there. The implication for attorneys, managers, and engineers is that to avoid the simplistic thinking of finding a single cause of egregious failure and instead look for the web of connectivity that contributes to the large failure. I'm sure that's what the discovery process in lawsuits amounts to, but it bears

reminding. CEOs, journalists, security analysts, and others must remember that the world is not easily reduced to one single cause.

DEAN RICHARD NEWTON:

Let me add something to that. We should spend more time as joint professions studying the motivations of those that are responsible for the work and why they are motivated to do what they do. For instance what kind of agreements are the people signing that you are preparing the agreement for, i.e., if you are preparing an agreement between architect and an owner, what kind of things does the architect do that causes all these ramifications through this network of individuals. If we spent more time looking at that opposed to just blindly pushing the risks down or across or at least out of the way, we might find that we actually improve the efficiency. Of course we are not paid to do that obviously, and you as attorneys are not paid to do that. But you would probably have gotten to a point. I saw a contract the other day that had liquidated and consequential damages, which I guess I hadn't seen before. I spoke to the contractor, and all of a sudden the schedule got longer by about six weeks. That's not a big project, so I asked the project manager what happened. He said the owner made some changes and so on and so forth, the subcontractor came in with changes and so on and so forth, and the schedule turned out to be six weeks longer. Well I guarantee the sub, and the general and the architect know more about what's causing that schedule delay. They could take the reverse approach and say: I'll take the risk of the time. I want to make this change. Then everybody gets on the same page together.

AUDIENCE:

This is a question that I hopefully can get an answer from the entire panel. For those of us who've really been involved in construction for many years from legal and other vantage points, we've always heard about the shrinking pool of engineers, architects, etc., but in particular for the schools, for the professional association, ASCE, from the industry, has there been any coordination or reaching down into the high schools in order to encourage students to consider engineering, because as the father of a 22 year old for whom it was "well I'm not good at math" and forget it. And no one has really seemed to be going down to that level to encourage the boys or girls to get into it. I'd like to hear from whoever wants to speak on it.

DEAN VINCENT POOR:

I can start out here. First of all I am happy to say that at Princeton we have the largest freshman class of engineers in history. So the trend is not going in that direction here. Perhaps you know that, in Massachusetts, there is now a state curriculum requirement for high schools to include engineering. In New Jersey, we are developing a very similar proposal. So I believe that in a few years, partly as a response to the forces you mentioned, we will start seeing engineering as part of high school curricula nationwide. And this will do a lot to expose young people to the field. I have talked with high school seniors who have had engineering courses, and it really gets them interested in the

field. They just had no idea before that what it was about. I think there's no question that we have to address awareness of engineering and appreciation for engineering at the secondary school level. And it seems to be happening, at least here on the East Coast.

At Princeton we already offer a course on materials for high school students. It is offered at a Middlesex High School, which is a large high school nearby. And there are courses scattered around in other disciplines, but this type of curricular action would create a broader introduction of engineering into secondary schools, which I think would be wonderful.

DR. PATRICIA GALLOWAY:

One of the projects that I have been very fortunate to chair is called the Extraordinary Women Engineers project. This was started in 2003 with National Science Foundation funding along with money donated privately, including Stephen Bechtel who donated a significant amount of money for the project. Some funding also came from the United Engineering Center. Why did we do it? Because, we are very concerned about the enrollment of women in engineering. The women enrollment in engineering is going down. It was at 19% a couple years ago and it's gone down to 16% and there is a fear that the trend will continue to go downwards. So the question is how to attract females that are already technically inclined in their schools, because now it's like 50/50 in math and science in the high schools with girls exceeding boys in some subjects even making better grades than their male counterparts, but the girls are not going into engineering.

The first research project that we did, involving a coalition of eighty engineering organizations and universities, was to interview 8,000 girls across the U.S., ages 14-17 with different backgrounds, gender, ethnicity, and schooling-- public and private. They all had similar responses to why they weren't choosing engineering. The first answer was: they didn't have a clue what engineering was, because it's not being addressed in high school. But the second most common response was: "Why are you selecting me, do I look like a geek?" It is quite a concern because girls want to be popular. The third reason was: Isn't that what guys do, not girls. The fourth reason was I want a career that helps people. Obviously that's what engineers do. So we have a very bad Public Relations image out there for engineering, and we need to correct that. We just received a 1.6 million dollar grant from the National Science Foundation. WGBH out of Boston has a program on TV called Zoom into Engineering on PBS, and they do a lot of the mega project engineering series, but they have been tasked as part of our coalition to develop teaching aids for teachers in high schools. It will be fifteen to one hour segments on engineering that will portray our society as a whole. It will show different people doing different things in engineering to encourage kids to go into engineering. We have already published a book entitled "Changing Our World" highlighting women engineers in all disciplines. I would encourage you to look it up-it is available on Amazon.com.

AUDIENCE:

They had the Ace program, which involves local chapters of engineers around the country setting up mentoring programs with high school students.

DEAN RICHARD NEWTON:

I think what we have to do is separate this problem into two parts. One is what are we going to do that's really going to make a difference on a large scale. Part of the challenge we have, and Steven Bechtel speaks to this one too, is we have lots of small programs distributed all over the place that are extremely well motivated. They are probably in their own way quite effective. They are all looking to raise money to support there programs and there is a lack of coordination. If we could get these programs together and establish the best practice, it would make a big difference. So when I look at it as a dean, I say I am willing to help in whatever way I can, but it's a drop in the ocean relative to the size of the problem and the challenges that we face. And we need as a society to decide that it is an important problem for us to work on, that's the bottom line.

Let me tell you about one more tool we are using, that is our alumni. The ISEE prepared some material, which is on their website that talks about what an engineer is and what they do. As our professional engineers retire in larger numbers, they are people that don't want to stop working. They are not all great teachers, let me be clear about that. That said, we are encouraging our alumni society, we have 54,000 alums, to use this material and volunteer at the local high schools and, with a teacher, go in and talk about what an engineer does and try to leverage that work force. So there are opportunities, but we must get our act together.

DEAN VINCENT POOR:

What Pat said about the issue of social relevance is very important, particularly to women students. Our freshman class is about 35% women. We have been promoting the idea of social relevance of engineering for some time, and I feel that this has had a major effect on the attractiveness of the field to women students.

AUDIENCE:

I am the President of the American Institute for Steel Construction. I have listened to the deans tell about the changes in their program, adding the credit hours, little about registration, the need for additional credit hours, etc.. On the panel today, we also have a customer of these people, Peter Beck, who's been with the organization annually out there looking at engineers, interviewing a lot of college graduates, employing them. My question to you is: Are the universities' education systems staying up with the education that you need for the people you are trying to hire? Are the graduates prepared, and are you finding a keen level of interest coming into the construction community out of the civil engineering or the construction management program?

PETER BECK:

Because of our business model, which is integrating architecture, construction, engineering, and development, we have great difficulty in finding people to fill that role, because one has to have a working knowledge and a respect and appreciation of the other disciplines. Most people we are hiring from architectural schools or engineering schools come to the table being suspicious of the other. And it only gets worse in the conventional world. And so we spend much of the first five years working with young architects and engineers saying excellence in design is something we aspire to. And, oh by the way, when we are talking to our architecture interns, etc., we impress upon them that the budget is really critical. I like something Bill said earlier about give me the budget and let's work from there. We are not getting the people we want, but I can't really complain about it. That's just the way life is, and it's our obligation to make sure we change some minds if they are going to stay with us within the first five years.

KATHERINE GURUN:

I think we have a rebuttal here, yes.

DEAN RICHARD NEWTON:

Let me tell you what we are trying to do to meet that objective, which is rather than teaching engineering from the silos, we try to create vision that we sometimes call a moon shot. There's a book by Donald Stokes called Pasteur's Cauldron. If you haven't had a chance to read it, I strongly recommend it. He talks about is what he calls use of inspired basic research. It's not applications, because that's what you guys do, but if we can be inspired by a purpose. So if we picked a problem, say we want to cure malaria in the developing world. To do that there are policy issues, business issues, distribution issues, technical issues, all sorts of things. If that problem is what we use as the focal point, it automatically breaks down the barriers and pulls people together around the problem, so the real challenge for us is picking the problem. So then the real opportunity for us in terms of working with our constituents and our customers is picking the problem. If we pick the right problem, people come together and by the time, they come out of our program, they have had an opportunity to work with each other, and they have that respect. They develop that relationship to some instinct. So we are thinking about how we can do a better job of that. For us at Berkeley, it's the development of inspired model, and we create centers around those models. The cement problem: The effort to get that technology out into the world is going to require corporate partners, it's going to require—we're just talking about the risk center and a gentlemen from Bechtel was saying: I'd love to be involved and can give you some case studies. So if we talk about those kinds of problems that will bring in public policy and an interdisciplinary team to address the issues collectively.

WILLIAM HELLMUTH:

Here at Princeton you are working very hard on this. But I went through a program here—I graduated in 77. I saw first hand how it starts with the fac-

ulty—how the architecture faculty felt about the engineering faculty and vice versa. Fortunately, there was one superstar here who is still here named David Billington, who was able to cross those lines and he was my advisor. I think he also was Preston Haskell's advisor. I think it may be based on individuals setting a vision. When your budget for the next year is set by the total number of hours taken in the prior year, I can see how it would be hard to encourage a student to go across the street and take a class in another department or school. And I know that's not quite the way it works, but in some colleges it does. I think it's a struggle.

DEAN RICHARD NEWTON:

It used to be. I think back in your day absolutely, totally agree with that in my day. I don't see it that way anymore. We do all the things we can. We make teaching equivalent across all departments. You would probably do the same.

DEAN VINCENT POOR:

Yes, we have very similar situation.

KATHERINE GURUN:

I'd like to hear from any other contractors or owners who take new graduate engineers.

AUDIENCE:

I fit in that category. I am CEO of Haskell Company. We are an integrated design-build firm, and we hire architects, engineers, builders, and lots of other staff. I have a somewhat different and fundamentally optimistic view about the hiring and education process for engineers and the prospects for industry as a consequence. The reason for this is that there are four significant trends that operate together in a positive fashion. And for me they are these: One, the industry is restructuring and transforming toward a more integrated less desegregated model. There is a reason why Peter's company and mine are organized the way we are. People like Bechtel have been there a long time, but there is an integrating trend. Our students find that attractive because they have more career opportunities. When they come into a company, they don't have to decide on day one what they are going to do for life. They can be builders. They can be engineers. They can be different things and that is inherently more interesting and more attractive to students.

The second significant trend is the virtual work that both our deans and our panel have described. After a lot of evangelizing within the industry, education is finally getting it. Patricia made some very important comments about education and the licensing process, adding more credits, recognizing you can't fit into a typical four year program what you need to. There needs to be more liberally educated engineers, and I was despairing for a long time whether anybody was listening, but there's clear evidence that the more progressive universities are figuring that out after a lot of hollering and screaming and everybody else will follow shortly. So education is slowly getting better,

and I'm grateful for the leadership of your two institutions in doing that and it's catching around the country. So that's positive trend two.

The third one is something that Patricia mentioned and that's the role of women—well she mentioned more in a declining numbers of women. We are pretty obsessive about doing a lot of testing evaluation of entering people—intellectual tests, but also personality profiles, etc. While disproportionately small in number, women are disproportionate at the top of how we evaluate recruits. They are approximately equal in terms of the intellectual acuity and skills, but they are superior in other areas, they are more highly ranked, and they are getting more job offers. And that's true across the board. So the way I look at it is, because women are a relatively small number, there is an untapped or under-tapped pool of applicants. Positioning and articulating engineering as an acceptable and desirable profession to women is a big, big opportunity for the profession. I think law was there thirty years ago. Women were twenty percent and that's no longer true to the great benefit and credit of the legal profession. Engineering needs to go through the same thing.

The fourth point: The gentlemen mentioned Charles Thornton's ACE Program, and we are a participant in that. I think it's an extraordinary business model, because it illuminates what happens when you take these kids from under-privileged backgrounds, under-privileged schools, and expose them to the possibility of careers in collegiate life. They light up. In our experience, the kids gravitate more toward engineering than construction or architecture. There is something about it that captures their minds and what needs to be done with the kids is to get their high schools into stronger curricula so that they will graduate high school students prepared to access the high quality education available. Now that is a bit of a problem, but that's solvable.

The last big trend is global demand. We had an awful lot of global talk, and we will have more of it before we are done here. There is an underlying strong and unyielding demand for engineering globally. This demand creates higher salaries and possibly higher salaries attract more people into it. I see significant upward mobility in salaries, that's a good thing too. So when you put all those together, I think the fundamentals are positive. I am optimistic for the future of engineers and engineering, both in this country and elsewhere in the world.

KATHERINE GURUN:

Thank you very much. I want to point out some things which are a little bit contrary to your positive trends. Several major engineering construction companies find they can't hang on to their new graduates. They have complex new graduate programs. They can't hang on to them. Part of this is the salary issue. They bring them in at tens of thousands of dollars below where they bring in new lawyers, and they fail to provide adequate career path mapping. It takes an engineer roughly twenty years in some of these companies to reach what would be the equivalent of partnership in a law firm or senior managing attorney in a corporate counsel situation. This is devastating. When you add the fact that a lot of these companies have great tentacles that reach deep into foreign countries where they outsource engineering, but they have not made

a commitment to create leaders out of their engineers in foreign countries. Their top ten or twenty percent leave every year to go to work for somebody else. They might go to work for someone like you. You are not as big as these companies, but you may offer them the opportunities, particularly in the U.S., that they wouldn't have otherwise.

I want to push on a little bit and drive a little harder here, because I agree with Bob Bruner's suggestion that leadership is the crisis. In spite of the great efforts that the schools are making, I think corporations have a long way to go in terms of shaping and developing leaders and committing to development plans. Unless we do this on a global basis we are going to be severely challenged. So the question for the group is: Are we talking about American continued preeminence—is that important? Are we talking about more and more global collaboration? Is it okay for engineers in another country to have the lead in certain technologies, certain issues, certain things? How do you all feel about that?

DEAN RICHARD NEWTON:

I find whenever we have these conversations, those two vectors that I started out with—the personal vector and the business vector—always get confused. It's really important from my point of view to keep them separate. What is in the best interest of the corporation and really Pat's points about leaders in other countries and developing them and making sure that they succeed, that's important from a corporate point of view. Even personally I can respond to that, but when I think about the United States, I feel that unless we can retain our leadership, right, we can't do anything else. I came here thirty years ago. I raised my family. I got my degree. I started a few companies, created a lot of jobs. I pay my taxes. I live in a community. It's really important to me that that community and my children's community and hopefully at some point my grandchildren's community, is a great place to be. And I worry about that when we confuse these two vectors, and we think more about helping the rest of the world. Let's go help Chinghua University in China. The vice president of research at Chinghua came over to Berkeley about three months ago, intellectual in-sourcing I call it, bringing the intellect in to the university. My industrial advisors said this is what you should be doing Rich. It's not something I simply came up with. When this vice president came over, he said "we just signed an agreement and now you can send engineers to Chinghua and help educate our students and isn't this fantastic." And I said "I have another proposal. I've got ninety acres just down the road here, why don't you build a campus here." He replied "what do you mean." I said "let's have a Chinghua campus here at Berkeley. You send your best people over here, we will work with them, and they will go back. We will have an opportunity to develop and work and develop a culture that we will ultimately export through these people. Soft influence those kinds of ideas." He said "no one has ever suggested that to me before." We always think as America about going over and helping people, which I am not saying we shouldn't do. I absolutely think we should do that. However, we have to get it here first.

KATHERINE GURUN:

Actually my point was different. My point is that, although I think helping the world developmentally is by definition a good thing, for America or multinational corporations to succeed don't they need to develop talent globally?

DEAN RICHARD NEWTON:

Absolutely.

KATHERINE GURUN:

What you are saying is that you would like to maintain super, if not preeminent excellence, here.

DEAN RICHARD NEWTON:

I like Bechtel and its Bechtel vector as distinct from its personal vector. Say I need to invest in the Bay Area or in the Princeton area, because there is a set of skills that are critical to my business, but I want to do that in collaboration with people who have a vested interest in that same thought. Now that doesn't mean Bechtel shouldn't invest in China or other parts of the world as well.

KATHERINE GURUN:

So let's say that's good. Then do you also collaborate with Universities and other corporations internationally?

DEAN RICHARD NEWTON:

You have to.

KATHERINE GURUN:

Okay. But your concern is that we don't diminish resources here to the detriment of your center of excellence would that be a way to put it?

DEAN VINCENT POOR:

I would offer a slightly different perspective on exactly the same question. First of all, we hear a lot of scary stories about the U.S. producing only X thousand engineers and the Chinese are producing 300,000 per year and India 400,000. I don't know what the exact numbers are, but that's actually very good news because the U.S. is still the dominant economy, and if China and India prosper, the U.S. is going to prosper even more. We are going to be selling things to these prosperous middle classes that develop in these countries. So I personally don't think we should be afraid of it. I think we should applaud that. Of course, we still have to be careful that we don't give up something that we are preeminent in. Right now, engineering education is one of those things.

DR. PATRICIA GALLOWAY:

I want to add a little controversial aspect to that. With my position on the National Science Board, one of the things that we have been talking about for

the last year is international collaboration and partnerships. And the United States has recognized that we may no longer be the preeminent society that we have enjoyed over all these years. There are emerging engineering technologies that are coming out of other countries that are far superior to what we have in the United States. We are beginning to recognize that and so there is a mandate from the President to the National Science Board to determine how international collaborations can take place with other countries to exchange technologies and people in order to solve the world global problems, such as global warming and natural disasters and the things that one nation can't resolve by itself. I went to an APEC meeting in Singapore two weeks ago, and it was very interesting because hearing from the Asian nations that they believe that the United States is the most dysfunctional nation that they have ever dealt with relative to research and funding and collaboration, because our State department. Unfortunately, we have lots of agencies, but they are not very coordinated and so they are not giving a lot of direction. In fact USAID has gotten rid of their international engineering group that they used to have, which we are recommending that they restore, and it' a big concern.

The other thing is the brain drain. While you indicate that the foreign researchers are going to return home that is not what they are thinking. For instance the Philippines believe that when they send their researchers to the United States they are not going to come back. China had the best response, they said they don't have that problem because they take care of it in a certain way, but we can't do that here of course.

Of course it all comes down to who pays for it? Who does fund these international collaborations for us to exchange, because nobody wants to put up the money to do it. And that's where Katherine, you come in relative to the corporations. Multinational corporations already have the assets. They have the international assets. They have engineers from all around the world. All they have to do is train them and move them up. And they will be able to effectuate exchange of technologies and information and collaboration with universities. But we are not doing enough of it as far as I'm concerned. And we are becoming way too insular, which is going to hurt us, if we're not careful.

DEAN RICHARD NEWTON:

You know again what you are saying is not inconsistent with my view. I just want to be very clear on this. I am not saying we should not collaborate with people. In fact I would say to identify, attract, recruit, and retain the very best people, you have got to be able to identify them and that requires collaboration. So collaboration is kind of central to it.

What I worry about is when the Singapore government says to MIT "why don't you build a lab over here and put a branch of the MIT campus over here," and there is no reciprocal investment. I like symmetrical relationships. I don't mind if Singapore says I will put a lab in Berkeley, and I will put a lab in Singapore, and we will work together on a problem. That to me is a relationship where selfishly, I can see a mutual advantage. So again I am all for international collaborations. I think they are ultimately critical to sustaining excellence for the reasons that you mentioned. I just think we have got to

think carefully about them and make sure we structure them in such a way that they work for the U.S. as well as internationally.

Now to your point about people gong back. One thing we can do better is to solve the problems with the Visas for the students that come over. We bring thee great foreign students to the United States. We give them the best education that they can possibly get anywhere in the world, and then we insist that they go home, because we won't give them an H1B and we won't give them a green card. And we run out of H1Bs in the spring and we have students lined up through July and they are out of luck. So, I think we should staple a green card to every degree we give a student.

We have invested in the person. We should say "you are now welcome here in America. If you choose to go back or if you choose to work for a multinational corporation that's fine." I don't mind that, but at least let's not turn them away. Right now we are turning them away. We are educating them and we are sending them back.

DR. PATRICIA GALLOWAY:

But, Rich, don't you think for national security purposes that if we build a capacity in other countries, and we do send them back so that we do build their capacity so that they can operate as a developed nation that that does protect the United States. That is to our advantage, because, if we impoverish these nations, it leads to major security issues, which is part of what we are looking at on terrorism because it breeds unrest. And so, if we don't assist in building the capacity of these countries, we, as a nation, will be hurt.

DEAN RICHARD NEWTON:

I hate to dominate the conversation, but just one more shot at this. I am just not a protectionist. I think we ought to let those people decide as they graduate where they want to go. We just want to give them more options. A lot of these people do go back ultimately for family reasons. In fact Bruce Chizen said he was recently in India, and one of the big advantages of Adobe in India is that if you work there for five years you get to come to the United States. It really speaks to your earlier point. This used to be a big attribute, if you worked for Adobe for five years at its facility in India, you got to come to America. And when he was in India this year, he asked the question "how many of you are thinking about coming to American" and not one hand went up. These people don't want to come to America any more, because they have got cell phones and shopping malls and they have got their family and their food and their culture and everything there. The world is catching up as someone said earlier, and I think that's important. My point is, I don't think we should try to legislate the fact that people should go back for exactly the point you made that all these other countries are looking at us and saying you guys are completely screwed up and we are doing better over here than you are, thank you very much. I just think it's shooting our self in the foot.

KATHERINE GURUN:

Now I want to make sure that if we have other questions we want to take them, but I want to kind of draw the threads together on what a leader in engineering looks like? So I want to come back to the question that I asked Rich initially. I don't think you answered it. What is an engineer to you? What is an engineer at Chinghua University? I do think there is a great difference, but I'd like to hear your view.

DEAN RICHARD NEWTON:

Bob Bruner and I just had a great conversation about this actually during the break because he asked me that same question. Many of you have engineer degrees. So, how many engineers stay in engineering? Which raises the question of what is an engineer? I would argue that a lawyer that has an engineering degree is still an engineer. I would argue that a CEO that has an engineering degree is still an engineer. Engineering is something different. It doesn't mean you need to be a technical person. An engineer has a set of skills that have to do with analysis, design, balance, risks, and all of these kinds of things that give you a toolbox that allows you to approach problems in a particular way. This has proven itself to be very effective. There are more CEOs in fortune 100 companies whose first degree is an engineering degree than any other degree. So I don't know how to define it or how to capture it or how to do a better job of expressing it.

In terms of the international people, there are different levels of training. That's why we say educate, not train. There are a lot of people who get trained. Training is about the data, it's not about the tool. And I would say that there's a whole spectrum of different kinds of skills that our students get and students at other universities get as a function of the opportunity they have to interact with mentors, to do all the kinds of things we were talking earlier that represents a great education.

KATHERINE GURUN:

And I just want to draw the analogy to Chinghua. I want to focus on the Chinese universities because the Chinese engineering schools train their engineers extremely well in very narrow discipline. So you will have someone who is an expert in wave technology and some minor detail of how to design certain kinds of coal mining facilities. So when a major company goes to China to hire engineers they get engineers that have been trained in very narrow areas, and they haven't had any general manager training usually.

DEAN VINCENT POOR:

I would agree with those comments. The trends that we have been talking about today in American engineering education have not swept the world yet, maybe they will. By the way we get extremely good graduate students from Tsinghua University. They are very, very well prepared. But it is a narrower education than what we would like. A little earlier I said that we like to think of engineering education here as a liberal art, and that is exactly what Rich was

articulating. Engineering is a way of thinking, a problem solving approach to things with a set of skills that allow you to do that, understanding of risks, analytical skills, and so forth. Of course the engineering disciplines have very specific knowledge bases as well, but those are not as important as the general way of solving problems.

A question was asked about what percentage of our engineers really become engineers. I would turn that around a bit to say that I think it is great number. A lot of CEOs are engineers, a lot of investment bankers are engineers, etc. It doesn't bother me that students move from engineering into other fields, because I believe the skills that we teach are very relevant to society and can be useful in all walks of life.

KATHERINE GURUN:

So Bob, putting you on the hot seat, what would you recommend engineering schools do differently to create leaders based on our three hours together?

DEAN ROBERT BRUNER:

I will answer that by telling a story. Jeffrey Immelt visited our University two days ago, and I spent considerable time with him. General Electric chooses a few universities to partner with in engineering, business, medicine, and the like, and he was coming to announce that Virginia had been selected. We talked at great length about his philosophy and how it felt to be stepping into Jack Welch's shoes and the like? And he said the big the difference between the two of us is that Jack Welch had the philosophy of choosing managers for different businesses according to the so called "best available athlete" theory. You just took the best talent, and you assumed that he or she could make the leap from turbines to medical equipment to running NBC to doing whatever. Immelt's view is different. He says domain knowledge is important. Domain knowledge is an understanding of customers. It's an understanding of the demand side, of understanding who wants things, why and what shape and what package. That domain knowledge doesn't transfer as well from turbines, to medical, to NBC, and so on. He was looking more discreetly at the kinds of skills it takes.

I think that we've heard a good exchange over what is the relevant domain knowledge for engineers. What is the domain knowledge for CEOs is the same. Graduate schools are wrestling with the issue of how broadly or narrowly to prepare their people. I would say Stanford, Virginia, Princeton, and Berkeley are all voting with their feet to say the rigorous mastery of the tools and techniques is essential, but there has to be more. And I think that's a very hopeful sign for us. The something more is the sizzle. It's the leadership piece that will actually take that domain knowledge and do something with it. Respond to customers. Perceive needs in the world and so on.

I get a proposal a week from an Asian business school seeking to partner with our graduate school of business. I am very tough minded about these proposals. The question is: How can we best serve our profession, business

administration, and globalization? The world is flat surely. We should strike up lots of partnerships and cast our knowledge much more broadly. The question is not one of breadth, but one of effectiveness. Where can we carry our training to an audience and then to a profession to have the greatest effect?

I have been to Asia a number of times in the last ten months, and on each trip, I visit schools and there is a certain bowing and scraping that takes place. The other dean hosts us to an elaborate lunch and then begins a long monologue of how great the school is. At this one school, the dean began by recounting how his business school had partnerships with thirty-four American business schools. My interest in that school evaporated.

What is the domain knowledge that the school wants to build? What is the leadership philosophy, what are the principles? How do they care about the method of education, lecture versus case method and so on? I will be very disciplined and focused but I expect sooner or later we will broaden out globally, but that's kind of multi sided response to your question Katherine.

KATHERINE GURUN:

Thank you. Peter Beck, what I think I heard from you is that you would like to see people come to you who have more business background, who have been through an internship or training or experiences that teach them how to handle these complex elements of development, who have some business sense about them in addition to technical expertise, but have real discipline to drive the project home and to stay with it. Not to be the intellectual provider of advice, but be the person who makes the hard decisions about how to get it done on budget. All those things would be helpful I think in engineers sooner rather than later?

PETER BECK:

I think that's right. You know it's too much to ask for them to have experience. I think that the intern programs that start early in the college years give good experiences. We get to know them, they get to know us. But the most important part of the experience is just the broadness of the exposure. The problems we are dealing with increasingly are not engineering problems. Yes there are engineering, construction and architecture problems, but it's how do you resolve both the architectural and the engineering problems and still work very effectively with the owner. We often find that the best project managers are not the best project engineers in their early years. They are not technically that great, but they have a deeper understanding of how people work. How people are motivated.

KATHERINE GURUN:

It's a very complex set of skills. Pat do you have anything to add to the final definition that we are working toward: what makes a leader in engineering and what we should do about it?

DR. PATRICIA GALLOWAY:

Engineers solve problems, and we have a lot of them today, but it's going to take the leaders to rise up to be able to solve them. I think what we as an industry and academia and government have to focus on is assuring how to get the right skill sets to these individuals whether they are in school now or out of school, and we need to retrain them, if we are going to be successful in the 21st century.

PHILIP BRUNER:

I am reminded of the advice that one Marcus Vitruvius Pollio gave to his boss. He was an engineer, but he was no ordinary engineer. He happened to be the chief engineer to Augustus Caesar and Julius Caesar and he wrote a treatise 2,000 years ago in which he discussed what made a good engineer and that included a broad liberal arts background as well as all of the tools and details of the trade. It's interesting that even 2,000 years later we are still addressing the subject.

With that we are going to be adjourning for the day. Thanks.

Delivering the Future: Technology, Risk and Reward

Moderator:

John W. Hinchey,
King & Spalding,
Atlanta, GA.

Panelists:

Mark E. Reagan,
Chairman, Willis Construction Practice,
Willis Group,
New York, NY.

Lynn Marie Schubert,
President, The Surety & Fidelity Association of America,
Washington, DC.

Michael A. Wilke,
Chief Operating Officer of The Americas,
Parsons Brinckerhoff Inc.,
New York, NY.

Thomas J. Stipanowich,
Professor, Pepperdine University Law School,
Academic Director, Straus Institute,
Malibu, CA.

The Hon. Sir Vivian Ramsey,
High Court of England and Wales,
Queen's Bench,
London, UK.

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JOHN HINCHEY:

Good morning everyone. Welcome to the third session of this symposium on "Building The Future." Before we began this session, I would like to ask our Chair, Phil Bruner, to introduce a special guest.

PHILIP BRUNER:

I am pleased to see everyone here this morning. I hope all of you will be sure to stay for lunch. The reason is that we have amongst us this morning someone who had registered for this symposium but was unable to attend yesterday because of official business. He is here today, and I have asked him to make a few brief remarks at lunch regarding global engineering and construction. In my judgment, he has about the toughest job that anyone holds in this field. He manages 34,000 employees, a multi-billion dollar budget, has operations all over the world. We are pleased and honored to have with us the Commander of the U.S. Army Corps of Engineers, Lt. General Carl Strock. Thank you General for consenting to make some brief remarks at lunch. We look forward to hearing from you.

JOHN HINCHEY:

This morning, we are going to focus on three groups of issues. The first issue group has to do with the allocation and transfer of construction risk. No one wants construction risk, but, yet, it doesn't go away. And so, we spend many hours at the negotiating table, pushing and shoving construction risk among the parties to the proposed contract. Typically, I represent owners, employers, sponsors, developers, and lenders on the money end of the project; and, for the most part, we try to push construction risk down to the contractor. But, as we heard George Conniff say yesterday, the contractors are beginning to push back, and push back hard, to the point where they are willing to walk away from jobs when they do not want to take on certain risks. So, what do we do with the construction risks that are left on the table? Enter the insurance market: Enter the bond and letter of guarantee market. Nevertheless, even the insurers and the surety bond issuers have certain limits of capacity and limitations on their appetite for taking on construction risks. So, what are these limits? What factors drive the insurance capital markets; where are the markets now; and, perhaps more importantly, where will they be in the next few years? These are some of the questions that we will address with two of our very distinguished panelists: Mr. Mark Reagan, who is Chief of the Global Insurance practice for the Willis Group; and Lynn Schubert, President of the Surety and Fidelity Association of America.

The second issue group that we will focus on is a relatively new project delivery system. Of course, I have reference to alliancing. It has been discussed and written about often, but I suspect that many of you are like me and have not had much, if any, direct experience with alliancing. So, we looked abroad and tried to find one of the most experienced professionals in the use of alliancing. We found Mike Wilke, who is the Chief Operating Officer of the Americas for Parsons Brinkerhoff.

The third issue group that we will address is the current state of dispute resolution in the construction industry. In the latter third of the 20th Century, the default dispute resolution mechanism for construction issues was arbitration, maybe sprinkled with a few ADR processes here and there. As we have made the turn into the 21st Century, we find that the honeymoon, and maybe

even the marriage, with arbitration may be over. Serious questions are being raised as to whether or not arbitration is efficient, whether or not it is truly inexpensive, and whether or not it is even fair. Is there a better method? As we all know by now, the new generation of AIA documents that is going to be published in 2007 will no longer have arbitration as the default dispute resolution process. The stated rationale for this change is that arbitration has become too much like litigation. Well, have we forgotten what it's like to try a construction case before a jury? Have we forgotten that many of our judges simply will not try a construction case? This will certainly be an interesting example of "back to the future."

Would a process like adjudication, which has been successfully used in the U.K. for almost ten years now, be more effective? Do we really want fast track arbitration? What about dispute review boards or dispute adjudication boards? Should we return to the traditional system of the design professional making decisions on disputes, binding decisions, during the course of the job? Clearly we are in a state of flux with respect to dispute resolution processes in construction, so what is the optimum method? Is there a preferred process that will likely become predominant as we go forward into the 21st Century?

To deal with this third issue group, we have two of the world's leading experts on construction dispute resolution. We have the Honorable Sir Vivian Ramsey, Justice of the High Court of England and Wales, Queen's Bench Division. Then, Tom Stipanowich, who has probably thought more, published more, and spoken more than any other person I know on construction dispute resolution.

These are the issues and here are the panelists. As to how we shall present these topics, I propose that we begin with the first issue group, allocation of risk in the insurance and surety market. Then we will have a brief opportunity, for questions and discussion on those topics. After our morning break, Mike Wilke will make his presentation on alliancing. We will take a few minutes for discussion on any issues or questions that we have with Mike: then we will immediately follow on with the dispute resolution presentations, with Sir Vivian beginning to be followed by Tom Stipanowich. That's the format.

Please allow me to introduce our first panelist, Mark Reagan. Mark serves as Chairman of the Willis Group Construction Practice. In 1993, Mark joined Willis from AIG, where he was most recently President of the AIG Bond Division and the head of their International Financial Lines. Mark began his insurance career with Seaboard in 1971where he was a senior underwriter in New York. Four years later, he became manager of European operations in London. In 1980, he returned to New York, after being appointed as Vice President of Seaboard's Contract and Surety Operations. He was later, appointed a director of the company. In 1984, Mark was named as Senior Vice President with responsibility for surety claims and management information services. Mark joined AIG in 1988, as president of their Bond Division taking on worldwide responsibility for surety and fidelity bonds. A year later he was appointed senior executive for the financial lines of AIG and served as director of several AIG companies. Since joining Willis, Mark has been directing their Global Surety Bond and Construction Insurance operations. He is widely

recognized as one of the leading construction insurance and surety executives in the world.

MARK REAGAN:

That introduction makes me feel like I am older than I feel like I am. Thanks to the College for having me. It's always dangerous to be the insurance guy, when you are in front of a lot of lawyers and contractors, because all of you know that we don't always get it right in the insurance industry.

As I was thinking through the topic and looking toward the future, I think one of the reasons that we don't always get it right in the construction industry is that we frequently drift from the core topic which is the same core topic in the insurance industry, the surety industry, and really all businesses. That core topic is the appropriate deployment of capital, so as to realize a return on capital. That issue changes somewhat in public construction, where you are looking to make an investment of capital that will be a service to the community. But, at any point in time, it's always where and what cost capital bears.

When you look at the construction industry, apart from the insurance issues, you see a fairly dramatic and continuing process of change, not only in what gets built, but how it gets built; its not only what gets designed, but who designs it and how they design it. And, the techniques you use today certainly are different than even twenty years ago. I went on the website and did a lot of research on the panelists today and the members of the ACCL. Twenty-five years ago I could not have said that I had been on the web, checking everyone's credentials, and having access to a huge volume of information very quickly. So, that has changed. The evolution of technology in construction has been dramatic.

Strangely, the insurance business sometimes seems to be still locked in a coffee shop in London, which was called Lloyds. Today, it's a much bigger coffee shop; there are lots of floors, and they do have more technology in there. However, as we look at the market place, we often see ourselves as the intermediary between two groups, those who have the risks and those who form the capital market place that we approach to take and form pools of risk and apply and dedicate capital to those pools of risk, and then price or monetize that risk. Unfortunately, there has been a significant disconnect between these two sectors.

In and around what you and your clients do every day, that is, build things, face challenges, solve problems, and at times face disputes, there is a whole process that has become very disconnected with the policies, the contracts if you will, that insurance companies write to protect those risks. The flaw in the process is most clearly seen in what I think almost everyone in this room would agree is a failure on the part of insurers to respond to the claim process. Fundamentally, we feel that the problems begin when insurance companies fail to deliver a policy in a timely fashion. I don't think anyone in this room would allow their client to sign a contract and begin construction without a signed contract. There should and would be some solution to all of those issues written out in some form called a contract. Well, in our business it is all too common that we bind a policy, assume some number of risks, and then

nine months or a year later, we are in the process of trying to negotiate the policy for a 12/31 renewal, when we haven't yet received the policy from the last 12/31 issue date.

This type of disconnection creates huge frictional costs. It's just one of many that have an impact on the need to dedicate capital in and around risks efficiently and effectively. When we look at the current process, we see a number of players along the construction continuum. We see those who want something built, i.e., owners, we see investors, we see lenders, we see architects and engineers, we see contractors. Then we see, again, the capital market playing through that process as they fund those risks.

You have, let's just say, owners, investors, lenders, architects, engineers, and contractors. The contractors, in turn, have subcontractors, vendors, subs of subs, vendors to vendors, all these parties at risk. In the current format, when you do an analysis of how the capital gets spent on a project, and what is being spent for the insurance for all those various parties, you will find something in the vicinity of three to five percent of the total construction value is being spent on insurance. The insurance portion spent is in itself inefficient, because you are buying at retail, again and again, what sensibly should be bought wholesale. We don't know of a major construction company that goes to Home Depot or Loews or down the road someplace to buy something retail, if they are building a billion dollar project. But, for some reason, insurance is often bought on a retail basis, rather than a wholesale basis. There is an enormous inefficiency which we think is at least a third, if not more.

Then, when you look at the cost of adjudicating, arbitrating, or resolving disputes in that process, you see further disconnects. The risks are occurring, the risks are real, and the risks need resolution; the insurance industry process has been set up in such a manner that all the parties of interest, the insurer, and all of those various parties and interests along the continuum I mentioned before, are looking at the need to perhaps go out and find counsel. This has led to higher risks most dramatically, in and around design exposures as you push the envelope of design, as architects and engineers try to find better ways to do things more quickly, efficiently, and effectively and better materials. We find that those risks are less and less insurable, because of the inefficiencies and ineffectiveness and the plainly incorrect processes around resolving disputes and handling claims. The appetite of the traditional market place to absorb those risks, to respond to those risks, to monetize them, and charge a premium for those risks has diminished.

I have traveled the world over the last six months addressing these topics. I have yet to find anyone who is happy with the capital that the insurance companies are dedicating to their design exposures. They see greater and greater exposure, and less and less appetite, on the part of the insurers. Now, our view is that it's somewhat unlikely, I won't say it won't happen, but it's not likely that in the short run, insurance companies, even the largest insurance companies, the AIG's, the Zurich's, are going to have a sudden increased appetite for business that has traditionally challenged their ability to get a return on their own dedicated capital. They have done a poor job of underwriting the risks. This is

not entirely their fault, because the risks that they frequently underwrite change over time, as precedents in litigation evolve and are applied by courts to policies that did not anticipate what the risk has become. We can give them a pass for that. However, it doesn't change the fact that the parties who were trying to get something built still have those risks and still need to find some vehicle for forming those risks into pools, to monetize that risk, so that everyone pays an appropriate share of the pool that is being formed, which, in turn needs to result in a return on the capital that's being put at risk by the insurers.

With respect to forming new capital, which is certainly doable, we have already got commitments of probably $2 billion. My Chairman, Mr. Plumari, would have been delighted to talk about that part of it. There is a lot of money seeking risk. There is a lot of money that has an appetite to get a return on risk. And, there is capital readily available to invest in new solutions to what the markets see as high profile, high risk environments where they might get better returns than a T- bill or some other guilt edge instrument. Construction is a growth arena, because it traditionally has had no one wanting to do it. Lynn Schubert will address the surety business which also has grown dramatically around the world on a global basis in the last five years. The numbers are revolutionary in terms of the growing utilization of guarantees in construction. That, in itself, is a response to the increasing risk in construction.

The newer construction delivery processes have evolved from general construction in the old days to construction management, to construction management at risk, to design/build, to EPC. All of these evolutionary delivery systems have brought with them efficiencies in getting things built. There may be arguments about that, but, in the thirty-five years that I have been in the business, it seems to me that the more partners you get in the process, the more people who get on the same page, and , if you will, take on the risk together, the better. In itself, joint venturing and partnering are risks. Mike Wilke, in his alliancing comments, will be far more articulate on that topic than I could hope to be. But, we see that partnering and alliancing are keys to reducing the frictional cost that absorb too much of the capital dedicated to the risks in and around the construction business, particularly on major projects.

We work with clients like the metropolitan transit authorities. They would like to build projects, two and three billion dollars at a time. They want to know why the surety business can't respond. They also want to know why we can't get insurance packages that are responsive to design and liability exposures or the property exposures. Of course, we tell them that you are building tunnels under buildings and that creates risk. You are asking people to build in and around live train lines, as one bit of drama, and you have, at the same time, an insurance industry that has was given shock losses on 9/11, shock losses with Katrina, and an emerging sense that there will be more hurricanes and more catastrophic losses.

Just to give you some metrics: As engineers, I know, because my father was an engineer and my brother is an engineer, although I am not; it is always clear, when I talk to them, that I am really not an engineer. I do know that engineers like my father used to use the slide rule, probably one of today's least useful

tools. They insisted I learn how to maneuver a slide rule. Now, of course, slide rules are replaced by a computer. Now, we can look at as-built plans and to-be-built plans on computers. Blueprints have evolved into CAD. The world has been that dramatic in changing all the parts of the construction process.

Projects are being designed and constructed completely differently today. Thus, it should come as no surprise, that capital in and around the risks is being formed differently. That's what we see emerging. We do not see the design risk going down. We do not see there is less appetite to do things in a dramatic fashion. The challenge is that as the world evolves, and as third-world countries become second-world, as second-world countries become first-world countries, and as first-world countries address the challenge of continuing to grow, everyone is looking to do it better, smarter, and more efficiently, deploying capital in a far more intelligent manner so as to get higher yield in a world of higher risk.

In and around insurance, we think the claims process, somewhat like your dispute resolution process, is badly flawed. In the current model, even on the largest and most elegant projects, an insured sends the insurer the contract that was written about those risks; then, the insurer sends them a notice, and they sit and negotiate, if you will, and try to underwrite that risk and agree on the policy. At that point, the underwriter leaves the picture. The underwriters get no claim notices, and by corporate edict and mandate, they are immediately severed from any further involvement in the dispute arising under the contract that they negotiated. It immediately goes into the claims department, a department that exists on the other side of an elaborate Chinese wall. The claims department comments are not allowed to be heard by the underwriter. The claims department then gets outside counsel who typically writes the insured a reservation of rights letter. Having read some letters written by outside counsel, when I ran the claims department, I found some of the letters to be personally offensive. However, we were just reserving our rights, not trying to insult the insured. The insured then gets the letter, and, in response to having being insulted, the insured hires an attorney who writes a response letter, which insults the claims department.

Then, there is a long process where everyone bitterly accuses everyone else of fraud and misstatement and lying and cheating and stealing. Then you get down to an elaborate process of claims handling, which is fact finding. That goes on for some period of time, with lawyers directing engineers, engineers arguing with the lawyers, and, finally, at the end of the day, after about one-third of the money has been spent, the parties finally sit down and the business people get together. However, these types of issues do not work well in court. Twelve fellow citizens of any constituency are doomed to be blinded by all the technical detail.

So, the business parties have to sit down and settle, and by-and-large come to resolutions where everyone is unhappy. The insurer thinks he spent too much, the insured knows he didn't get enough, and the attorneys on both sides are whispering, "you have to take the deal because that is as good as it will get, but you are, in fact [pardon my language] "getting screwed." That

environment must change. There needs to be changes in the capital to be dedicated, to taking and absorbing those risks, forming those risks in the pools, and monetizing them. That, we think, is the next real opportunity. As that happens, we also think there needs to be a fundamental change, not just in the way the contracts are negotiated, the policies are agreed, or in terms of the risks, but all the parties of the construction process must be more fully involved in that process, because the risks are shared by everybody in some fashion. The push-down of risk, the distribution of risk, and the inefficiencies when you get everyone buying their own insurance, are too costly. In a world where the parties are asking for the best delivery system, the cheapest delivery, and building the most elegant and phenomenal technology in the world, the greatest disconnect is between the elegance of what gets built with the inelegance of how those risks get assumed, distributed, and priced.

We think that will change, and that the people in this room, engineers, contractors, and especially the attorneys, have a challenge ahead of them. But, I think that the experts in the room, when brought into the environment and representing all of the different players in the process, give great promise for attracting additional capital, addressing, and articulating the risk in a far better manner, and also changing the process when there are problems. When you build, things go wrong, and from time to time, things go badly wrong. Those are the risks that need to be handled and effectively responded to. We can't afford litigation that takes five years to solve a problem that needs cash today, tomorrow, or next week. That process, which is today's process, is unacceptable. The appetite for capital in the world to fund the risks can be monetized. That process can and will be changed, and I would invite everybody in the room who is involved in the process to work with people like myself and with companies like Willis to see if we can get it right, get it done better, and get it done more effectively. So as the processes are changing, the insurance industry is going to change, and the people in this room can help shape and drive that change to a far more efficient and effective process that will attract capital and get these problems solved.

Thank you.

JOHN HINCHEY:

You may know Lynn Schubert as President of the Surety and Fidelity Association of America. Or you may have known her as Chair of the American Bar Association's Fidelity and Surety Law Committee, consisting of approximately a thousand or so members. Or, you may have known her as the Corporate Secretary of the American Insurance Association, or as Counsel for the Law on Regulatory Affairs to Aetna Life and Casualty Surety Company, but I have reference to another little known aspect of her published CV that is a little vague, which is that Lynn was, several years ago, a "partner in an Atlanta law firm specializing in surety law." I would like to say for the record that I hired Lynn Schubert straight out of law school, and that I had the privilege and opportunity of practicing law with her in Atlanta for about seven years. I am delighted to welcome Lynn today to speak on the current state of affairs with the surety market.

LYNN SCHUBERT:

Yes, John, I have been practicing for a very long time. I was going to say nice things about John being my teacher; but, thank you for letting the folks know that I did practice law at one point. I have been an outside surety lawyer, and also was in-house as a surety claims attorney for about a year with the Continental Insurance Company, which is where I went from the law firm, and Mark, thank you so much for all those great comments about insurance claims attorneys.

I am here as the surety representative on this panel to talk to you about the issue of: Will traditional products will be able to survive and be able to provide value in this changing global market place that we have been talking about for the last two days? From the sureties' perspective, we believe the answer is yes. Will we survive exactly with what we have been doing for the last hundred years? I don't think so. We are changing. Those of you who have experience with sureties will recognize that that is an amazing statement. The surety industry is changing. We are growing, we are developing.

Mark mentioned the increase in surety bond usage around the world. It is dramatic and it has increased most in the last five to ten years. Prior to that, demand guarantees, letters of credit, and bank guarantees were the product most used around the world. We did have surety bonds, but the change over the last ten years has been very dramatic and very surprising to a lot of the bank people, and as well, to some of the contractors around the world.

Most of you are experts, not only in construction, but also in surety; because if you are in contracting, and you are in big contracting, you must know about surety bonds. You know that here in the U.S. a surety bond is a conditional guarantee, and it is for 100% of the contract price. That is not true around the world. In Canada the size of the bond is 50%, possibly up to 100%. In Australia it is 10%. But in both of those places it is a conditional bond. In Latin America it is 10%, and it is a conditional bond. In Asia and Europe it is primarily a demand guarantee, anywhere from five to ten percent, and frequently it is on the exact same form as the bank guarantee. What is interesting is the change from the use of just bank guarantees to the use of surety bonds written by insurance companies on that same type of a form. Insurance companies, even U.S. insurance companies, are writing those bonds outside of the U.S., and that is a dramatic shift from perhaps fifteen to twenty years ago. Whether we are going to see that same shift in the U.S. is something that remains to be seen.

The reason that I believe that surety bonds will continue to be valuable as the world changes and as the construction market changes in the U.S. is that the fundamental need for the risk guaranty that is provided by those bonds and the other benefits of the bonds will continue to be needed. You will continue to need, in certain instances, particularly for public projects, an independent third party to evaluate the various bidders on the project and determine if there is an independent third-party who believes that a contractor is qualified to perform that work.

The second benefit of a bond is that if that independent third-party, the surety, is wrong in its evaluation, and it turns out that the contractor defaults on the project, then that surety steps in and performs the contract and protects the taxpayers' dollars. The fundamental need for that guaranty will remain.

Also, on the owners' behalf, the bond protects the owner from providing payment twice, once to the GC and once to the sub. Under the payment bond the subcontractor can make a claim against the surety and does not have to make that claim against the owner to obtain its payment if the GC fails to pay.

Last, and certainly not least for the subcontractors and suppliers, they have a direct cause of action against that payment bond, which is very critical. They don't have to lien a private project. More important, they don't have the right to lien a public works project. The need for this protection will remain as well.

Will we continue to provide the exact type of bonds that we are providing now? I would suggest the answer is no. We are seeing significant changes in bond forms. Obviously, you all are seeing significant changes in contract forms. Contractors are pushing back. Sureties are pushing back as well, but the risk allocation has shifted. Sureties are taking on more liability than they have in the past, and they are doing that for the same price that they used to charge.

Let me tell you a little bit about some of the changes that we have seen globally and where we see sureties stepping up to the plate. There is always the question of whether a conditional bond or an unconditional bond is better for the owner. One concern is that with a conditional bond allegedly it takes longer to get your money because it takes longer to prove your claim. In the U.K., adjudication bonds address that question. You have a defined method of making a decision on whether or not there is a default and moving forward with the payment.

A number of years ago, probably fifteen, SFAA, representing the United States surety industry, the International Credit Insurance Association (ICISA), and the Pan American Surety Association (PASA), worked with the International Chamber of Commerce (ICC) to create something called the Uniform Rules for Contract Bonds. This booklet provides rules and model forms for conditional style bonds to be used around the world. Part of the reason to create the rules and model was because of the concern about demand guarantees versus contract bonds. Part of the Rules, 7J1, I believe, provides for a Certificate of Default to be issued by an independent third party. Therefore, under these rules you can put in your contract that a decision will be made very rapidly in determining default. We are seeing that used. The United Nations Commission on International Trade Law (UNCITRAL) has endorsed the model rules of the ICC. The World Bank also has accepted the model rules of the ICC, and we are hoping that that will increase the use of contract bonds around the world by addressing the concern of the timeliness of default declaration and payment.

We are seeing a significant increase in the use of surety bonds in Latin America and Africa as concerns arise in various countries about the stability of the banks. Traditionally, banks were providing most of the demand guarantees. However, as concerns about the stability of the banks arose, public own-

ers as well as private owners have turned to the insurance companies, who are very highly rated insurance companies, worldwide insurance companies, to provide those guarantees instead.

China is moving dramatically and rapidly into creating a surety bond market. Financial guarantees for small and medium enterprises (SMEs) are well established, and the surety bond market is growing. They have created bid bonds, performance bonds, payment bonds, advance payment bonds, and maintenance bonds. There is a surety company which Bob Peckar actually got on its feet a number of years ago, Chang An Surety Company, now writing bonds, and a number of other insurance companies in China who are licensed and will be writing surety bonds. I was there just last week on a panel presentation and found that the government officials have recognized what is needed to be put in place in China for the guarantee market to really be able to survive and flourish: A legislative system, better access to the courts, a regulatory system; and interestingly, all of them mentioned an industry association. I have learned how to say Good Morning in Mandarin, and if I can learn a little bit more, perhaps I will be going over there to help them set up their industry association. It is an interesting development to watch, because the products they are putting in place are very similar to the products we currently have here in the U.S.

In the U.S. we are making changes because we need to address the changes in the delivery system of construction projects: design/build, construction manager at risk, construction manager agency, public private partnerships (PPPs). All of those things are moving forward and are helping to make construction more efficient and more cost effective. We as a surety industry need to step up to the plate, and we have done so piece by piece as the new project delivery methods are created.

On design/build, for example, we worked very closely with the Associated General Contractors (AGC) and also with the Design Build Institute of America (DBIA) when the first push for design/build started. We created bond forms that would allow the owner and the surety to decide whether or not the surety bond covers the entire design/build project or only covers the construction portion of the contract. What we originally found was all of the sureties wanted the second option. We only want to cover construction because we know how to cover construction. What we have seen through the years is that this is shifting and many more surety companies are very comfortable in covering both design and construction under their performance bonds.

The issue as far as construction management goes, from our perspective, is as long as the contract with the owner is covered by a surety bond then the protection is in place. So, if you have a construction manager at risk, for example, and, therefore, that construction manager is responsible for the entire project, then that entire project needs to be bonded so that the owner has protection.

If you have a construction manager agency project, and the construction manager holds the contracts with the subcontractors, then the construction manager needs to provide the bond for the entire project to the owner for the very same reason. On the other hand there are construction manager agency re-

lationships where the primary subcontractors contract directly with the owner. If that is true, then in order for the obligee or the owner to have the protection of the bonds, the bonds can be written from the subcontractor to the owner.

Two of the biggest challenges that we have are the last two things I want to talk about: one is mega-projects and the other, the PPPs. Pat mentioned yesterday, and Mark mentioned today, that we are seeing billion dollar plus projects. The question becomes, not only are there contractors capable of performing those contracts, but are there sureties willing and able from a capital standpoint to bond those projects? It is a challenge. At the moment we are confident that surety bonds can be written for up to $800 million projects, and probably a billion dollar project. They have been written. It depends on the contractors. As the sureties say, for the right contractor, with the right contract terms, we can put together a group of co-sureties who are willing to do that. It has been done, and it is being done for projects of $200 million and above on a fairly regular basis. Is it going to decrease competition on those projects? Yes, of course it is, because there are only so many contractors who are capable of performing those contracts.

What we in the surety industry would like to see, and I think perhaps would be of some help to the government, is for those contracts to be broken down. The U.S. government contracting officers are between a rock and a hard place. They have one side of the government saying, you must bundle all the contracts together, you must make them more efficient. Therefore, we want a billion dollar project. The other side of the government is saying you have to have 20% or some other percent of those contracts let to small and emerging contractors, service disabled veterans, and women owned contractors.

Now, you are not going to find many small and emerging contractors capable of doing a billion dollar project, much less getting bonding for a billion dollar project. It is a very difficult situation for the contracting officers. We have worked very closely with the Corps and some other agencies in discussing the issue, trying to come up with ideas. Is there a way to provide phased contracting so that we can provide separate bonds? Is there a way to divide the design out of a particular project or have the steel bought directly by the owner rather than the contractor, taking a large amount of dollars out of the contract? There are ways to address it, and we are working with it, but it certainly is a major challenge.

The last topic I would like to address is PPPs. Obviously PPPs have been well known and used extensively in Latin America for many years. It is increasingly popular in Europe, and it is beginning to grab a foothold in the United States as well. A number of years ago SFAA worked, again with ICISA and PASA, with UNCITRAL on a guideline for developing countries for public/private infrastructure projects. In those guidelines, UNCITRAL recommends a surety bond as an option to protect the construction phase of those projects, not the financing phase and not the operation phase, but the middle part, the actual construction part of those projects. That is an easy thing for sureties to do and they are, in fact, guaranteeing those all around the world.

In certain places, on the other hand, sureties also are rumored to be providing a guarantee for the entire project: financing, contracting, and operation. In those instances, frequently, the guarantees that are being written are like the guarantees that would be written by a bank, it is just a decision of whether it is written by a bank or whether it is written by an insurance company. In the U.S. so far we have found some understanding by the owners, the Port of Miami, for example, of the need to divide parts of the entire PPP project out so that the bond does not cover financing or operation.

There are a number of surety companies, obviously the largest, because they have to have the capital and the capacity to cover projects that are that large, who are willing to undertake this PPP risk. They are doing so on an increasingly frequent basis. We as an association work with them. We meet with the owners and try to address the concerns about capacity, the concerns of what is covered by a surety bond, what is not covered by a surety bond. We have been successful in doing that so far. Will there continue to be changes? I think so. As a surety industry, we went for about ninety years writing exactly the same product in the same way for the same cost. In the last eight years we have made significant changes.

Not every surety company is going to be willing to write creative products. Let me just add one caveat to that. When the surety industry got extremely creative recently on the commercial surety side, we lost our shirts. We are an industry that had been profitable for thirteen years, and then we lost money for five years in a row. We are finally coming back to profitability because the industry has gotten conservative again. As the trade association representative, I am a little nervous that they are getting creative again. But it seems to me that the creativity is on the construction side rather than on the commercial side, and as long as we continue to have strong contractors like the people in this room and smart owners like the people who are in this room, I think together as partners we will be able to continue to be successful and address each other's needs.

I will be happy to answer any questions. Thank you.

AUDIENCE:

Question for Lynn: At General Electric we typically don't ask our contractors to provide bonds, with the philosophy that if you could provide a bond we really don't need one, which means that we only require one if you cannot provide one. More and more, it does make sense if you think about it, in kind of a weird way. More and more we are seeing contractors that are coming to us and saying, even though you are not requiring us to provide a bond, our surety company will want to see this contract, and will want to review the terms and conditions and sign off on it before we are able to enter into an agreement with you.

I have a question that I guess is three-fold: One, are you seeing that in the industry? Is that a true statement? Two, if it is a true statement, do surety companies realize the level of influence and responsibility they are going to have in negotiating contracts? Three, how can we as owners be assured that

the surety companies are going to be exercising that influence in the spirit of partnership that you referred to earlier?

LYNN SCHUBERT:

Have you ever heard the name MK? There are a number of contractors that you think could never possibly fail, and therefore you, as an owner, say, "Well, that contractor could get a bond, therefore, I don't need a bond." The surety industry would not have lost all the money it lost or paid all the claims that it paid over the years, if it was true that contractors who could get a bond don't need a bond. You also always have to remember the second side of the performance bond. The first side is exactly what you are talking about, the second side is what if we are wrong? The surety does step in and pay.

Since you started your question with that premise, I had to address that for you. Now to your questions, the surety wants to see every contract and wants to know about every project, whether or not it is bonded, because the surety evaluates the contractor's overall book of business. What a surety has to decide when it is deciding whether or not to write another surety bond for a principal isn't based on how many surety bonds are out there, it is based on whether or not the contractor has the capacity to take on that additional project. So, it is very important that the surety know about every project that the contractor is performing.

Sureties, also, have gotten very smart about reading the contract terms. Over the years, as owners have been pushing the risk down onto the contractors, the contract terms have gotten very onerous. Sureties are very interested in whether there is a twenty year warranty provision, for example. Are they going to have to worry about that contractor being liable on a warranty for twenty years after completion of a project? Do sureties understand that they have some influence? I think they do. I think how much influence they have depends on the surety company. It also depends on the relationship the surety has with the contractor. I do believe that sureties recognize their influence, and hopefully, the analysis is based on what is good for the contractor, not just what is good for the surety. You don't want a contractor taking on your project if they will be overextending themselves, so the analysis is good for the owner as well.

JOHN HINCHEY:

Thank you. This is a question for Mark and for Lynn. On the underwriting side, I am curious about the extent to which insurers might utilize independent certification agencies or certification processes as a means of qualifying specialty subcontractors and therefore reducing risk?

MARK REAGAN:

On the insurance side, I would say the underwriters are more and more looking at what in-house engineering expertise they may have. I think that the industry has been slow to catch up with later techniques and frequently don't start to address exposures until they have a loss in an area where they didn't do so. The better underwriters try to stay up with technology, but they are always, if not a full generation, probably the major portion of a generation,

behind technology in underwriting it. Some exceptional underwriters are all over it. There are a small number of companies, and there is not a lot of talent out there that does that kind of specific or focused underwriting. It does happen, and, when it does, those underwriters tend to dominate those markets. Then a lot of capacity follows that skill set.

AUDIENCE:

A question for Mark: Over the last couple of years, in mediating cases, I have increasingly found that the design professionals have had insurance-driven incentives to participate in mediations, which I think has been helpful. I was wondering whether that incentive program is seen as being successful and whether the carriers intend to continue it.

MARK REAGAN:

I think, yes, to your first question. That program has been successful, and I think there is going to be more pressure for mediation and informal dispute resolution, not just an incentive, but I think it will become part of the policy itself. In other words, a condition of being insured will be including mediation and arbitration clauses in their contracts.

There have been a lot of professional liabilities emerge out of the Internet, cyber risk. It's impossible to address those risks, unless you are going to bring in firewalls and all those things. Professional liability underwriters are all around those risks, whether it's design, in and around construction, or other areas of professional liability. So, we just see that the insurance carriers will be more and more insistent that you try to get a resolution that doesn't involve getting into litigation when you are dealing with that kind of sophisticated arena.

AUDIENCE:

What about building information modeling, which people are using increasingly? The manufacturers of the software are taking no liability whatsoever and are pushing it totally on the architect or the engineer or the contractor who is using the building information modeling software, even though the software itself may have been the cause of the problem. Does the insurance industry have any take on this?

MARK REAGAN:

This is another example of the cyber risk arena that I mentioned earlier. It is just beginning to take hold in the major firms, I mean all the major firms, not just the Verizons and the Cingulars, but also a lot of the software developers and increasingly people that are building the platform software. So, the industry is beginning to recognize that you have layers and tiers, and, just like you do in construction, you have vendor levels. I know that AIG, is now addressing major firms like IBM and Apple, and others, and talking to them about their software design and what happens if there is a failure because of their software, and somebody is using that platform to build on it.

The cascading down of liability comes into play where people, if they outsource some software package, are subjecting themselves to liability, if they

incorporate that software into what's already done. I don't think there is much legal precedent on that, but there is a lot of emerging activity and litigation around those exposures. It is inevitable, given the look we have taken at it, that the design professionals on the software side are going to be subjected to getting involved, if their software fails to deliver and it has been used and relied on to design a project.

AUDIENCE:

Question for Mark: Are we ever going to get to the point where we can have no-fault insurance for the entire construction process.

JOHN HINCHEY:

I was just talking to one of America's largest domestic contractors, and he asked me the same question, he asked, "Can I insure our stupidity?"

MARK REAGAN:

I don't know that you can necessarily insure against it, but we see, in other parts of the economy, major corporate enterprises that take large chunks of capital and dedicate them to funding enterprise risk. So, I do think, not without some limitations, the amount of capital risk is whatever it will be. There are techniques that we have developed in other arenas. Directors and officers liability and capital technology responding to those risks was very quick, very agile. We are in construction, because it's bricks and mortar and steel. Certainly, in the last twelve to twenty-four months, hedge funds and private equity funds have been looking for new places to put capital. They have caught on to this, because the banks and investors who are involved in the construction process have become more sensitive to the risk in construction. They see it as less of a black hole, but something that can be understood. These kinds of developments in the financial community are actually going to bring those kinds of solutions to the construction process. I think though there will be a cost attached, this isn't going to be like a BOP policy for your local deli, this is going to be something more elegant, but I think it will merge.

AUDIENCE:

This is a question for Mark: We see our clients, owners, contractors, design professionals, all racing at full speed at something called building information modeling (BIM). We are treating BIM like the holy grail and espousing the many benefits, but without a great appreciation for the risks inherent in collaboration of that level. Now, what do you foresee the insurance industry doing in terms of responding and being able to insure some of those risks?

MARK REAGAN:

Well, I think that there has been a long tradition; as risk emerges, the more sophisticated, larger players in the game are determined to write them in the contracts and push them down; push them down onto smaller, less sophisticated players, down the chain to those who were able to buy insurance that was typically uninformed insurance. As the projects become larger, more compli-

cated, and more intricate, the lawyering of those contracts has become just as complicated and intricate. The industry has become more and more aware that everyone is now buying their own insurance and pushing that risk down. The system is broken. It just doesn't work. The ability of uninformed insurance to be responsive in a timely fashion or with adequate capital is not there.

So, I think that, as the industry uses the more sophisticated information and modeling techniques, what we will see is the emergence of owner or contractor controlled insurance programs where they buy it on a wholesale basis and try to protect all the interests. Now, we are seeing what we call COSIPS, contract and owner controlled programs. What that does is identify all the risks of the process, and the parties can then agree what the best process is to mitigate and to manage that risk. That becomes very sophisticated, and that's where the amount of capital you need to bring to bear on a billion dollar project becomes very elegant.

At the same time, the total capital of the insurance industry is $450 billion. If you look at the total spent in the U.S. economy on construction, it's something over a trillion dollars, about eight or nine percent of the economy. When you look at that capital base for the entire construction industry, and the exposures it faces, and you look at the impact of 9/11 and Katrina, and you look at taking out $80-90 billion of the $450 billion in one event; and you then look at some of the modeling that's done on the catastrophe side; an earthquake along the fault in the middle of the country that the industry is predicting in the next fifty years, you are looking at something in excess of $100 billion of loss. That's 25% of the capital of the industry. So there is a need to address these capital issues in terms of the exposures. What you do becomes so compelling, just by looking at the size and sophistication of projects.

We are not just talking about building grammar schools, we are talking about building entire school systems. Californians spends billions of dollars on education and highways. So, I think that that sophisticated modeling identifies the need to develop parallel-efficient delivery systems on risk management techniques that parallel how you are becoming more evolved in the delivery systems themselves. The risk process has been very slow to catch up, but I think it is getting there.

JOHN HINCHEY:

I would like to ask Lynn how sureties feel about arbitration these days. A lot of arguments are being made, successfully, I think, that when a surety incorporates the construction agreement into the bond, that includes the ADR clause and the arbitration provisions. Sureties tend to go kicking and screaming into arbitration, what's the concern?

LYNN SCHUBERT:

The concerns are all the things that you mentioned in your introductory remarks. Sureties feel the same way about arbitration that contractors feel about arbitration, and we were delighted to see the new AIA documents coming out, providing a list of options versus arbitration as the fall-back provision. We

actually do support mediation. We are working with the AGC on some new contract forms where we would support the option of a standing mediator on the project. Sureties feel that arbitration has turned into essentially litigation, with all the expense of litigation, and without the court.

KATHERINE GURUN:

Mark, I want to ask you whether you think there are going to be new forms of insurance, which emerge out of the construction industry? We have seen efficacy insurance, we have seen cost-overrun insurance, and I think there the biggest program was the one done for the high speed rail link in England. Are there any new forms of insurance on the horizon? Because, as contractors get pushed more and more, they are looking for ways to spread this risk more broadly.

MARK REAGAN:

One of the challenges for insurance right now is that for all of the underwriting skills, this is still an industry that is very prone to shock losses. What we are looking at is a capital solution, in dedicated slips which we have done for some contractors, when we have the same players who have contract documents that will be signed on a continuing basis, and have mechanisms to refer to the underwriters. Then we can build a substantial capacity for that contractor. I think that the next logical step is to build pools along the lines of that slip. There are not a lot of those slips out there, so it'll take some time; but I think that the push from the market slips is from contractors and from owners to find solutions, because they end up with the same risk. If they don't get it insured from the contractor, they have the same risk. It's this emerging awareness of the shared risk of a project, and the need to get all of the players to address it, that will drive the potential for a larger pool of premium, and then the capital can be formed around the opportunity. Right now, it is still too fragmented and it's been a contractor by contractor solution. Even worse, it's project-by-project-by-project. We need to get an aggregation of data, and as owners, lenders, and investors are more involved, we will see what happens. An opportunity exists to build bigger pools around more standard forms of delivery.

LYNN SCHUBERT:

I misspoke at the very end of the answer to my last question. I understand that arbitration is binding, sorry about that. It was supposed to be fast and quick, without much discovery, and it's turned into typical litigation, at least in the sureties' view.

JOHN HINCHEY:

The next group of issues that we are going to discuss have to do with project delivery methods. What are the optimum ways of delivering a project, in the form of a contracting structure, that will bring the projects in, on time, within budget, and with fewer issues and disputes arising out of the project?

A project delivery system that is currently up for nomination for that position is alliancing. I think many of us are generally familiar with the concept.

We have read about it, and perhaps we have talked with others who have done it. We have heard views, pros and con; but, I think it is true that few of us have had actual experience in doing it.

Our next speaker has had extensive experience with alliancing. Mike Wilke is the Chief Operating Officer for the Americas of Parsons Brinkerhoff. He oversees all of their company operations in North and South America. He has had an extensive career and spent a lot of time in Australia doing alliancing projects. Mike, welcome.

MICHAEL WILKE:

Thank you. I'm delighted to be here and delighted to be invited to speak. As an engineer by training, I must use slides. I must use some visual concepts and paradigms and put them up on the screen. The other issue for me is that when I say "project," you would say project. If I say "process," you say process, so it's also important to use these slides as an interpretive tool so that you can pick up the difference in the different pronunciations. The other issue is that I've got twenty minutes to talk about a topic that you could make into a two-day symposium in its own right.

My move to the U.S. had nothing to do with alliancing. I am not here as an advocate of alliancing. I just happened to be invited to participate in this symposium because of my knowledge of it. My actual day job is to lead and develop the next future of Parsons Brinkerhoff, which is 121 years old this year, so it is a whole different challenge than alliancing.

When I talk about alliancing,[1] it is a risk sharing, no blame project delivery method. Today, I want to talk about what it is, what it isn't, and what's different about it. I want to talk about the contractual arrangements. I want to talk about how you would choose it, because it's not for every project. I will give you an example of a typical project and the outcomes. I want to talk very briefly about whether it really could be considered as value for money.

Project alliancing had its origins in the U.K. in the early 1990s because of cost and time overruns on the building of offshore oil platforms in the North Sea. These projects weren't coming in on time or on budget, and there was a significant investigation through the U.K. government that looked at methodologies to improve the outcomes of projects. The key thing was to look at sharing the risk and not allocating the risk. This was the fundamental recommendation that came out of the investigation, and hence project alliancing began. Several of the projects then were delivered on time and on budget in the North Sea. It was natural for that methodology to shift to Australia, when Australia was developing the Northwest Shelf, which is a significant offshore gas reserve. Project alliancing shifted to Australia that way.

Then, from there, some of the government departments looked at better ways of delivering infrastructure projects, because they were having the same

1. See Michael Wilke, Alliancing for Infrastructure Projects-Sharing Risks and Rewards With a "No Blame" Agreement (Appendix C hereto).

issues. In the U.S. case, the governor, and in the Australian case, a minister, didn't want to see the press report in the morning saying: "Cost Blowouts - Government Is A Pack of Idiots," the type of media report that you regularly see. A lot of government organizations were looking for ways to get away from these headlines on project cost escalation, and that's how project alliancing got started on infrastructure projects.

It started with two particular projects. They weren't so much cost oriented but time oriented. The Northside Sewage Tunnel was an upgrade of the sewage system in Sydney that needed to be in place for the Sydney Olympics in the year 2000. The owner took a risk on using an alliance to perform that project. Australia had a 100-year centennial celebration in 2001, and the National Museum in Canberra was a part of that. The museum had to be completed and opened on a particular day with a maximum amount of money spent. You can imagine an architectural project where you went to the project team and said, you've got only this amount of money to deliver this project. The Queen was to open the project on a particular day. They used the alliance contract to achieve those objectives.

Since then, and that was late 1990s, there have been thirty-six projects of record throughout Australia and New Zealand, a mixture of highways, bridges, port development, waterworks, and dams. They were largely public projects.

So what is project alliancing? The best definition is "a virtual organization among owners, designers, constructors, and suppliers to deliver a specific project." Four things drive the alliance: a collective responsibility for the project delivery, a collective ownership of all the risks, a share in the gain or pain against actual project outcomes, and a collective agreement on performance targets. So, it is not partnering. Partnering has a lot of the same principles behind alliancing, but it doesn't have the contractual agreement to support the principles.

To my knowledge, there haven't been any construction projects delivered in the U.S. through alliancing. Yet, the IT industry here is very strongly delivering projects using alliancing. In fact, there is an American Association of Alliance Professionals. So, a lot of IT software and hardware development is being done by this methodology. If you want to look somewhere to see some experience in the U.S., go to the IT industry. I have had active involvement in six of the thirty-six alliancing projects, so I am sort of 1/6th experienced in this alliancing system.

What are the fundamentals and the actual principles of the alliance culture? It is important to understand that risk and reward are shared. It's an all win or all lose amongst the parties. There is no individual win/lose. So, it makes it very difficult in this conference to talk about arbitration and all those dispute resolution issues. They are all win/lose exercises as between parties. There is no individual win/lose in this, the parties all win or they all lose.

What is the encouragement to achieve gain breaking performance? I will come back to what that means; decisions best for projects, open, straight, and honest conversations, unconditional support of the alliance partners. The

managing directors and general managers get involved with these projects as part of the organization; no litigation, no blame, equal say for all partners.

Let me talk briefly about the legal framework that goes with these principles. The legal framework is an agreement; it's not a contract between the owner and the designer and the constructor, but an agreement between all parties. It's the agreement that this group of people and companies are going to collaboratively deliver a project. Agreements have become more sophisticated over time, with a lot of legal tooing and frowing and a lot of conversations. In developing an agreement a lot of the issues that would normally turn to arbitration, that you would solve at the end of the job, end up getting written into the agreement. Everybody agrees to progressively solve these issues without arbitration.

So, the first part of the agreement is setting the tone of how people are going to behave and the commitments to that behavior. All of those alliance principles are written into the agreement, with very strong sections on governance and decision-making. Who makes decisions, how are the decisions made? All of these projects have a leadership team which is effectively like a board of directors, because it's a virtual organization. What role does that leadership team take? What sort of governance does that leadership team provide? These are covered in the agreement. Many of the contracts now have specific owner-reserved powers, but they are relatively small. Then the agreement defines how the team is selected, and how the team works, conflicts of interest, which is pretty standard stuff. The compensation, invoicing and payment, that's pretty important for the designers and the constructors. How you deal with variations in time and in costs. The principle of no blame is defined in some significant detail. Willful default, how to handle that? Indemnities and insurance, and I will come back to insurance. Mark gave me a lead-in to talk about insurance. Termination for convenience, the owner must have the ability to terminate this agreement, if something comes from an external influence, like the project is no longer acceptable to the public, and you have to shut the project down. There is a process in there on how to deal with that. And how do you deal with defects that come out of the project?

The commercial arrangement is a three-limb structure. Limb one are the direct costs and the overheads that are project specific. Limb two are the corporate overheads and normal profit. Limb three is the project gain. The commercial participants, designers, and constructors are putting at risk their corporate overhead and normal profit. So, you are not putting all the costs at risk; but certainly, if you only received your direct costs on the job, it wouldn't be a very satisfactory outcome.

That's all measured against (I have to have a chart in here) a target out-turn cost; and I will come back to how that's developed, but the gain or pain is measured against a target out-turn cost. So, if there is an underrun, that's a gain share with a smaller face, it is shared between the owner and the commercial participants. Most of those thirty-six projects had a 50/50 split: 50% with the owner, and 50% with the commercial participants. Now that's a difference from a normal project, where the designers and constructors would get all of

the underrun, but in this case there are some balances for that. First, the client is playing a fair role in helping the project to underrun; and second, the client is actually taking some of the risk on the downside, which traditionally hasn't been taken, so there is a balance.

Typically, between designers and constructors, the splits have been 15/85. We have been in one where the designer took thirty percent of upside and downside. It depends on what the role the designer could play. So, typically if the job is underrun then, with the three-limbs, there is a return. If the job overruns, well then the overhead and profit gets chewed away, until there is no overhead and profit left and the job is just returning the cost of the project.

Some clients like to put in non-financial key result areas, particularly in community oriented jobs, and those with environmental outcomes, safety outcomes, quality outcomes, and time outcomes. Owners put a piece of money available as a reward for performance in those areas that is separate from the cost underrun. Another reason the clients and owners are doing that is that if a job looks like it's going to go into an overrun situation, they still want to achieve very good outcomes for environment, safety, and community, and they want to make sure that the team is still incentivized to perform against those non-cost parameters.

The selection process: How do you choose a team? How does an owner choose a designer/constructor? That has become a robust selection process. It is qualifications-based. It does not include a cost component to the selection. The owner, through a selection process, chooses the team that they believe has the greatest potential to achieve an outstanding outcome on this project, as a partner with the owner themselves.

It's a complicated chart, but there are nine steps: Call for proposals: generally, the proposal requests are a series of questions. Let's take an example: An owner might be calling for a designer/constructor team to deliver a water treatment plant. So, there will be a series of questions, asking the party to prove to the owner that they have the team that can deliver an outstanding outcome in time, quality, environment, community, etc. for this project.

The proposals come in and the clients (owners) rate the proposals, and they pick the highest score. Now, in our industry, as you know, there are a lot of very smart people that can write some smart words and smart proposals and it all looks very good. So what the owner then does is to interview the team that is going to do the job. For half a day, they ask questions about how the team is going to do the project. They test the proposal against the people that are in that room, through this questioning process. At the end of the half day, they remark the proposal on the basis of what they saw and heard. In most cases, the score goes down. I have been through a process where we have been the number one rated proposal and not gotten to the final selection, because the team did not match the great words that some of us wrote.

The next stage is where the owner chooses the best two and says to each that you have the job; and we will have a start-kickoff workshop with you, as if we are going to do the actual project itself. How are we going to have an integrated team? What would our agreement look like? What's the first ninety days

of the project going to look like? The full workshop could include sometimes twenty-five to thirty people; ten or twelve people from the owner; designers/constructors; going from the principal level to drafters, engineers, supervisors, construction supervisors—a whole slice of the team, a sample of what the team would look like. They go through the foundation process; and, after two days, the proposal is remarked to make a choice of the successful team.

The commercial agreements and financial checking happens after the preferred proponent is selected—an exciting exercise. It's absolutely gut wrenching when you lose and exciting when you win; but it progressively builds up the team, because this whole exercise is all about people. The three most important things in alliance success are people, people, and people. So it is about building teams and getting the best of teams.

So what's different about this fully integrated project team? No boundaries. It is quite clear that this is the team that is delivering, and, after a while on a project, you cannot tell which company any individual comes from, because they are all focused in on achieving the project and the outcomes. Put them all under one roof, shift them away from their prior offices so they really own this project. The alliance leadership team is a significant part of the delivery of this project with senior people from the organizations driving the project. Because it is all about people, we are using coaches, high-performance coaches, to build the leadership skills. As we talked yesterday, there is a need for leadership skills. You lead from whatever position you are.

The alliance leadership team, in which I have had significant involvement in projects as an alliance leader, is to drive the behavior, the vision, to empower the team to do the work, to provide the governance that's necessary to do the project, and to resolve disputes. The projects are set up so that all decisions are unanimous. Now, that's a very powerful tool in arbitration, when the owner, the designer, and the constructor have to agree on the solution. I have been in some circumstances where we have had eight people, and one person disagreed; and one person really held to the disagreeing, so there is no solution. Then, you have got to work from one person disagreeing to seven people agreeing to come up with an answer out of that. In fact, it wasn't a "camel" that was produced as a solution. It was a far better solution. This is a very powerful way of resolving issues, because it's done in the project itself.

One of the keys for success is that the effort of all of the people working on a project is focused towards delivering the project outcomes. The intercompany, the contractual issues aren't in the process of actually delivering the outcome. That's where the power comes from in the whole delivery system. Here is an example of a project with four companies and just how integrated it really is. That's an organization chart where there are no watchers watching the watchers, there are no supervisors supervising other people, it's just one organization built with four companies, one client, one owner, and three commercial companies delivering a project in an integrated manner. There are adventurous solutions in some of this. For example, the construction manager for this project did not come from the constructor, but from the client. It's a truly integrated team.

There is much more involvement of the client, designer and constructor in the development of the target cost, sitting around the table and developing what's the scope of this job, what's its functionality, what sort of outcomes are we going to produce, and developing the cost of the delivery for that scope, that time, and that functionality. That's again part of the power of this methodology. The value of the money comes in here, where the final target outcome (TOC) is established. What would be the final cost, not what would be the bid cost, but what would be the final cost of this job, incorporating all the risks, variations, and all that sort of thing. It's independently validated. That's where another team comes in and validates that there is value for money.

On the insurances, everybody is sitting around the table looking at what the risks are on the job and how can they be managed. What do we really need to insure, because we don't need to insure everything. An example of this approach was in an alliance to design and build a sea wall to expand a port. The sea wall had a maximum height of eight meters, and, at one point, the wall was to be built over thirty meters of mud, which you could not stand on without disappearing. The traditional way of designing, constructing, and insuring that would be extremely conservative. In fact, we started looking at insurance, and there was only one project in the world being done of a similar type in Japan, which was an absolute disaster. The ability to insure that project was zero. One estimate we received required us to pay almost the cost of the project to insure it. So, we sat around the table and analyzed how we would deal with the risks and build the cost of the risks into the target costs. It really has to be a much more rational and satisfactory approach to looking at risk. Insurance is still in the mix, but you look carefully at what you do insure.

Now I like the expression, big licks and sacred cows, because what this tries to do is to not look at the traditional continuous improvement, the business as usual approach. It looks for breakthroughs in performance; it looks for stepwise changes in how we go about things. The place to look for stepwise changes is to look at where the same thing is being done the same way for ever and ever, and people believe that that's the only way to do it. That's a sacred cow. That's where a lot of the advantages come in these projects. A lot of the real improvements in big-step-change come from looking at the standard way of doing things. That's part of the fun, particularly for owners that have very strong engineering groups.

Where would you use this approach? It is not the answer for everyone. If you can clearly define the project, the scope and risk, then you should just use the traditional contract. You wouldn't go through all that selection process, etc., you would just go through a traditional project. Alliancing is very suitable when there are lots of unknowns; it's complex, it's very hard to assess what the risks are, to actually think about how you allocate them. It's a fast track project. That's the sort of project that you would do it on.

Let me just talk about an example of a project. This is the Port of Brisbane Motorway. It's not a large project, a hundred-odd million. It was a project that's very significant in the Brisbane environment, in that this enables the Port to put containers on a truck and shift them 100 kilometers to the north,

to the south, or to the west before they hit a traffic light. It's a very high profile project in the City of Brisbane, which is my original home, a city of 1.2 million people.

The target cost of the project was $112 million. It was delivered for $103.7, twelve percent under the target costs. It was built six months faster, so it was actually fourteen months of construction for the project. Seventy percent of the cost savings that were achieved on the job were identified and locked in before construction started. We always knew that more upfront planning and design would produce a better result, but this is proof.

We also required the constructors to slow down at the beginning. The first thing a constructor wants to do is to place concrete. We said, "No, we think if you spent a little bit more time planning about how you are going to place that concrete, you might get a benefit." So, in all of these projects, the construction is actually started later, and the constructor is being far more involved in the design process, and working at what we are going to do before we start it. A lot of the benefits are coming from that process.

Safety was a key issue for this project, 808,000 hours of work over twenty-eight months with only three lost-time injuries. Our aim was to have zero lost-time injuries, and we were quite disappointed in having three in those 808,000 hours. This was the first project ever in Australia that had certification for environment, safety, and quality, all operating on the same project; $112 m work done with no variations. Some of the issues we had would have had the printing presses running, if it was a traditional delivery system, particularly the building of the embankments that were over thirty meters of mud, and were settling at greater rates than predicted by the client's previous consultants.

In cost estimating, the focus now is looking at it more from a probability point of view, and doing a simulation of costs, and looking at thirty percent probability, fifty percent probabilities of delivering at a particular price. In this case, the $112 million was believed to have a thirty-percent probability of being achieved, so that is a pretty good outcome for this project. Significant savings were made through design and construction, safety, excellence in environment, and community outcomes. But, if you talked with the supervisors, the foreman on the job, they will say how terrific it is just to focus on doing the job properly, and on how to do it better, and not focusing on how to get more money as a result of a variation or a scope change.

It's interesting in that the unit costs of construction were pretty well in the middle of the benchmark—not a lot of change to the dollar cost per cubic meter of concrete, but that the savings were related to how much concrete was actually used.

Is it value for money? This is a favorite chart of mine. You can be sure that guaranteed maximum price is the maximum price you are going to pay. When you put out a design-bid-build, you can be guaranteed that the project will cost more than the bid price. So, the answer is somewhere between the tender price and the guaranteed maximum price. When the initial alliance cost estimates are done, they are always more than what the tender price would be, because it is a true estimate of the final out-turn of the costs, including all the

risks and all the opportunities. On the thirty-six projects, 90% of them have come in within ± 5% of the target cost. So there is a fair degree of certainty of delivery costs.

I have seen some statistics from the Departments of Transportation, and they are saying average variations from the engineers' estimate to final delivery are in the order of thirty to fifty percent, so those variations and claims are as applicable in the U.S. as they are in Australia.

I'll stop there.

JOHN HINCHEY:

I think we will have time for a few questions.

AUDIENCE:

If you have some specialty contractors who are inactive at the beginning of the project, and others who are very engaged at the end of the project, are representatives of those contractors on the governing board for the entire life of the project?

MICHAEL WILKE:

That is a choice that is made at the beginning. In some cases where we worked, the alliance agreement hasn't been between all of the contractors and all of the suppliers involved. The key companies who are driving the projects would provide the alliance and the governance. To get the same behavior from key suppliers and consultants is to have some form of sub-alliance agreement with them, to drive the same behaviors and have the same risk reward-type relationship in there, but without having them in the overall governance.

One of the challenges of the National Museum project is that they chose to have all the key suppliers, like windows and frames, and have them all on the governance board. This made it very difficult to get unanimous decisions and to draw the right outcomes on the project. That's a fundamental decision that really needs to be made very early.

JOHN HINCHEY:

Mike, I have a couple of questions: First, what would be best way to integrate project alliancing principles and processes into the U.S. market. Second, do you think that these project alliancing schemes might be better suited to BIM and integrated practice models of project design, construction, and delivery than what we currently use in the U.S.?

MICHAEL WILKE:

The answer to the first question is that because I have had alliancing experience, I get invited to speak to many of the DOTs in the U.S., and their greatest concern is that delivery is legislated here. The procurement methodologies are legislated, whereas, in Australia, they are not. There are only a few states that actually have the legislative ability to deliver an alliance contract. That's the first hurdle.

The biggest issue in Australia in terms of delivery is the fact that the government departments have never signed an agreement of this type where they were truly sharing the risks and sharing the upsides and downsides. That probably has been the greatest legislative issue. We are incorporating a lot of the things that are being done on the alliance projects into how we do our business in-house. We don't want to just do it on outside projects; we want to incorporate those same things in our business. It does grow on you after awhile.

Coming back to the second question on how do you get started? To get started, somebody has to be a champion. An owner is going to have to stand up and say: "We are going to deliver our project by this method, and I'm going to make it successful." That's how it happened in Australia. Somebody basically took the risk of delivering the project by alliancing. You must be prepared to know where the potential is for it not to work. I think that's what is going to have to happen here. Somebody is going to have to take the risk, and it will be an owner prepared to do it. There are owners out there that are prepared to do that.

The other thing in terms of choosing a project, I wouldn't select a billion dollar-size project. If you are going to do it first up, and you want to take a risk, I would be down in the low hundreds of millions and pick a job that is quite complex and fits these criteria, where you can prove you got value for money and that you got really good outcomes, but without taking a billion dollar project risk.

AUDIENCE:

Michael, I would like to share with you and everyone a story where alliancing was actually used in a project at Kennedy Airport to save a traditional project that was about to go into absolute disaster. It was a traditional project where the Port Authority had given a concession to a private developer to develop Terminal One. They had all the contracts with all the concessions inside, so they had the responsibility to open the stores by particular dates, to open the gates for the airlines by particular dates, and the project was really in distress. The owner, in this case, the concessionaire, was threatening to get rid of the construction manager, and this job was in real trouble. At the ultimate confrontational meeting, the construction manager suggested an alliancing team: "Let's save the project by putting away all of our disagreements," and coming up with common goals, setting up an alliance, just like the chart that you had up there, where we are going to take the best people, and, instead of having our two experts be confrontational trying to prove that one to the other is better, we are going to take the better of them and that one is going to be the one doing the scheduling. They successfully completed the job, and there was no litigation. It was an interesting application and the first time I had seen it used in this country.

MICHAEL WILKE:

One of those thirty-six projects in Australia was very similar to your example. In fact, Heathrow Airport Redevelopment in the U.K. has a large piece being done by alliancing as well.

AUDIENCE:

I am with AMEC. From our experience, I think it will probably be a while in the public market place here before we this kind of delivery system is used. We are still struggling with design/build and PPPs at the DOT level. In the private market place, I am a little surprised to see you guys working on a P30 target cost level. In our experience that's typically where these things are breaking down. The owners are still looking for a low-level GMP price. The contractors, of course, don't want that target cost set too low. We are finding that more and more of the private owners are veering away from these kinds of delivery models. Do you have a comment on that?

MICHAEL WILKE:

A couple of comments. This particular issue, P30, was driven because many clients are saying ninety odd percent of the jobs finished plus or minus five percent. This particular team for this project had previously finished another alliance project that was nearly twenty percent under the target costs. So there was an enormous drive on this team to make it harder in terms of attempting to achieve against the price. The private sector has not embraced this in the Australian environment either. The main reason is that in the PPP market, where they are looking for a guaranteed maximum price, they are really looking at off-loading risk and they want a guaranteed number. They still will not accept that alliancing target price as a guaranteed number. From a government department point of view, a target price is as guaranteed as they would like, because they can put in all these variations and still come up with an answer that's almost fixed. In the PPP environment in the U.K. and Australian environment, guaranteed price wins the day all the time.

JOHN HINCHEY:

Let's move on to our next group of issues, dispute resolution. Tom Stipanowich is one of those individuals who has done a little bit of everything, and everything he does is par excellence. Tom earned his degrees in architecture, he practiced law as a construction lawyer. In fact, he was first hired by the "Dean of American Construction Law," our own Overton Currie. He has taught construction law, arbitration, and ADR in many fora; he has served as the president of the International Institute for Conflict Prevention and Resolution (CPR); and he has traveled the world over, being much sought after as a consultant to countries who were looking to set up conflict resolution procedures. As I said earlier, I don't know of anyone who has thought more deeply, more extensively, and is published more often than Tom Stipanowich.

PROFESSOR THOMAS STIPANOWICH:

Thank you so much. I appreciate the kind introduction and am delighted to be here with so many friends and colleagues. As many of you know, I recently departed the East Coast for the West Coast. The other day I was driving down Venture Boulevard in Encino, and saw a sign on a restaurant that said, "Café Boujour—Kosher Sushi." That is when I knew I had arrived in California.

I am very fortunate to be at the Straus Institute for Dispute Resolution at Pepperdine, the largest and among the best known of emerging conflict resolution programs at academic institutions around the world. Our faculty includes nine full-time professors and many adjuncts who devote most of their time to conflict resolution, including everything from NAFTA to international claims tribunals and, of course, negotiation, mediation, arbitration and other forms of conflict resolution. We sponsor two masters programs and a variety of different programs for mid-career professionals, primarily attorneys. It has given me a new perspective on the future of modern legal education, a subject to which I shall return.

It is my intention to offer three predictions for the future evolution of conflict management in the construction arena. They are based on my own experience at the helm of the International Institute for Conflict Prevention & Resolution (CPR) between 2001 and 2005, conversations with colleagues in the field and mounting evidence of other kinds. Some of my observations will be received as common knowledge, others as controversial. My hope is to stimulate continuing discussion about the challenges and opportunities facing the construction industry and the legal advisors and advocates who serve it.

Prediction One: Arbitration processes, in many ways "the new litigation," will be further marginalized. Arbitration's future role depends upon our making better choices respecting arbitration, and acting accordingly.

For arbitration, it is the best of times and the worst of times. During the course of our careers arbitration has evolved from a favored option in construction and other commercial settings to become an all-purpose surrogate for litigation. It is now applied to virtually the entire spectrum of civil disputes, including tort and statute-based claims. In the U.S. it is no longer simply a commercial forum, but effectively a court of last resort for consumers and employees. It has also become increasingly well established as the widely preferred mechanism for adjudication in cross-border commercial transactions. At the same time, criticisms of arbitration have never been more palpable if not more widespread. Moreover, lawyers and clients looking for effective approaches to resolving conflict have a wide array of choices, including mediation and early decision-making processes such as DRBs or "statutory adjudication," which may be viewed as much more effective than arbitration in various respects.

While arbitration is not going to disappear, it is already being marginalized as a dispute resolution approach. There is no better example of this trend than the announced intention of the drafters of the 2007 AIA contract documents to take out the longstanding binding arbitration provision and require parties to take specific steps to affirmatively indicate their intent to arbitrate rather than litigate. Arbitration's precise future role will depend on its effectiveness as perceived by increasingly sophisticated users. It is going to have to prove its value in specific settings, and among a variety of alternatives.

A couple of years ago I was a participant in the ABA Litigation Section's Symposium on The Vanishing Trial, in which Professor Mark Galanter and a number of other scholars unearthed a variety of statistics. One of the more salient points was that federal court cases in which there was an actual trial on the

merits fell from 11.5% of all federal cases in 1962 to 1.8% in 2002. There were also significant reductions in both jury and bench trials in state courts as well.

What about arbitration? Judging from the articles one sees in legal and business publications, arbitration has serious problems with business clients. However, there are other sources that suggest a more positive or at least mixed point of view, including surveys published by law firms such as Fulbright & Jaworski and DLA Piper Rudnick. These provide rough data regarding arbitration usage by corporations along with their perceptions of arbitration and other processes. These are not scientific surveys, but are prepared primarily for marketing purposes; nevertheless, they frequently provide interesting insights on trends and perspectives.

Results from a survey of 300 corporate counsel by Fulbright & Jaworski, looking at attitudes toward domestic arbitration reflect a tendency to view arbitration more positively than litigation but also reflect a division of perspectives among corporate counsel. In the Fulbright survey, counsel were asked their views on whether arbitration offered cost savings over litigation. Not quite half of those responding answered affirmatively. A similar comparison was sought in a survey by *Corporate Legal Times,* with most respondents (59%) concluding that arbitration generally was less costly. In the latter survey arbitration almost four-fifths (78%) percent of those responding thought arbitration tended to produce quicker results than litigation. Moreover, most counsel perceived arbitration results as just as fair or fairer than litigation, but responses to another question indicate that there is still an abiding perception that arbitrators tend to "split the baby" in their awards.

So why are there so many concerns about the future of arbitration? There are several reasons. If you go back fifty or sixty years and examine some of the studies of arbitration by Professor Soia Mentschikoff and others, the picture that emerges looks very different from the arbitration of today. The studies depict relatively simple and straightforward procedures involving business disputes. There is less talk of the role of lawyers. There was no pre-hearing discovery and motion practice. Arbitration was very much a black box, and businesses appeared to prefer it that way. It was a don't-ask, don't-tell arrangement in which arbitrator's awards were as short and to the point as possible, and courts were happy to look the other way on the merits.

As previously noted, arbitration has expanded dramatically in the last quarter century. In the United States we saw the dramatic growth of arbitration to address all kinds of civil disputes as courts were broadly interpreting arbitration agreements. Arenas like antitrust and intellectual property that had been resistant to arbitration for various public policy reasons were sooner or later judicially "opened up" to arbitration. We also had dramatic expansion into the realm of standardized mass consumer contracts and employment contracts. Finally, we have the growth of arbitration with the emergence of global markets, where growth continues.

The expansion of arbitration has resulted in a dramatic change in the arbitration procedures. In order to grapple more effectively with a wide range of complex business disputes, arbitration procedures have tended to become

longer and more detailed, and lawyers apply all the same tools of zealous advocacy they employ in litigation.

American arbitration hearings are now typically preceded by motion practice and discovery, including depositions. Although many arbitrators and some arbitration rules aim to hold the line on excessive discovery, it is not unusual for zealous legal advocates to agree to trial-like procedures for discovery, even to the extent of employing standard civil procedure. "Docketing" problems often occur due to the busy schedules of arbitrators and counsel--a reality exploited by parties seeking delay.

One of the much-vaunted aspects of arbitration is its finality. Under applicable arbitration statutes judicial review of arbitration awards is limited to looking for fundamental procedural deficiencies such as evident partiality of arbitrators, prejudicial fraud or misconduct, a failure to hear material and relevant evidence, or a decision beyond the scope of the arbitrators' contractual authority. These limited grounds for review have long been viewed as imbuing arbitration awards as much more impervious to reversal than court judgments. But this reality is challenged by a survey of published federal and state court decisions on motions to vacate arbitration awards during a ten-month period in 2004. Although not by any means conclusive, the limited data suggest that the "finality" of arbitration awards varies considerably from jurisdictions to jurisdiction. For example, while federal courts granted only six of sixty-one motions to vacate during the survey period, the courts of California, New York, and Connecticut collectively vacated awards in nineteen of sixty-four cases—about one-third of the time. Another breakdown shows that among grounds upon which awards were challenged, the most successful ground for overturning awards was the argument that the arbitrators "exceeded their powers." There were 101 attempts in this period to vacate awards on the basis that arbitrators exceeded their powers; that succeeded twenty percent of the time.

There are a lot of pressures on arbitration today, more than ever before. Fairly or unfairly, there are continuing complaints about the process, and unfavorable comparisons to litigation. There are attacks by consumers and employee advocates here in the U.S., some of which are having an impact on regulation that is "spilling over" onto commercial arbitration. There are also complaints about cost, speed and risk by business clients who are increasingly focused on the bottom line—and in some cases are treating their legal departments as profit centers. Finally, and not coincidentally, there is the emergence in the marketplace of competing conflict resolution options such as mediation, DRBs, and statutory adjudication that are perceived to do a better job of achieving most of the benefits—speed, efficiency, economy, privacy, control over process, and reinforcement of business goals—traditionally associated with arbitration. They have challenged the primacy of arbitration, and require those tailoring arbitration provisions to take a much closer look at the proper role of arbitration in conflict management systems—normally as a backdrop for other less formal and less costly processes.

Prediction Two: Multi-step "filtering systems" for managing conflict, many emphasizing mediation, will become the norm in many public and pri-

vate contexts. There will be greater emphasis on early assessment of conflict, on "real time" approaches and on "thin-slicing."

Construction lawyers know well that the great success story of the last two decades is not about arbitration, but about the revolution in the use of nonbinding processes such as mediation and "early decision processes." Comparative numbers from the Fulbright & Jaworski survey suggests that, as one might suspect, mediation is generally more popular than arbitration among corporate counsel. A more salient number is one from the *Corporate Legal Times* survey of 2004, indicating that four out of ten corporate respondents said they had used mediation more in the last year than they had in the past.

In common law countries such as the U.K., the United States, Australia, and Canada, mediation as we know it is being utilized fairly heavily. Throughout the rest of the world there is a lot of talk about mediation, but it has not yet reached the critical tipping point among users, including construction users. There are in these countries, however, many, many people who have been trained to be mediators as well as national or regional mediation institutions that have been established and are looking for business. These organizations, including academic institutions, are in some cases setting very high standards for mediators, establishing much more elaborate criteria for mediator training and education than what we generally see in this country. In short, the world is gearing up for a global expansion in the use of mediation.

Yet another recent marketing survey of corporate counsel by DLA Piper Rudnick focuses on international dispute resolution methods in five regions of the EU. Some of the data on the use of mediation and other "ADR" processes in the EU must surely be grossly overstated, based on other studies and experience. Indeed, it is not even clear from the survey what processes the respondents perceive "ADR" to include. But it is very interesting to see that, despite the lack of real experience with mediation and other "ADR" processes, the surveyed corporate counsel indicate that compared to litigation, and especially to arbitration, mediation and other "ADR" approaches are perceived as being much more successful in resolving disputes. In other words, let me suggest, they may not have a sophisticated concept of what it is, but they believe it must be better than the traditional approaches.

Substantial obstacles remain to the expansion of global mediation along Anglo-American lines. The encouragement of courts and usage by business are critical elements. Sooner or later, however, we are going to see dramatic growth, not only in the use of mediation but a variety of other processes. Here in the U.S. we are already seeing a shift in the AGC contracts and the AIA contracts away from arbitration and a more variegated system which focuses on a consensus building or integrative processes.

There will be growing emphasis too on what have been called "real-time" processes such as DRBs, statutory adjudication and the like. In the construction industry we have long understood the dangers of unresolved conflict. It drains attention and energy from business and other pursuits and, often escalates as parties become more and more committed to fight. Delay in resolving conflict on a construction site can divert of attention from the project,

adversely affect relationships, delay or disrupt the job, and lead to escalation and protraction of conflict.

Today, the construction industry is just one arena of experimentation with "real-time" approaches aimed at addressing conflict at its roots. "Real-time" intervention in relational conflict means active involvement in the early stages of conflict by a third party with appropriate credentials and authority. Such intervention typically aims to maintain or support a relationship or relational system; resolve issues, conflict or disputes by relatively quickly and efficiently "thin-slicing" the issues; minimize costs, including the costs of resolution; avoid the courthouse or extended adjudication; and in some cases limit lawyer involvement.

"Real time" processes have a long history. We can, for example, look back a thousand years to the courts held at international trade fairs—what the English referred to as the courts of pie powder. "Pie powder" referred to the dust on the boots of the involved merchants; the idea was to resolve disputes before the merchants knocked the powder off their boots, or before they returned to their home countries on the next tide.

Today there are three major forms of real time intervention. There have always been mediators and conciliators who help to resolve issues or disputes within a relationship or a community—in some cases applying evaluative approaches or bringing authority to bear. We are also seeing widespread use of ombuds here in the United States and abroad. The concept evolved in Sweden two centuries ago, and is suddenly popping up in corporate HR programs and governance programs, universities, and health care systems. Kaiser Permanente has just introduced, in California, a point-of-service ombuds program in which an individual seeks to resolve disputes while the patient remains in the hospital and before legal process.

The third form of real time intervention is summary adjudication or evaluation, which is of special interest to the construction industry. People increasingly want a decision and they want it fast. Historically, this decisional role was played by a project architect or a project engineer. Because the utility of this approach was often undermined by perceptions of conflict of interest, we've gradually seen the growth of surrogates in the form of standing Dispute Review Boards, or DRBs. DRBs have been employed on nearly a thousand major projects in the U.S. including the Boston Central Artery/Tunnel project. The DRB Foundation claims an extraordinary 98% success rate for the processes, meaning a resolution with no further arbitration or litigation. The World Bank now requires DRBs on projects exceeding $10 million and as many of you know the ICC has just come out with DRB. Although there is very little solid evidence on the impact of DRBs on project cost, duration, or dispute resolution cycle time, surveys of construction industry personnel reflect very favorable perceptions of DRBs and their role.

In the United Kingdom, the statutory form of adjudication, in which a neutral decision maker (usually a chartered surveyor) makes a preliminary decision within a very short time frame (usually 28 days) that is binding until appealed to arbitration or litigation, now dominates the construction dispute

resolution landscape and has profoundly affected construction contract administration. It has also been a major factor in the dramatic reduction in construction litigation and arbitration in the U.K.

Although there are legitimate concerns about the limitations of such abbreviated processes in conflict management, the fact that they have been so willingly embraced by the industry (especially in the case of adjudication) bespeaks a genuine desire on the part of business people to "get it done" with less fuss and bother. There are a variety of possible lessons here, including the possibilities of quick and efficient "short form" arbitration that inspired the creation of new expedited construction arbitration rules by the International Institute for Conflict Prevention & Resolution (CPR).

One dynamic that feeds the growth of DRBs and statutory adjudication is the industry's frustration with lawyers, lawyer-dominated adjudication, and even lawyer-driven mediation. It is also important to understand the value of real time processes like DRBs, on relationships. The legal system generally tends to ignore relationships; litigation looks at the two parties and the rights and obligations of parties, and lawyers speak about the economic "bottom line." There is often, however, too little focus on parties' interests and the needs of the business relationship—the elements "below the line." The DRB focuses on defining rights and obligations within a relationship, but then indirectly supports relational elements "below the line"—trust, solidarity, reciprocity between the parties, and other corporate and individual interests and goals.

For the same reasons, it may be highly appropriate to employ a "standing mediator" to address conflict flexibly and early. I've had the experience of being a standing mediator who facilitated project meetings and communications in order to keep a project going, defusing some conflicts and reserving others for arbitration at the end of the job. Such approaches have the potential to do lot more both "above the line" in terms of rights and obligations and "below the line" in terms of reinforcing the relationship, moving the project forward and serving the primary business goals.

As lawyers, we also need to be careful about smothering creative and flexible approaches with what one of my colleagues refers to as "legal clutter." Perhaps it is inevitable, but we are already observing the beginnings of a substantial body of law building up around mediation. A recent article in the *Harvard Negotiation Journal* pointed out that there were more than 1,200 court decisions on mediation issues between 1999 and 2002, of which 300 involved courts looking at evidence coming out of mediation; in sixty-seven cases mediators offered testimony.

Prediction Three: Information technology, already altering the landscape in myriad ways, offers unprecedented challenges and opportunities for the management of conflict.

Other presentations have focused on BIM (Building Information Management) and the revolution in information technology that is transforming every aspect of our lives. Today, when I teach a class of law students, virtually every one of them has a laptop on which they are multi-tasking, sending e-mails to people a thousand miles away or communicating with someone else in the

classroom. "Infotech" is ever-present, transforming every aspect of our lives. It has changed the way we communicate, the way information is collected and stored, and the way we negotiate and resolve disputes.

A prime example of this new "disputing culture" is the resolution of sales disputes on eBay. The process begins with online negotiation. If that fails to resolve the issues, there is online mediation. In this way hundreds of thousands of disputes have been resolved; it was recently reported that the IRS is contemplating resolving millions of taxpayer disputes online. We are begin to think about the idea of holding hearings or a mediation sessions or arbitration hearings over thousands of miles with the help of HDTV and other technologies. Virtual arbitration hearings or virtual mediation may be the truest evocation of the promise of economy and efficiency in ADR, particularly in the world of complex international dispute resolution.

Infotech is also relevant in another rather terrifying respect, and that is the evolution of e-discovery in the wake of the revolution in electronic communication. E-discovery is rapidly changing the dynamics of information exchange in litigation, creating new challenges for courts and advocates and huge costs for parties. E-discovery may also end up being the acid-test for the ability of arbitration to provide effective alternatives to court. At the same time, infotech may be a part of the solution, including new technologies aimed at parsing and prioritizing documents and managing all the information with which we are attempting to deal.

For the legal profession, the future holds many questions. The questions begin with our present system of legal education, which is very much the same as our past system of legal education. Like Henry Adams long ago, I would suggest that our educational system that remains a century behind the realities and challenges of practice. America's law schools are still dominated by the long shadow of Christopher Columbus Langdell and his case method of instruction. We still refer to our "case books" and focus on appellate court opinions to the exclusion of trying to solve problems prospectively. We are paying insufficient attention to the fact that we live in a global society and one that is dominated by infotech. And then there is the cost of legal education: heavily-burdened graduates are driven to jobs that will enable them to address their debt burden, and required to hit the ground running in order to justify the salaries they are now being paid.

As practitioners, we need to temper our tendency to worship exclusively at the altar of zealous advocacy. Too often, we are too obsessed with the need to achieve "perfect information." Like General Montgomery at El Alamein, who insisted on having every gun in place before the battle, we are conditioned by the American litigation discovery model to insist on looking under every stone before trial. Maybe Montgomery needed every gun, but many of our business clients understand that in many situations getting the last 20% of the information involves 80% of the cost—and it may simply not be worth it. No due process is perfect, but trying to achieve perfection usually involves a very high price.

In his bestseller, *Blink!,* Malcolm Gladwell's essential point is that our minds operate to seek out the most quickest and efficient path to solutions. Our brain

designs shortcuts in order to allow us to cope with the myriad decisions that must be made in life; enabling us to function effectively. Without these "shortcuts," Gladwell explains, life would be intolerable if not impossible. As lawyers, we have a tendency to want to do everything scientifically and perfectly while the world around us is saying more and more loudly, "find a more efficient path; get it done, and quickly." The challenge, as always, is the balance between getting it done and serving other goals deemed essential by the client.

Thank you for your attention.

JOHN HINCHEY:

I first discovered Vivian Ramsey when I was looking for the definitive treatise in the U.K. on construction contracts. Of course, I was directed to Keating On Building Contracts. I found that Vivian was the author and editor of that much applauded text. Sir Vivian, as he is now known, currently serves as a Justice on the High Court of England and Wales, Queens Bench Division. He has seen construction dispute resolution from just about every angle. He has been a construction advocate in the courts, he has been an arbitration advocate, he has served as an arbitrator in many U.K. and international cases; and now, of course, he sees the disputes from the level of a judge. So, we are privileged and honored to have Sir Vivian Ramsey to speak to us.

MR. JUSTICE SIR VIVIAN RAMSEY:

It always happens, doesn't it, it all ends up with the judge. So, I am here on what I learned yesterday from Anne-Marie Slaughter is a junket. Frankly, Phil, you did not need Tom Barnett to tell me that the special relationship is going to be with Iran in the future, so that in the next one of these conferences, an Iranian Supreme Court judge will speak to you. Having followed Tom Stipanowich, I feel like the judge in the Court of Appeals who, when he gives the second judgment, just says, I agree, and sits down. There's a lot we have in common, but let me try and find something that's different to say about courts, arbitration, and ADR.

Obviously my approach is U.K.-based. But, as John said, I have practiced and appeared in court in four different jurisdictions overseas and acted in arbitration in about twenty different jurisdictions and in cases to do with about sixty different countries. That gives me a slightly different approach over a purely domestic approach, which I think many people in the U.K. and U.S. have. Everything is, in a sense, grounded in where you come from. The home approach is where you start first. However, my approach is a more international based view. The first thing I look at is what is the appropriate dispute resolution process internationally, and then see whether or not there is any reason why that should not be the one which is chosen domestically.

We have heard a lot over the past few days about the need for flexibility and adaptability in courts and arbitration. What I would suggest is that now, the U.K. model of the courts and arbitration has shown that it is possible to have flexibility and adaptability in both arbitration and the courts. I obviously accept now that ADR, which I do not think is really an alternative, but a supplement

to dispute resolution by courts and arbitration, has to be used in every single case. I don't think there is now any case that you just start in arbitration or you start in the courts and that's the only process you go through. Today, as we saw in the slides from DLA Piper Rudnick, everybody puts together surveys which question time, cost, fairness and finality of dispute resolution.

The first thing I would like to do is to look at courts and arbitration. My perspective is that the process in court and the process in arbitration should actually be no different. Obviously, there are differences in different jurisdictions. In the U.K., we have the Technology and Construction Court, which is a specialist court, which deals only with construction and technology disputes. We do not have jury trials, we abolished those a few hundred years ago in terms of a civil procedure. We still have them for criminal matters, of which I am only too well aware in my new role.

The choice between court and arbitration should not be made because a party wants something in arbitration that it is not going to get in the courts or the other way around. There are choices to be made between the two. If you are dealing with an international case, you are very unlikely to choose a court. Why, because you have two different cultures, two different parties, and if you have a project in Pakistan, with a Korean contractor, you are very unlikely to use the Pakistan courts, you are very unlikely to use the Korean courts, you are bound to use arbitration. Now, there are other reasons why you might use arbitration domestically. You might use it because you want a confidential process or you want a particular arbitrator, but what you should not be doing is making the choice, because you say: we chose arbitration because it is the best of the bad lot. Both of them should follow a process, which I suggest is time and cost efficient, fair, and final. There are also differences domestically. If I look in the U.K., for instance, you wouldn't chose arbitration as of choice in modern dispute resolutions. The reason for that is that most major construction disputes in the U.K. are multi-party. If you have an arbitration clause in your contract, you have a compulsory stay now under the Arbitration Act of 1996 in England, and it's one of the major reasons why, like the AIA, the JCT 2005 now makes arbitration an opt-in rather than the automatic process. That is being followed by a number of forms, but I don't think that should result in fewer arbitrations. What I think it means is that people should make an informed choice of arbitration, rather than the courts.

Let's look at a few matters which are relevant in terms of ADR in the U.K. I am sure you have been bored to tears with U.K adjudication, but the decision was made to introduce it, and it follows a process which the construction industry, not the lawyers, led in the UK. That process was to decide to reduce conflict in the construction industry. Frankly, that is the starting point for such things as alliancing, and the lawyers in the construction industry need to keep that principle in mind in every single national construction industry. The need is to avoid disputes, but, as we all know, disputes arise. They especially arise these days, and there are new areas of disputes. There are now new complex requirements of employers. You have such matters as lifetime costing, key performance indicators. You have all sorts of new obligations under the Public Private Partnerships, Private Finance Initiatives, strategic alliancing, partner-

ing, and all sorts of other issues, which are bound to give rise to disputes. You also have technological developments. Most people, as lawyers, who are drafting contracts, draft them on the basis of the contract they have just drafted last week, last month, or last year. Technology and other developments mean that each contract now has to be much more current, and when you have current contracts, you get problems because the contracts have clauses in them which haven't been tried and tested, and problems arise. You are bound to have more disputes in the changing world.

Why adjudication? First of all is the desire for a quick decision. Most people want to have their disputes resolved quickly. The other point is that the adjudication applies at any time. It means that it can apply during the course of the project, and it applies after the project, as well. The question is, is it a fair process? Most processes which resolve disputes in twenty-eight days are not going to be fair. They have a degree of rough justice about them, but people choose to use them. The final point of why people go to adjudication is that they are not final, and that, I suggest, is one of the most important reasons for people to go to adjudication. These are interim decisions which are made. It gives you a cushion of comfort when you go into the dispute resolution procedure, because if you win, you win; but, if you lose you can regroup and decide whether you want to try again. Like a number of dispute resolution processes, it is not final, but the reality is it is final. The majority of cases which go to adjudication in the UK never then proceed to arbitration or the courts. The reality is the parties treat those as final. Why do they treat them as final? Because they have obtained a decision from somebody, and they live with it. They do not decide that this is something they have to re-litigate, even if they are dissatisfied with it.

Often, if the dispute arises in the course of an ongoing relationship, the important point is to see it in the context of the project in the future, and what is going to happen on future disputes: "We will see what happens at the end of the whole project"; and, by and large, they decide to live with the position.

It's interesting, because it creates an atmosphere on the project. If you have an adjudication favorable to the contractor, the client's representative, who has been stonewalling every single change order, suddenly realizes that there is a process which is going to expose him publicly to his employer and the other side. This means that the process encourages a much more co-operative attitude between the people working on the project.

As far as the process is concerned, let's begin with: how quick is it? It's a twenty-eight day decision that can be extended by fourteen days to forty-two days by agreement of the party who refers the dispute. The majority of the disputes are dealt with in twenty-eight days, but there are disputes which are being put to adjudication that are totally unsuitable for it.

There was a final accounting dispute for a whole project, a project which had a fire during the course of it, had losses, expenses, and program delays, was referred to a twenty-eight day adjudication. The process of obtaining a decision in twenty-eight days was, you might think, impossible. I was the adjudicator. One of the best pieces of the procedure was to say that we would

have hearings over the weekend, and we would have five-minute hearings on each claim. After we had spent a morning on the five-minute claims, the afternoon went something like this. Claim #128, we've got nothing to say about it; #129, we've got nothing to say about it; and before you knew it, they were actually resolving a lot of the disputes themselves by deciding they weren't going to pursue large numbers of claims, which they had put in with the thought that perhaps at the end of some long arbitration process the arbitrator might give them a couple of dollars on this or a couple of pounds on that. So, the reality is that it can all be dealt with in twenty-eight days.

The other side of it is that some parties will agree to extend it. I was in an enforcement of an adjudication decision where the adjudication had taken 100 days. I've just done an enforcement of an adjudication where the parties agreed for it to last a year. Now, you can see that those situations, I suggest, are moving far away from the purpose of adjudication.

I now would like to touch on mediation. Mediation is by far the largest method of dispute resolution in the U.K. It is used almost invariably in all litigation, and the reason for that is because we now have the pre-action protocol before the litigation. That means that you cannot start proceedings until you have gone through a process where you have explained to the other side what your case is, the other side has explained to you what their defense is, you have had some basic discovery from each party, and you have approached the question of whether you are going to resolve it through a form of ADR. That form of ADR is normally mediation. What that means is the courts in various sections are running out of business. In the TCC, the Technology and Construction Court, I am glad, personally, that that is not happening.

Why is mediation a good idea? I suggest that compared to adjudication where a third-party is making the decision, and making a decision which you may or may not live with, the great advantage of mediation is that it has to be the informed decision of the party who is there. The parties to the dispute make the decision themselves.

Adjudication and mediation, therefore, are totally different, but they are supplementary to a court process. If adjudication or mediation has not worked, then you have to go to arbitration or to court.

Let me discuss the international perspective of adjudication and mediation. First of all, statutory adjudication is something which the government decided to make compulsory in all construction contracts in the U.K. It is now being introduced even into contracts to which it does not apply. I gather, in a number of other jurisdictions, including the U.S., adjudication is now a contract term. It will be, I suggest, a contract term in most jurisdictions. Australia and Singapore have introduced it; Hong Kong is about to; and various other countries around the world will introduce it.

Adjudication is universal; mediation is more difficult. Mediation on an international basis is a problem, and the problem is one of culture. I had a case, not long before I came to the bench, where I had French insurers. French insurers could not understand why you should mediate a dispute. They had no concept of mediation. The French have a different way of dealing with things.

Another important factor is that in international disputes there has been a growth in corruption. One of the difficulties in an international dispute involving a third-world country is finding anybody who is prepared to commit themselves to the mediation solution. This is because there is a suspicion that they have taken a kickback, or there is a suspicion that they are the people who have made a bad decision, and mediation is a very difficult mechanism to use in a lot of international construction disputes.

Let me just deal, in closing, with three examples of where our courts and arbitration have been very effective in dealing with dispute resolution; because I think the perspective these days, is that the courts and arbitration should be ditched in favor of ADR. I had a case that started in June, my decision was handed down in August, and it had to do with a project which was running. The question was a heating and ventilating issue. Traditionally, in the UK as elsewhere, you heat during the winter, and you cool during the summer. The problem with modern buildings, as Bill Hellmuth was telling us yesterday, is now you cool it during the winter. In this case, the winter temperature was 21°C and the summer temperature was 23°C. Did you have to cool it in the winter down to 21°C when you only had to cool it down to 23° in the summer? A lot of money stood on this. Now, that was resolved after a two-day hearing in court, involving the architect, the main contractor, the developer, the tenant, and all the parties who were necessary. I decided that it had to be cooled down to only 23°C at all times. One of the major reasons for deciding that was the fact that it was a sustainable building. Mediation would not work, because there were so many parties. Adjudication would have given some result the people might have lived with, but you are designing the building. If you design it to 21°C, and, in the end in litigation, it's determined to be 23°C, you have had it.

Let me give you another example of difficult cases in ADR, an international arbitration that I did just before I went on the bench. A Scandinavian country and a former Soviet state entered into a bartering agreement between the two. In that case, the whole matter depended on who was telling the truth. With some former Soviet states, it has been my experience that all of the documents are said to have been forged. How do you resolve that sort of question by adjudication or mediation? When you see the witnesses coming in front of you and they are asked, "Well, we found this copy of the letter in your file," they will say, "It's not my letter, it's not my signature." If you say someone saw you sign it, they will say, "They are lying, that it is not true." You have absolutely no success, I suggest, using ADR with that type of dispute.

The third case is an insurance case, involving technology risks. Tony Smith was involved in this one. The issue was very simple. One party, who manufactured a generator, said that if insurance was not available at reasonable market rates, due to a failure of the design of this type of generator, then they would provide a letter of guarantee for $120 million. A dispute arose, when the claimant could not get insurance. After an arbitration, one party obtained an order that a letter of credit should be put up. That meant that the panel had to resolve complex questions as to whether it was market hardening that had caused a non-availability of insurance or was it the technology risk. That

is not a dispute which easy to resolve by adjudication temporarily. It is not a question which could easily be mediated. How are you going to get that letter of credit produced as a result of a mediation. And, so, it had to be resolved by a final process, in that case arbitration.

Those three disputes were resolved in arbitration or the courts in between two and six months. I suggest that the courts and arbitration still have a major role, and that ADR should be described as supplementary dispute resolution.

Thank you.

LYNN SCHUBERT:

Since there don't seem to be questions for the panel, I would actually like to ask a question. I have known a couple of the gentlemen in this room for a very long time, almost as long as I have known Mr. Hinchey, who was my former partner; also, Mr. Jim Groton, and Mr. Les Edelman. We were part of a group called DART (Dispute Avoidance Resolution Task Force), Ava Abramowitz was on that as well, twenty years ago, I believe. At the end of the day, all of the parties to the construction industry signed off on an agreement that we would do something even greater than the partnering that the Corps had started at that time. We would find a way to avoid disputes on construction projects. That was twenty years ago. I have heard some very interesting and exciting ideas today about those types of issues; but as I understand it (because I did the same thing that Mark Reagan did and went and did a little background search on the members of this organization) you are the experts in construction litigation. You are the experts, you represent as far as I can tell, contractors, owners, architects, engineers. I am curious by a show of hands how many of you would be willing to recommend to your clients to enter into an alliancing arrangement at this point in time? That is extremely good news. I am looking forward to not having this conversation again twenty years from now.

AUDIENCE:

It really all started when the industry said I have had enough. I will never forget a meeting at the Corps of Engineers when the whole discussion was about what was happening to our construction industry. It was conflict after conflict. The only thing that I can say is that I spent a number of years as an in-house counsel for a very large organization, and if I learned one lesson during that period of time; the key to good governance, the key to leadership, is the ability to make your own decisions. I don't know why, and I have never understood why, disputes that come up through the contract should be an exception to that general rule. Alliancing seems to use some of the principles we worked on, and that we came out with. Disputes that are based on fraud, that are based on criminality, that are based on one of the parties having a strategy of litigation, and there are many of those, forget them. Let them go to litigation, and let them go to arbitration. But, in those cases where you have a good organization, and it wants to adhere to the rule of making in-house decisions or at least being part of those decisions, then I think it's our job as attorneys to come up with the various processes that are most effective.. I believe pro-

cesses change, they must change, and I think each case has to be looked upon individually with the idea of coming up with that process that will help the decision-making be retained within the organizations that are having their discussions. That to me has always been the key. I know I'm one of the few that belong to this organization. I have heard enough about litigation and arbitration. I have heard enough, because arbitration is equivalent to what we had in the government and the board of contract appeals in the private sector. That's all it is. It failed in the government side, and except for those cases that we discussed, that had to go to that process, it failed generally. But I would rather us place a lot more energy spent on the concept of trying to come up with a process that keeps decision making for decision makers.

AUDIENCE:

I want to clear up a misconception about alliancing. We have been using alliances in the United States for our company, Washington Group, for the last five years in the power industry. We have alliances on an ongoing basis with several major utilities. The good thing for us is that we have a consistent baseline of business, we have a risk profile that we like, and the clients get engineers with the expertise on a regular basis, when they need them, especially at a time when engineering is in such a short supply. Another thing that I would like to say is that Vivian Ramsey and I met in the late '90s, and it was at that time that we got involved with dispute resolution in the U.K. on two major power projects over there. We have adopted adjudication on several of our contracts in the United States, where we get quick resolution of change orders. We did this because we had recalcitrant clients, mostly in the public sector, which had a bureaucrat that didn't want to make a decision on a $5 million change order. It was not to his benefit to make a decision; and, if he could put off the decision, it was better for his career. So, we have adopted this type of dispute resolution, the same concept Vivian's been talking about today.

JOHN HINCHEY:

As we close this session, I want to express our great appreciation to this distinguished panel for their provocative and challenging presentations. As we do that, I will ask Chairman Bruner to walk up and dismiss us.

PHILIP BRUNER:

Thank you John. I invite all of you to join us for lunch. General Strock has kindly indicated that he would share some remarks with us, and then we will close our proceedings. Thank you.

The Path Forward

Lt. General Carl A. Strock P.E.,

Chief Engineer and Commander, U.S. Army Corps of Engineers, Washington, DC.

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PHILIP BRUNER:

We are pleased to have with us an individual who is one of the world's top construction executives. He has agreed to offer some remarks about our industry. He is a registered engineer. He is a member of the Order of Engineers, which is a distinguished group established by the American Society of Civil Engineers. He's a graduate of VMI, and holds a master's degree in engineering from Mississippi State. He has devoted his entire career to the defense of this country and to its improvement through civil works as well as military works. He has, in my judgment, the toughest job of any executive in global engineering and construction. First, he manages some 34,000 employees. Second, he manages a budget of multi-billions of dollars. Third, his operations are global and go to the far reaches of this earth into a lot of places where many private contractors would never want to venture. And fourth, he's got a tough boss in the President of the United States and only 300,000,000 people to be responsible to. We are delighted and honored to welcome the Commanding General of the United States Army Corps of Engineers, Lieutenant General Carl Strock. General, we are very pleased to have you with us.

GENERAL CARL STROCK:

Phil, thank you very much for the opportunity to say a few words. I really am honored to be here in this place. Dean Poor, thank you very much for hosting this symposium and before this body. I am truly honored to be here. I came here last night with a wonderful sense of expectation because this is the first time since I have been the Chief of Engineers, about 2-1/2 years now, that I have gone to a conference in which I did not have a leadership role or some speech to give, and I found myself looking forward to sitting back and listening and understanding some things that perhaps I had not been exposed to before, and this symposium has certainly done that for me.

In the military, we have terms of reference, and we do a lot of things by radio. You're either on transmit or receive, and I find myself all too often being on transmit and not enough time being on receive, so it was really refreshing

to sit down and read a paper as I was flying here to Princeton last night. This morning, though, I realized why I am here. I was talking to one of your members in the hall. I was explaining some of the experiences we had on the Gulf Coast over the last year or so, and I remarked that we did accept accountability for some of the contributing factors in the results of the disaster down there. And he made the comment: "You are the Holy Grail." I asked, "What do you mean?" He said, "well, you've admitted culpability and you have deep pockets. So this group is very glad to have you here." So I now feel I am in the witness chair, as it turns out. I also was warned that there is a member of the press here from the *Engineering News Record*, which is a wonderful publication. ENR is really one of the few magazines that I make sure I read. If I am too tired then I throw it in the briefcase, and I read it at home or elsewhere. It's a great publication. They truly are there to inform the industry. They are very balanced. But, at the end of the day, they are reporters. So, I am in a room full of lawyers and reporters. I have no further comment. Thank you.

No, seriously, this morning has been a very stimulating and informative period for me, and I regret that I wasn't here yesterday. As I looked at the panel, not only the participants, but the subject matter, it was clear that I missed something that could have been very useful to me. I thank Hans Van Winkel from CII and Les Edelman who is one of your members for encouraging me to come and spend some time with you. I wish I had brought a gaggle of my lawyers along to listen to this discussion.

On the subject of Les Edelman, let me share with you one of the watershed moments of my life as an army engineer, one that occurred when I was newly promoted to Brigadier General returning to the Corps of Engineers after about a fifteen year absence. Les sat me down in his office—chief counsel at the time—and he said many things to me that I needed to know as an incoming leader of the Corps of Engineers. But one of those that really resonated with me, and I share it with other decision-makers in the Corps of Engineers every chance I get, is that as a public official we are not like the person on the street who, if there is no law against it, they just do it. In our case, there must be a law that empowers us to do what it is we propose to do. So his advice to me was whenever I have decision, the first question to ask is: Do we have the authority to do what you're proposing? If the answer is no, then the discussion has ended, and we look for another solution. If the answer is yes, but I see that look in their eye, then I say let's talk about that a little more, what is our authority? But if they are very clear and confident, then we move to the next level. It may be a minor point, but that has been my compass for the last ten years or so that I have served as General in the Corps of Engineers, and it has never failed me in making decisions so I deeply appreciate that.

The other thing I learned early on in the Corps of Engineers was that Elvis Presley and I have something very much in common and that is—every day we get a new suit. Except that my wardrobe has not increased, because the kind of suits I get involved in are not like Elvis—they are dirty and they are not glittery and full of sequins. In fact, to carry that analogy a little bit further, there's a difference, well, maybe it's the same. Elvis probably had as hard a time getting into his suits in his later life as I have getting out of my suits.

So, coming and listening to some alternative ways to resolve conflicts is of great interest to me. There are many topics that I could talk about today, and one of the most topical of those is Katrina, both what occurred and what the results are. I won't spend time on that here unless you want to pursue some discussion later on, but I will touch on one point very briefly and that is a subject that we've spoken a lot about today and that's the subject of risk. It's very clear to us that one of the greatest lessons learned in this event was that we did not clearly enough consider and articulate risk to the public. We are not the only players in that, obviously, but it was very clear to me that we have a responsibility to inform the public and inform decision-makers about the consequences of their decisions, whether they are decisions on the part of Congress on what to fund and not to fund or decisions on the part of homeowners who are thinking about rebuilding in New Orleans. We must ensure that they make informed decisions and a big part of that is the business of risk.

In fact, the Inter-Agency Performance Evaluation Task Force which we convened, was a wonderful effort, a model for both analytics as well as a peer review process. One of the conclusions reached was that we needed to spend more time on understanding risk and its consequences and, unfortunately, as that 6,000 page study was published in June in draft form for review by the National Academies, one missing chapter was the chapter on risk and consequence. I believe we are really doing some truly groundbreaking work on being able to understand and articulate risk, very sophisticated approaches. I hope, in the next month or so, we will publish that final chapter of the IPET study. I think that you and this industry will find that very interesting and enlightening.

Let me switch though to talk a bit about the other part of what you were talking about here today and that's the global engineering business. I would like to talk about that in the context of the Global War on Terror. Now with some reluctance I am going to throw out a topic, and because my handlers haven't prepared a speech for me, I am going to say something probably very dangerous here, but I am going to express a concern that I have. I don't want to send alarm through the industry, but I do have a concern about the role of this industry, the construction industry, in the Global War on Terror. It's a very long war. In fact, I was reading an inscription on the statue of Adlai Stevenson in the lobby of the Woodrow Wilson School. It says that the pursuit of peace is not going to be a short effort. It may be decades long. There's recognition that these things don't happen quickly and what we're about now is not a war. We are still in pursuit of peace, but we have to do that, unfortunately, through war at this time. It's going to be a very, very long war, and it's going to wear us all down in many ways.

What we like to do in these kinds of situations is to shape choices of those who still have the ability to make choices. And when we can't do that, we must be prepared to take action as we have done in Afghanistan and Iraq. We are still trying to shape the choices in places like Sudan, and I hope we are successful at that. But regardless of whether we are shaping choices or taking actions, I think that any aspect of our engagement is going to involve some kind of reconstruction or, in some cases, construction in the countries we are

dealing with. Ideally we will do it in failing states and help them avoid the failures, but if we must, we will go into failed states as we have done in Afghanistan and Iraq. Now, obviously, we precipitated the failure in some degree in both those countries, but while we call it reconstruction, if you look in Iraq, I think it was truly reconstruction there. They had a system that performed at a fairly good level thirty years ago, but since then through neglect, through the impacts of sanctions, through corruption, and many other things, their system had degraded to the point where it simply didn't function any more. And we are in the business of rebuilding that and, in some cases, reconstructing elements of the system.

In Afghanistan, there was nothing to reconstruct with the exception of the roads. We and USAID and some others went in and built roads around the country about thirty years ago, but those roads have degraded to goat passes now. So there will be an element of construction and reconstruction in anything we do in this global war. Our military officers, of which I am one, but I am not the warrior, the steely-eyed killer that I once was, have recognized and they discuss openly our engagement in two terms: one is kinetic and the other is non-kinetic, and they talk about them in a balanced way. The kinetic is a business of kicking down doors in the middle of the night and doing the kind of terrible things that you occasionally need to do as a soldier. The other is non-kinetic and that is rebuilding power plants, water treatment facilities, sewage plants, electrical facilities. If you talk to General Pete Carrelli, who is the three-star leader in Iraq right now, who, by the way, has his degree in community management, he understands this, and he sees these things going hand in hand. Without reconstruction, where you give hope to the people and a sense of future, it's very difficult to establish security. Our enemies will exploit the degrading conditions and tell the people the reason for that is because the United States is here. So we have got to do something to raise the quality of life of the people in the countries we deal in.

On the other hand though, without security it is very, very difficult for us to achieve meaningful reconstruction. Terrible things are happening in Iraq as you know, and many good things are happening too. For example, some of the challenges we face there: you are building or rebuilding a power plant, and you have a security force around your workers, but the enemy comes in, takes over the security of the place, parades all the workers out in front of the plant, and calls the supervisors forward, and executes them on the spot, and then tells the workers now, don't come back tomorrow. What happens then? I am sorry to be so brutal and blunt with you because it literally sends shivers down my spine to think about that kind of situation. Well, that is happening. Now that is not characteristic. Fortunately, only about four of the eighteen provinces are still in a very unstable state. Most of the country is not like that, but these things do occur, and I will talk about the connection here and express my concern in that context.

What is my concern? The U.S. Army Corps of Engineers is, as Phil pointed out, the largest public service engineering organization in the world. We have 34,000 or so people - that changes all the time. In fact, in the last ten years we have gone from 40,000 people in 1995 with about a fifteen billion dollar total

workload indexed to current dollars. Today we have about 34,000 people and our workload last year was thirty-two billion dollars. So our work force is dropping off, while the workload is increasing. Because of technology, we are able to do a lot of those things, but we are facing a very demanding workload now on both our civil and military fronts. We are successful because, in addition to our 34,000 people that work any day, we rely on about 300 or so contractors in the architectural, engineering, and construction business and many related fields. So we are, as we describe ourselves, a pyramid of capability, but the Corps of Engineers is a small corner of that pyramid, and we expand and contract the structure as necessary to accomplish our missions. In order to be successful, we must reach out to the private industry. So—if Lynn Schubert is still here, when you talk about surety—we have got to maximize the capacity of the industry to come to our assistance in instances like this. That pyramid I described talks about our finite number of people that work day-to-day in the Corps of Engineers, and assumes an unlimited capacity of the industry to respond. Well, we are now recognizing that that is not an unlimited capacity. There's a finite capacity and we are very concerned about anything that gets between us and our ability to mobilize the capacity of the industry. So, things like surety are important to us. If we require full performance bonds for the entire duration and scope of a contract, we are going to take away part of the industry's capability, and we will deny that availability of that industry to other sources. What we have got to do is look for innovative ways to use stack bonds and floating bonds and phase bonds and those kinds of things to really get access to the full capability of the community.

Now to take it into the theater of operations globally, we have got to do the same thing there. And the situation we faced when we went into Iraq early on and my shipmate, Dave Nash, is here, who was really the architect of our approach over there, and it was the right approach, it truly was. The fact is that there was excitement in the early days of Iraq because people saw the second largest oil reserves in the world that had not been exploited fully and that provided great potential for development. Of course, if Iraq were to realize their full economic potential, it would be the centerpiece of the Middle East and it would be very, very influential in the world. So, what a great opportunity to get in on the ground floor by establishing contacts and building reputations in the country that then, when things resolve, you are there on the ground, what a wonderful thing. So, there is a certain amount of risk, but the expected rewards were potentially very high. In the short term, there may have been losses but long term, a lot of people saw a great benefit in getting involved in spite of the risks.

We all were very hopeful, and it's been a source of a lot of debate about what would ensue after the fall of Saddam. We were hopeful it would be a "ding, dong, the witch is dead" sort of moment when the people came out, and well, you are here, thank you very much and welcomed us with open arms. That was largely the experience we had early on, but it didn't turn out that way, and the security situation has gotten very difficult for us right now and that has impacted our contractor's ability to get the job done. There's a great urgency in these kinds of situations. We must mobilize quickly. The uni-

formed engineer capability in the Army, the Navy, and the Air Force simply doesn't have the capacity to move in quickly and get things done. One of the beauties of Dave Nash's solution was to bring in the private sector firms to handle different sectors of the infrastructure, to get us that traction and get the momentum going, and it worked very well. We need to continue to be able to do that.

The aspect of risk is something we were aware of. Our general philosophy is that in the early days of uncertainty, you do cost plus award fee acquisitions where the contractor is not going to lose money, regardless of the outcome. It's very important in these kinds of situations, because things happen beyond the contractor's control and beyond our control, getting materials through customs; strikes on our work; sabotage that you must repair, very unpredictable elements. And if you have a rigid contract that you have got to do conflict resolution, you will never get to where you need to be. As a result, we have to have ways to reduce risks to contractors and that was one mechanism we used early on. Over time, as the situation stabilizes, as things are less ambiguous, we go to defined and fixed priced contracting, which we're attempting to do now. The other thing we also are attempting to do in both Afghanistan and Iraq is to use Afghan first, Iraq first approaches to bring those contractors on board and build up the local capacity. Sometimes our contractors are in the business of working themselves out of work as they develop local capacity through hiring and growing subcontract capability.

It's not just a business risk of profit and loss. There is the real physical risk to the employees of companies and over the last year in Iraq, we have had eighty-six of our contractor personnel killed and about 180 wounded in the pursuit of their business. So there's a physical risk to that.

There's also a less tangible risk and that is the risk to reputation to some of these firms as we have seen. And it's really disheartening to me right now to see the politicization of everything, it seems, that we do in this country, especially what we are trying to do in Iraq. Contractors who have answered the call to duty, who have lost people killed in action, are being portrayed as profiteers. And when we have companies whose overhead cost is a large portion of their cost, and security is a large portion of their cost, they are slammed as a result because that's called profiteering. That's simply wrong, because if you are one of our firms over there—and I won't mention any specific ones—and your employee has had his family kidnapped and told don't come to work that day and so you don't get anything done—no production occurs, but your overhead remains and the high cost of maintaining people in that environment remains. So the overhead costs rise and production stays flat and it appears that you are profiteering, but it not the case. However, it's very difficult to get that message out to people. So it's a tough environment we work in right now.

Boy, I'm getting pretty negative here. I will finish up my concern here and then I will say something good and happy, okay.

My real concern is that exposing this too dramatically may scare off this industry. I don't want to say it's too risky, it's too dangerous, don't bother,

let somebody else do it, because if that happens, we will not succeed. If non-kinetic and kinetic must be balanced and there's no mechanism to deliver the non-kinetic—to get the water flowing; to get the oil flowing; the electricity flowing; to create the conditions for recovery—we will not succeed with the pure application of force. So we must be able to continue to incentivize people to come forward through patriotism; through opportunities for a business, or other means. So—that's my real reluctance in giving a dire message here. But I have that concern that the risk— the business risk, physical risk, the reputation risk, the political risk—may be too big for us. I have a growing sense of concern that while we don't like it, we will be doing this kind of work in other places. We will be doing this work for years to come, and we must continue to rely on this industry to make it happen.

Well, is there anything good happening? One of my biggest frustrations here is that the things that you hear about, the things I have talked about, the things you see on the news, are real. I rarely see inaccuracies in media. The challenge we have is that you see the truth, but you don't see the whole truth and you don't see the full balance. The fact is we are doing tremendous things to improve the quality of life of both the Iraqi and the Afghan populations. I go back there about every six months, so I have the ability to have almost time lapse photography of the progress. It may not be noticeable incrementally day by day to the people, but I see it every time I go back. As I fly over Baghdad, there's a satellite dish or two or three or four on every single roof. Those were not there at all under Saddam. The city is bustling. Commerce is flowing. So in spite of things that do occur, it's a city of seven million people and tragically, people are killed every day, but things are not in total chaos there. There are some very, very good things happening.

Electrical production is a good example. You see and hear about the conditions in Baghdad. Baghdad today, on a good day, gets about nine hours of power, and they typically switch it on for two and off for three and so on in different parts of the city and share the load that way. But across the country, they get about eleven to fourteen hours a day. Now that's not much compared to what we enjoy here in this country, but for seventy-five percent of the Iraqi people they enjoy more power today than they did before. Unfortunately, twenty-five percent live in Baghdad where they are very visible and vocal, and Baghdad is the center of the country so it is a tough situation. But if you live 100 kilometers away from Baghdad, under Saddam you would have gotten two hours a day, and, if Baghdad needed another 100 megawatts, you wouldn't get any power that day, because Saddam used services to punish and reward people. That doesn't happen now. There's an equitable distribution now and the reason Baghdad doesn't get equitable power is because the insurgents are cutting the fuel lines that fuel the thermal generators and they are cutting the power lines that bring transmission in from outside the city. Because they know that if they can make life miserable for the people of Baghdad, it will help them achieve their ends.

We are doing tremendously good and important work around both these countries. Again, I know Dave had some slings and arrows directed at him over the last year or so, but I'm telling you his idea was a good one and it has

to do with a true public/private venture leveraging all the capacity we possibly can.

I probably exceeded the time I was given to speak. I will stop there and, Phil, I know you have some business to do but I would be happy to open the floor to any questions about further stuff on Baghdad, Kabul, or Baton Rouge, whatever you want to talk about.

AUDIENCE:

It's been reported you have a very large construction project about to get under way in Afghanistan.

GENERAL CARL STROCK:

Not a project per se. It was reported recently that the workload of our Afghan Engineer District would probably double in this coming year. The biggest project we are most excited about was a big power plant at a place called Berzegan. We would rebuild a power plant for the Afghans. They have no national grid to speak of. That is kind of on hold now. What we spoke about there was the doubling of our program next year. We work in concert with USAID on many projects. Our main effort is to focus on security infrastructure at the moment. And that security infrastructure has to be first with the Afghan National Army. It's the only functioning institution of national government they have. And because it's a militia tribal culture, they respect the business of military, so the basic approach was to build the army around Kabul to create stability there and then incrementally throw brigade sized forces out into the provinces around the country. We have gone out in front of that and put down very fine facilities for these brigades, so we are building the camps that the Afghan Army will move into.

The next phase then is to restore a rule of law and to impose rule of law in some places. We are trying to make it very clear to the Afghans that the Army should be used to counter external threats and the police and security forces should be handling internal threats. And so the next phase is to send the police forces out. So the Afghan National Police program is a huge program. Next year we will build about 700 police stations which range from simple precinct offices to complexes that have power plants and sewage treatment plants on a regional basis. That's a big part of the program this year. But we really couldn't do that until the national government had a presence in the region and now the police will begin to move out and start to establish some sense of law. It's a wonderful environment. The Germans are training the police; the Italians are developing the justice system for the Iraqis, so it's really an interesting time to be there. The other part of our program is border security. In addition to working internal stability, we recognize that a lot of influence is coming from out of the country so another major part of our effort is to build border forts across the border of Afghanistan.

We're also doing other things, not only to prohibit entry, but to also encourage entry. We are building the first ever land link between Tajikistan and Afghanistan—a bridge that will connect those countries and really open up

central Asia in a much more effective way. No land transportation routes, rail or road, exist right now. And you can imagination if we can open up that central Asian area to the ports on the Indian Ocean, what a great boom that's going to be so it'll allow the Afghans to start collecting some revenues, commerce across the borders and so on. So we are doing a lot of exciting stuff. The security work is where our program is going next year, about one billion dollars worth of effort by the Corps. But USAID is also doing work, the roads are being improved throughout the country. We are doing a lot of micro hydroelectricity, since we can't put in a national solution we will do pinpoint local solutions, which are wonderful projects. Lots of good things are happening in Afghanistan.

AUDIENCE:

This has to do with Katrina. If the Corps of Engineers recommendation had been accepted in 1986 to build flood gates at Lake Borne into Lake Pontchartrain, what would the consequences of Katrina have been?

GENERAL CARL STROCK:

Well, it's awfully hard to predict. I would say that if we did have flood gates that functioned properly, the floodwalls that did not function properly would have been taken out of the mix and it is likely that that part of the flooding would not have occurred. But, there were fifty breeches in the levees. Four of them associated with the collapse of the floodwalls, which were design deficiencies. The others were anticipated, anticipated is probably not the right term for that, but understood consequences of the level of protection we had and that was overtopping of levees. Levees are designed to a certain elevation. They will hold back the water at that elevation and every indication is that our levees functioned as designed, until they were overtopped. Levees are not designed to withstand overtopping. So when they get overtopped, depending on the height and the duration of the flow over the levee, they erode on the backside and they eventually collapse and have the same catastrophic result. So, a good bit of the flooding had to do with levee overtopping and failure. Not a design failure, but a failure nonetheless and so those gates would have certainly reduced the flooding, but would not have eliminated the flooding.

The other thing is that the big problem in New Orleans is that it's a bowl below sea level and one of the greatest dangers New Orleans faces is internal drainage due to precipitation. So, they have massive systems of pumping stations. One of the other failures was that pumping stations stopped working because crews were evacuated and because they are on the main power system. When the power system went down, the pumping plants went down and so they didn't have the ability to evacuate water. It would have been academic because the levees were breeched to that point, but Katrina would have been a significant disaster in New Orleans, as it was elsewhere, even if our floodwalls had held.

It is a great question. It's one of those we have taken up in our studies, the Performance Evaluation Task Force, but also in a broader study of the decisions that led to how we got there. It really goes back to 1965, when the

project was authorized and the initial response of the Corps of Engineers was to build a massive surge barrier across the face of Lake Pontchartrain to keep the water out of Pontchartrain in the first place. It's almost ironic that that was proposed only twelve years after the Dutch floods in 1953. It's also ironic that it was the Corps of Engineers that went to Holland and helped the Dutch put together that plan and propose those barriers and then after this disaster, the Corps is told well, you should go listen to the Dutch because they have it figured out. That's the way it is in our business.

I won't go through the full litany of this but one of my conclusions from this experience is that we proposed a number of ways to provide protection to the city and for many reasons our proposals were not accepted. Some will say it was because of environmental litigation and other things but for whatever reason they were not accepted. And so we went from a large surge barrier at Pontchartrain; we fell back on what was called a high levee plan, which envisioned bringing the pumping stations to the face of the levees and taking those canals out of operation. That was not acceptable so we said, let's put in floodgates to keep the water out of the canals from a surge. That was not acceptable, for some good reasons. Then we go back to interior drainage. If you close the canals off, you can't pump the water out of the city. So, we did not do that. In fact, there was legislation that prohibited us from putting in floodgates.

So then we fell back to another solution which was levees. We like to build big massive earthen levees. They are the most effective form of levee, but where you have constrictions on real estate and other things, you go to smaller levees. There's a risk when you go to a smaller levees. We got the height through floodwalls. So we assumed some risk there. The end result of all of that is that it went from a barrier system to a high levee system. We said, okay, we will inherit some level of risk, and then we go from high levees with pump stations back to floodgates. There's another increment of risk and when you go to no floodgates and levees, there's another increment of risk. And then when you go to small levees and floodwalls, another increment of risk. And taken at each step, it seemed reasonable but when you stepped back now after forty years and say, wait a minute, risk plus risk plus risk plus risk, equals risk. I don't think we looked at it in a systemic way and that's certainly one of the lessons that we learned out of this.

I am sorry, I have taken your question in a completely different way but it would have been a catastrophic situation anyway. And we are not making excuses about the fact that we were prohibited from putting gates in because at the end of the day, as engineers, we have the responsibility if it is going to be small levees and floodwalls that that system will be designed and will function properly. So it's not about shifting the blame and saying. If you would have let us do what we could do in the first place, this never would have happened, it's not that at all, but thank you for asking.

AUDIENCE:

Can you talk to us a bit about how you and the civilian contractors partnered or divided up the work in Iraq. I think that's an interesting discussion.

GENERAL CARL STROCK:

Admiral Dave Nash, you want to take that one? Dave would probably be the best one to do this, because I wasn't involved in that. I happened to be back in Tampa on a conference on how to fix the electricity. At the time it was announced that we were going to get a five billion dollar program to fix Iraq, Dave Nash was one of the civilian advisors, former Naval CEC commander, admiral, who commanded the Naval CECs. Dave was over there, when I got back from our conference at McDill. Dave called me aside and said, what do you think? It was clear it was too big for the Corps of Engineers to start flat-footed. So let's let Dave handle that one.

ADMIRAL DAVID NASH:

Thank you. The original concept was we had no plan. We had nothing to start with, and I knew that we could not get the people over there from the United States government for a lot of reasons, so we came up with an approach that looked upon the United States government as an owner. It would have an owner's cadre that would operate much like an owner does in the private sector. Around that we would add contractors who would do both program project management and construction and design-build construction. The laws of the United States constrained us on how we did it. We went through that in great detail and set it up that way. So despite what you read in the papers and you hear, it was a way to get the job done with the resources that we had.

Carl was much more involved. He was one of my advisors. I don't mean to implicate him in it, but he was a good friend in Iraq and, frankly, what we had to do is just with a plain sheet of paper try to figure out what to do and that's what we did.

GENERAL CARL STROCK:

Thank you very much. Phil, thanks for the opportunity. You burst my little bubble of sitting back and being on receiving end for awhile, but it is helpful for me to sort of speak in an off-the-cuff fashion on what's in my head because that's probably a reflection of where my mind really is instead of these carefully structured and diagramed speeches that I tend to give. So thank you for the opportunity to just reflect among friends here.

PHILIP BRUNER:

General, we have been honored by your willingness to give us off-the-cuff remarks. All too often senior generals in your position would only speak to this group with a tailored written speech, and we only would get the actual words that were on the sheet of paper, so we really appreciate the confidence that you have shown in this group in wanting to speak to us off-the-cuff. It's a real honor and privilege.

It is time to sum up the symposium. I will begin and then be followed by Katherine and John, and then talk about the path forward. Where do we go from here?

This has been the first of what I believe to be a true industry-wide reflection on global engineering and construction issues, taking into consideration all disciplines that are involved, all the way from engineers, contractors, owners, architects, material suppliers, and even the legal profession. Certainly, we lawyers know about allocating international contracting risks by contract, and we also know about dispute resolution. Beyond that, there are a lot of things we, as lawyers, can learn from the rest of you.

We heard from Anne-Marie Slaughter, our first speaker, about what is really happening in international transnational interrelationships, including networking at the administrative level, the legislative level, and the judicial level, where people in different countries talk to each other and come up with common solutions which then are implemented trans-border.

We heard about transjudicialism a few years ago in one of our legal conferences when the Chief Justice of Canada, Beverley McLachlin, talked about transjudicialism and how the Canadian Supreme Court pays attention to cases of other jurisdictions in deciding what the law of Canada ought to be. We have our United States Supreme Court that is beginning to pay attention to foreign decisions as well, and that's also happening at the administrative level and the legislative level. As Anne-Marie says, there's never going to be a world government per se because international vertical and horizontal networks are already developing harmonization and uniformity in policy throughout the world on similar kinds of problems. Anne-Marie advises us that networks are growing in response to globalization, and we need to decide how to use them positively. She suggested that the U.S. should take the lead to harness and to stay in touch with those networks.

We heard from Alan Larson that there is a tremendous need for energy project engineering and construction. Nuclear power is on the world's horizon. There will be an increasing role for the private sector in nurturing public-private partnerships, because government alone is not going to be able to do as much as government and private industry could do working together. There's also the political environment that he spoke about regarding allocation of risk. He talked about the needs and opportunities and best practices in international construction. He talked about the problem of corruption. Transparency International, of which he is chairman in the United States, maintains a list along with the World Bank of a corruption index of countries around the world to be most corrupt. There are a lot of countries particularly those outside the functioning core, where corruption is still a significant problem.

We heard from Bill Hellmuth about sustainability being the number one issue in years to come, and about the United States being way behind the European Union on that issue. Our U.S. owners still want the cheapest buildings per square foot and don't want to pay as much attention as Europeans to buildings that are more sustainable but are going to cost more. We heard that building energy consumption is having a huge environmental impact. He indicated that a new connection is occurring between the mechanical and environmental engineering disciplines and architects, which is similar to what occurred a number of generations ago between the structural engineering and

architectural disciplines. Bill spoke of this as a new network approach to design and building a sustainable environment.

We heard from George Conniff on a number of different themes. He gave us a direct shot from the perspective of the contractor on what is going on in world engineering and construction. He talked about the blistering rate of change in global competition, which the United States is not doing a very good job of keeping up with. He talked about new sources of competition, about new sources of supply, and about new drivers of computer power and communications pushing change. He pointed out that U.S. engineering and construction firms maintain a flexible and adaptable approach to global work. He discussed trends. He talked about competitive pressures compelling Bechtel to use engineers overseas who are paid $16 per hour there, as opposed to $60 per hour here in the U.S. He spoke about China delivering steel at $1,500 per ton whereas it costs $4,000 per ton out of our U.S. mills. Now, of course, if China spends money on environmental protection as it should, the price of steel will go up over there. Because China is able to produce steel with cheap labor and without a lot of the regulation, things right now are economically very price competitive. Bechtel, as our largest U.S. contractor overseas, is obliged to compete with other international contractors including the Chinese, who now sport at least twenty-five of the largest 225 international contractors in the world.

George indicated that trends also suggest that there will be more large capital projects than ever before—larger projects, more complex projects, more expensive projects—and that China is one of the biggest drivers. China's consumption also will impact international construction for at least a generation or more. We need to come up with and address our dependence on Middle Eastern oil. Nuclear energy capital projects may be one response. Global warming also may drive capital projects. To the extent that seas may rise more land areas may want dike systems like New Orleans. And finally with regard to international construction, George reminded us of the extreme shortage of craftsmen and designers. That shortage must be addressed through a combination of training and immigration, and outsourcing of design and construction work may result as well. Where are these people going to come from and who can adequately and competently perform?

Owners are pushing risks onto contractors. From Bechtel's position that means that Bechtel in turn pursues aggressive risk management. Problems with regard to risk sharing generally arise when risk is passed onto somebody who doesn't control the risk. People who can control the risk ought to carry the risk.

Finally, George indicated that leadership was important. Where are we going to get the next generation of leaders and how is engineering leadership going to be developed. So, for Bechtel, people are its number one initiative.

Over lunch, we heard a compelling lecture from Tom Barnett about the connected core nations and the disconnected areas of the globe that remain sources of war, terrorism, and failed states. He also proposed that the U.S. Government enhance significantly its capacity to win the peace after winning

the war. He said the U.S. Military Leviathan must be supplemented by System Administration capable of fostering nation building after invasion of a state. He looks for strategic U.S. alliances with China and India.

Katherine, will you summarize your panel.

KATHERINE GURUN:

Thanks Phil. We had a very lively discussion about leadership and engineering. I noticed that our panel got through the entire three hours without mentioning the fact that there is an engineering "crisis" although several in the audience commented on that later. I stayed away from the word "crisis" because the focus of the panel was to talk about how we are going to create the leaders we are going to need for hugely complex situations through professional development at the universities. We didn't hear anything about a simpler world in the opening panel as you have just heard from Phil. And so in the engineering panel, I think we can draw the following conclusions.

We had the good fortune to have on the panel the deans of two of the most progressive universities in American engineering. We had the deans of Princeton and Cal/Berkeley Schools of Engineering. We also had Bob Bruner from the University Virginia Graduate School of Business, where he is a distinguished and noted expert in leadership. And so we started by trying to define what a leader was in this world today and what a leader really would be with this new generation coming up. Bob told us that leadership is the number one contracting resource. The good news was about the future generation is that they looked to have all the hallmark characteristics of tremendously talented and capable people.

Leaders more then ever must be fleeter of foot, more adaptable. They have to be able to lead from wherever they are, at the bottom of the rank, at the top of the rank. Rank, I think, will become something very different. What we have learned in the engineering world is that you build an organizational structure, and then you take it apart as you need to accomplish the task. So much of what is done in modern global engineering and construction is really task-orientated, and we have gone beyond projects. A lot of informal networks are formed within companies, among suppliers, and with clients. We heard today about alliancing which is a new way of putting together a team to do a task.

So leaders have to have, not only personal moral core convictions, but the ability to sense the future as it's arriving, before it arrives, and be able to reconfigure the way they look at this. We spent a lot of time focusing on the university yesterday, but the truth is that you spend a few years of your life in a university, and you spend the rest of your life building your career and your life, and so it's very clear that all of the corporations in this world have got to plow more back into your leaders because if you don't develop your leaders, you won't have the teams when you need them to do the amazing things which you guys are doing in all your places, and our guys are often there beside you.

So the leadership panel was, for me, the beginning. There's a lot longer discussion that goes there. Pat gave us a fantastic experience from her global experience in all the countries she's been in, and I think the engineering resources of the rest of the world are still largely untapped. I think that outsourcing is not the end, but the beginning and that really we need to put a lot more emphasis there in building leaders around the globe.

JOHN HINCHEY:

Our third panel focused on three sets of issues: One; to whom or what parties can construction risk be transferred, when the traditional parties, the owner, design professionals and contractors refuse to take on more risk? Two; is there an optimum method of project delivery that avoids, or mitigates construction risk, with a particular focus on alliancing? Three; what are the most effective and efficient means of resolving construction disputes, and what methods or processes are likely to be prevalent in the foreseeable future?

In response to the first set of issues, we learned from Mark Reagan and Lynn Schubert that insurance capital and surety capacity for major infrastructure projects is still available, and that there is still some appetite on the part of insurers and sureties to take on significant construction risk. However, the capital pool is limited, and insurers and sureties are going to be much more selective in choosing their risks. For example, they are going to be looking more closely at the specific terms of the contract that they will be insuring or guaranteeing, and they are going to be looking at the individual players that are going to be involved in these projects, so as to determine what their capacity, background and experience is. Further, they are going to be looking for larger capacity in their insureds and their contractors, which carries a number of implications, one of which is that only the larger companies and the larger joint ventures are going to be able to carry sufficient insurance and surety bonding to take on major projects.

In response to the second set of issues, the search for an optimum project delivery system, we looked at alliancing. We learned that alliancing is for real. It has been proven effective on major infrastructure projects, particularly in Australia, but it's not for everyone or every project. The efficacy of the system really depends on the specifics of the project and on the specific goals and objectives of the individual companies. While alliancing has been successfully used on quite a few international privately owned projects, and on publicly owned projects in Australia, it will be more difficult to implement in the U.S. with its plethora of procurement laws and regulations. Alliancing seems to be particularly well-suited for public-private partnership (PPP) infrastructure projects, assuming the procurement laws permit.

On the third set of issues—dispute resolution, there continues to be a growing dissatisfaction with the so-called "lawyerization" of arbitration. For the first time in decades, the AIA suite of documents will be modified to delete arbitration as the "default" dispute process. Now, contracting parties must "tick" a box, in order to provide for arbitration as a final and binding means of resolving disputed issues. Major reforms are needed, and Tom Stipanowich reminded us that the construction industry continues to serve as a "labora-

tory" for experimentation with ADR methods. Clearly, there is a preference for a greater use of non-violent ADR or "non-kinetic" ADR . As Sir Vivian Ramsey noted, we probably are going to see a demand for fast-track type arbitration similar to the adjudication system in the U.K., even if it means a bit of "rough justice," which recalls the lesson that Vivian brought to us, i.e., it may be painful in the short run, but the parties can learn to live with it in the interest of ultimately resolving the controversy. In the end, the processes of litigation and arbitration should be efficient as well as fair. But, are American parties and counsel prepared to gather, present and resolve significant disputes in complex construction cases in less than sixty days? Or, will there be pleas for continuances and more time to "discover" the facts? The success of such "fast-track" systems will greatly depend on the willingness of the parties, counsel, and arbitrators to devote virtually full-time to the task. There are open questions as to whether a more effective process is needed or whether the process selected by the parties is the optimum process for the particular dispute.

PHILIP BRUNER:

To conclude our proceedings, when the transcripts have been prepared and published, each of you will be receiving a copy as a permanent record of what you have heard and engaged in here. And in the coming months, the American College of Construction Lawyers is prepared to join with the global construction and engineering industry to join in a new initiative to address the challenges of construction in the coming decade, the coming generation, and to try to bring together the best and the brightest in this country to address the transformational issues confronting us all. It certainly would be appropriate to continue our discussions in future symposia of this nature in coming years. We hope that all of you will take an opportunity in the coming months, as you come up with thoughts and ideas as you think back on this symposium, to let Katherine or John or me know your thoughts. The College in future years looks forward to continuing the industry dialogue commenced here at Princeton. We can to work together for the good of this country and for the good of this world. Thank you.

APPENDIX A

LEADERS, MANAGERS, AND THE MILLENNIAL GENERATION

Robert F. Bruner[1]

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The fate of the world hinges on our preparation of the next generation of leaders. The argument is simple: economic growth is, in the words of John F. Kennedy, the tide that lifts all boats. If we seek to create a better world, alleviate poverty and suffering, growth creates the wealth that makes many things possible. What are the chief constraints on growth? There are at least three "usual suspects":

- Technology? I don't think the chief constraint on growth is technology: you can buy or license the technology you need. The problem is getting technology from the lab to the marketplace—but this is not a failing of inventors, scientists, and engineers.
- Manufacturing, project development, or service delivery? No, as the global outsourcing phenomenon has amply shown, you can pretty much hire all the productive capacity you need, somewhere in the world. The problem is making the connections, setting high quality standards, and helping organizations adapt to the relentless pressures of global competition, using W. Edwards Deming's spirit of kaizen or continuous improvement.
- Capital? As markets demonstrate each day, there is more money in the world than people know what to do with. The problem is finding,

1. Mr. Bruner is the Dean, Darden Graduate School of Business, University of Virginia, Charlottesville, VA. The author acknowledges helpful material provided by Marshall Pattie of the Darden School and Jonathan Bruner.

shaping, and marketing great investment opportunities to those with capital to invest.

I assert that the major constraint on growth is leadership.

The world economy today is growing in real terms at about five percent annually—this is a blend of two-to-three percent for the mature industrial nations, and seven to ten percent for large emerging countries such as China, India, Brazil, and Russia. The world economy has grown at about five percent for some years now. To give you some sense of the astonishing implications of this, consider that the last time the world economy grew at about this rate was during the industrial revolution, a time of dramatic gain in economic welfare. Can our rate of growth today be sustained to produce a similar gain?

The textbook analysis of economic growth would be that it eventually hits limits of various resources. Leadership is significantly involved with relaxing resource constraints. But what do we do when leadership itself becomes a constrained resource? Growth creates a huge vacuum for leadership. Feeding that need should be the concern of each of us.

The first principle must be that education for technical competence is not enough. It is a mistake to equate readiness to lead with a graduate degree (or any degree, for that matter). Much of what constitutes advanced education consists of mastery of technical matter: tools and concepts. The world needs technocrats. They are a necessary, but not sufficient, requisite for economic growth. We see this vividly in business, for there is a wide gulf between managers and leaders. John Kotter (1996) has distinguished managers from leaders: too often managers are focused on compliance with existing policies and procedures while leaders are focused on the resolution of deep problems. Perhaps we could draw similar distinctions between engineers and leaders, lawyers and leaders, doctors and leaders, and so on. The point is that technical competence is simply not enough.

How we assert what else we should teach must draw on some vision of leadership and what leaders do. The *Oxford English Dictionary* defines[2] "leader" as:

One who conducts, precedes as a guide… who leads a body of armed men; a commander, a captain…who guides others in action or opinion; one who takes the lead in any business, enterprise, or movement; one who is 'followed' by disciples or adherents; the chief of a sect or party…The first man in a file, one in the front frank, one of the foremost in a moving body…The first player in a round….

Similarly, the *OED* defines "leadership" as "The dignity, office, or position of a leader, esp. of a political party; ability to lead; the position of a group of people leading or influencing others within a given context; the group itself;

2. *The Oxford English Dictionary* (2nd ed. Clarendon Press) (hereinafter "OED").

the action or influence necessary for the direction or organization of effort in a group undertaking."

The standard definitions aren't much help in reflecting on the challenge of developing leaders. The training of leaders must spring from some notion of what they *do*. As I think about the challenge of leading, the work of leaders entails at least six elements:

- Recognize problems and opportunities. In part, leadership entails able analysis. But this is more than just pattern recognition. Leaders grasp the implications of an evolving situation. Winston Churchill, *Time* magazine's man of the 20th Century, foresaw the implications of German rearmament in 1933 and the Iron Curtain in 1947.

- Take action. Analysis by itself is insufficient. Leaders *want* to grapple with the action implications of analysis. Don't just stand there, do something. Bureaucracies breed inaction and inflexibility. Jack Welch at GE and Louis Gerstner at IBM broke corporate passivity. Leaders have a bias for action.

- Feel the social pulse. Leaders are socially aware; they have a heightened sense of the environment in which they live and work, their social surroundings—who are the adversaries and who are the potential allies, where groups are getting stuck or finding resistance, and so on. Social awareness also suggests a concern for the welfare of the community and the issues that excite attention within it.

- Enlist others. The old saying is that if you want to know whether you are a leader, turn around and look behind you. Leaders are effective at engaging people to form coalitions in response to problems and opportunities—this kind of engagement is, quite simply, a means of giving responsibility back to a group. Lyndon Johnson was the most masterful leader of the U.S. Senate through an extraordinary ability to build coalitions.

- Communicate well. Action-taking and enlistment of others depends so importantly on communication skill that it merits separate acknowledgement. Virtually all great leaders are memorable for their ability to reach the minds and hearts of their followers.

- Build trust. Communication devoid of content is just "spin." Trust builds on firmer ground. I think of at least three elements:

  — Competence. The leader must know his or her stuff. The platoon leader must be able to read a map sufficiently to get the troops to their objective. The modern manager must be able to coordinate project teams often dispersed by time, distance and ability.

  — Integrity. Leadership without ethics is just management by brute power. Followers willingly grant authority to those leaders who are fair and who fulfill commitments.

— Determination. Conflict is the medium of virtually all leadership. James MacGregor Burns has argued that leaders distinguish themselves through conflict. Leaders do not shrink from conflict that matters.

My colleague, Jim Clawson, distills such attributes in a framework of "Level Three Leadership." He notes that "Leadership implies three major thrusts: strategic thinking (leadership for what?), relationship building (leading whom?) and designing an action context (effective organizational design). Leaders who target Level Three (core values, assumptions, beliefs, and expectations) can be more effective and powerful than those who, traditionally, target Level One (focus on behavior) and Level Two (conscious thinking)."

As these attributes suggest, leadership is poorly reduced to checklists or maxims. In corporations today, the leader is subject to immense pressure from others, must have a bias for action, and yet must analyze carefully and comprehensively, often under conditions of incomplete information. Leaders don't merely solve problems; they arrest messes.[3] Leadership requires extraordinary preparation, mastery of a wide range of tools, skills, and concepts, and above all, qualities of social engagement, communication, and trust-building. The whole of leadership is more than the sum of the parts.

It is time for a fresh perspective on the predicament of the general manager. The more forward-thinking companies are returning to models of professional development that prepare general managers. Business schools are starting to return their resources toward leadership development in the cause of preparing general managers. But the "supply side," the rising generation, also has some influence on our ability to meet the need.

"Baby Boomers" (born between the early 1940s and the early 1960s) represented a sharp turn from their parents' generation. Attitudes of this generation were shaped by the Cold War, space race, racial desegregation, the Pill, Vietnam, and Watergate. Protest and rejection of the status quo are hallmarks of attitudes in this generation.

"Gen X" (born between the early 1960s and the early 1980s) also protested. Attitudes of this generation were shaped by the fall of the Soviet Union, AIDS, Tiananmen Square, the personal computer, and the *Exxon Valdez*.

The new generation just hitting college and graduate schools today is the "Millennial Generation" (born starting in the early 1980s). Survey research tells us that the Millennials are considerably different from their predecessors.[4] They are:

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3. Russell Ackoff wrote, "Managers are not confronted with problems that are independent of each other, but with dynamic situations that consist of complex systems of changing problems that interact with each other. I call such situations messes ...Managers do not solve problems: they manage messes." (The Future of Operational Research is Past, 30:1 *Journal of Operational Research Society,* 93-104 (Pergamon Press, Ltd., 1979))

4. The following points and the tables are drawn from direct analysis of the General Social Survey, 1972-2004, by the U. S. Commerce Department.

- More confident in major companies (Table 1).
- *Much* more confident in banks and financial service Institutions (Table 2).
- More confident in organized religion (Table 3).
- Much more confident in the benefits of education (Table 4).
- Somewhat more confident in the executive branch of the federal government (Table 5).
- More confident in the press (Table 6).
- More likely to spend an evening with relatives, neighbors, and friends (Table 7).
- More likely to continue working even if rich (Table 8).

Analysts and pundits see in these and other attributes the makings of a generation of leaders rather like the "G.I Generation" or, as Tom Brokaw dubbed it, "The Greatest Generation," that dominated the 20th Century. Their attitudes represent a sizable swing from the Boomers and Gen-X'ers. Howe and Strauss[5] suggest seven defining characteristics:

- Special. In direct contrast to the phenomenon of the "latch-key" kids and the rejectionism of Gen-X, Millennials see themselves as "special." Perhaps this springs from the cosseted "Baby on board" signs, soccer moms, and PTA activism of their parents.
- Sheltered. This reflects perhaps the growth of the child safety movement of the 1980s, and the vaulting attention to security following the Columbine shootings and 9/11. These children experience intense adult supervision at home, at school, and at play—we witness the rise of the "helicopter parent." This generation expects and wants structured processes.
- Confident. Nine out of ten Millennials describe themselves as "happy, confident, and positive." They are relatively scornful of the achievements of boomers and X'ers.
- Team oriented. The Roper survey of Millennial high school students asked them to identify the major cause of problems in the country. Their answer: selfishness. These children grew up with cooperative learning initiatives in classrooms, sports teams, instant communication opportunities, and popular culture examples (Barney, Power Rangers, etc.) The culture of this generation emphasizes groups and teams rather than the individual.

5. N. Howe & W. Strauss, *Millennials Rising: The Next Great Generation* (Vintage Books) (2000).

- Achievers. This generation grew up with increased accountability and higher school standards. Surveys reveal eight out of ten believe it is cool to be smart.
- Pressured. This generation has been pushed to study hard, take advantage of all opportunities, and be the best in their cohort (Trophy Kids). Multitasking is the norm; information overload, short attention spans (sound-bite generation). These students are heavily involved in social, service, and professional/academic activities.
- Conventional. Rules and processes are not merely accepted, but seen to be "good." They are comfortable with parental values. And they trust authority. In higher education, they expect policies to be defined and enforced; they welcome tradition and ritual.

What can we anticipate from this new generation?

- Intelligent and technologically savvy, but impatient and sound-bite focused; multi-taskers. Higher expectations for service delivery and comforts.
- Impatient. Pressured to be successful and affect change, but willing to work within existing systems.
- Educated to be wily consumers; know what they want and expect to be satisfied. Expect more involvement from parents/family.
- Heavy reliance on getting the "right answer." Less comfort with process and ambiguity.
- Higher frequency of anxiety and stress.
- Great optimism and focus on community and values.

If leadership development is an urgent need, how then, shall we develop leaders? I offer three principles:

1. Action-Learning in a Community Context

Knowledge consists of two types, "know-that" and "know-how"—this is the distinction between what epistemologists would call propositional and procedural knowledge. Propositional knowledge ("know-that") describes the state of the world and is obtained, for instance, by reading an encyclopedia: the encyclopedia can tell you that the two sides of a balance sheet must balance. But propositional knowledge says little about "how to do it," such as making the difficult judgments entailed in presenting the financial results of the firm.

Procedural knowledge is "know-how" and enables action. Such knowledge is probably also tacit, learned best by "touch," active learning, experience, or direct observation of a master. Procedural knowledge (know-how) conveys the ability to actually do something rather than merely describe some state of the world (know-that). "Know-that" may be a necessary foundation

for "know-how," but alone is not sufficient to motivate solutions to business problems.

My argument is that leadership skills are essentially "know-how" and are best learned through processes of active engagement with masters and peers. Dorothy Leonard and Walter Swap (2004) call this kind of leadership skill, "deep smarts." This knowledge is best gained in context with someone else—leading firms have dubbed such contexts, "communities of practice." The transfer of leadership skills can be assisted by individuals who prove particularly adept at connecting those who need best practices with those who know them. Malcolm Gladwell, in his book *The Tipping Point*, called these people "mavens." Morten Hansen and Bolko von Oetinger (2001) call them "T-shaped managers," people who reach across an organization as well as up and down a hierarchy.

2. Remain Open to the Varieties of Leadership

One leads in a variety of ways, as Howard Gardner has illustrated in his writings. He argues that a leader is one who successfully imparts an arresting story to an audience. This framework embraces a wide range of leaders, including Eleanor Roosevelt (the story of a woman focused on the poor), Martin Luther King, Jr. and Mahatma Gandhi (the story of nonviolent resistance to oppression), Jean Monnet (the story of unification of Europe). Gardner's point is that leadership may focus on a variety of instruments—not merely the commander on a horse—to include intellectual, artistic, moral, and social contributions. For this reason, I am a skeptic of one-size-fits-all leadership development programs. Obviously, governments, corporations, and not-for-profits need leadership of a certain kind to survive and prosper. But the student has some influence in the matter:

3. Authority Does Not Equal Leadership; Charisma Does Not Equal Leadership

Let me caution organizations about two traps. The first trap is to assume that leadership development must be oriented toward some ladder of authority. Authority only confers power; it does not confer allegiance of followers. The worst assumption is that the highest authority (e.g., the CEO) is *the* leader. But leaders can appear anywhere in an organization. At Darden, we teach the virtue of leading *from where you are*: be it the top, middle, or bottom rung of an organization. The function of the leader is to mobilize people to address their own problems—wherever they may be. The implication of this for leadership development is that it should be organization-wide and not something to defer until the candidate is in mid-career.

The second trap is to assume that certain traits of individual personality (such as "charisma") define all leaders. Yet we know that magnetism and social influence are relevant to only part of the skill set of leaders—these speak to the tasks of engagement discussed earlier. Other tasks include analysis, action-taking, communication, building trust, and so on.

Table 1

Generation * CONFIDENCE IN MAJOR COMPANIES Crosstabulation						
			CONFIDENCE IN MAJOR COMPANIES			Total
			A GREAT DEAL	ONLY SOME	HARDLY ANY	
Generation	BB	Count	320.090	895.740	215.680	1431.510
		% within Generation	22.4%	62.6%	15.1%	100.0%
	GenX	Count	276.280	691.550	134.080	1101.910
		% within Generation	25.1%	62.8%	12.2%	100.0%
	Mil	Count	44.870	104.240	11.330	160.440
		% within Generation	28.0%	65.0%	7.1%	100.0%
Total		Count	641.240	1691.530	361.090	2693.860
		% within Generation	23.8%	62.8%	13.4%	100.0%

Table 2

Generation * CONFID IN BANKS & FINANCIAL INSTITUTIONS Crosstabulation						
			CONFID IN BANKS & FINANCIAL INSTITUTIONS			Total
			A GREAT DEAL	ONLY SOME	HARDLY ANY	
Generation	BB	Count	315.350	890.770	239.690	1445.810
		% within Generation	21.8%	61.6%	16.6%	100.0%
	GenX	Count	351.890	598.670	154.870	1105.430
		% within Generation	31.8%	54.2%	14.0%	100.0%
	Mil	Count	71.370	77.630	11.920	160.920
		% within Generation	44.4%	48.2%	7.4%	100.0%
Total		Count	738.610	1567.070	406.480	2712.160
		% within Generation	27.2%	57.8%	15.0%	100.0%

Table 3

Generation * CONFIDENCE IN ORGANIZED RELIGION Crosstabulation						
			CONFIDENCE IN ORGANIZED RELIGION			Total
			A GREAT DEAL	ONLY SOME	HARDLY ANY	
Generation	BB	Count	303.720	811.090	317.220	1432.030
		% within Generation	21.2%	56.6%	22.2%	100.0%
	GenX	Count	251.180	588.570	241.360	1081.110
		% within Generation	23.2%	54.4%	22.3%	100.0%
	Mil	Count	48.240	82.020	30.640	160.900
		% within Generation	30.0%	51.0%	19.0%	100.0%
Total		Count	603.140	1481.680	589.220	2674.040
		% within Generation	22.6%	55.4%	22.0%	100.0%

Table 4

Generation * CONFIDENCE IN EDUCATION Crosstabulation						
			CONFIDENCE IN EDUCATION			Total
			A GREAT DEAL	ONLY SOME	HARDLY ANY	
Generation	BB	Count	341.300	866.230	254.180	1461.710
		% within Generation	23.3%	59.3%	17.4%	100.0%
	GenX	Count	301.160	657.470	155.280	1113.910
		% within Generation	27.0%	59.0%	13.9%	100.0%
	Mil	Count	72.770	67.630	22.440	162.840
		% within Generation	44.7%	41.5%	13.8%	100.0%
Total		Count	715.230	1591.330	431.900	2738.460
		% within Generation	26.1%	58.1%	15.8%	100.0%

Table 5

Generation * CONFID. IN EXEC BRANCH OF FED GOVT Crosstabulation						
			CONFID. IN EXEC BRANCH OF FED GOVT			Total
			A GREAT DEAL	ONLY SOME	HARDLY ANY	
Generation	BB	Count	239.320	724.590	461.360	1425.270
		% within Generation	16.8%	50.8%	32.4%	100.0%
	GenX	Count	233.770	555.980	297.680	1087.430
		% within Generation	21.5%	51.1%	27.4%	100.0%
	Mil	Count	36.890	90.510	33.040	160.440
		% within Generation	23.0%	56.4%	20.6%	100.0%
Total		Count	509.980	1371.080	792.080	2673.140
		% within Generation	19.1%	51.3%	29.6%	100.0%

Table 6

Generation * CONFIDENCE IN PRESS Crosstabulation						
			CONFIDENCE IN PRESS			Total
			A GREAT DEAL	ONLY SOME	HARDLY ANY	
Generation	BB	Count	127.580	689.910	626.220	1443.710
		% within Generation	8.8%	47.8%	43.4%	100.0%
	GenX	Count	128.060	493.990	481.860	1103.910
		% within Generation	11.6%	44.7%	43.7%	100.0%
	Mil	Count	24.350	77.770	59.720	161.840
		% within Generation	15.0%	48.1%	36.9%	100.0%
Total		Count	279.990	1261.670	1167.800	2709.460
		% within Generation	10.3%	46.6%	43.1%	100.0%

Table 7

Generation * SPEND EVENING WITH RELATIVES Crosstabulation

			SPEND EVENING WITH RELATIVES							Total
			ALMOST DAILY	SEV TIMES A WEEK	SEV TIMES A MNTH	ONCE A MONTH	SEV TIMES A YEAR	ONCE A YEAR	NEVER	
Generation	BB	Count	133.720	355.890	293.240	229.050	273.720	97.460	69.480	1452.560
		% within Generation	9.2%	24.5%	20.2%	15.8%	18.8%	6.7%	4.8%	100.0%
	GenX	Count	152.670	330.560	227.070	172.920	162.090	56.290	35.860	1137.460
		% within Generation	13.4%	29.1%	20.0%	15.2%	14.3%	4.9%	3.2%	100.0%
	Mil	Count	37.530	47.160	31.540	29.450	23.090	2.000	.000	170.770
		% within Generation	22.0%	27.6%	18.5%	17.2%	13.5%	1.2%	.0%	100.0%
Total		Count	323.920	733.610	551.850	431.420	458.900	155.750	105.340	2760.790
		% within Generation	11.7%	26.6%	20.0%	15.6%	16.6%	5.6%	3.8%	100.0%

Generation * SPEND EVENING WITH NEIGHBOR Crosstabulation

			SPEND EVENING WITH NEIGHBOR							Total
			ALMOST EVERY DAY	ONCE/TWICE A WK	SEVRL TIMES/MNTH	ONCE A MONTH	SEVERAL TIMES/YR	ABOUT ONCE A YR	NEVER	
Generation	BB	Count	52.040	189.370	159.500	212.420	236.240	178.690	420.860	1449.120
		% within Generation	3.6%	13.1%	11.0%	14.7%	16.3%	12.3%	29.0%	100.0%
	GenX	Count	94.080	213.320	132.820	169.090	98.310	95.380	332.460	1135.460
		% within Generation	8.3%	18.8%	11.7%	14.9%	8.7%	8.4%	29.3%	100.0%
	Mil	Count	36.780	33.530	16.370	17.950	11.480	8.880	45.780	170.770
		% within Generation	21.5%	19.6%	9.6%	10.5%	6.7%	5.2%	26.8%	100.0%
Total		Count	182.900	436.220	308.690	399.460	346.030	282.950	799.100	2755.350
		% within Generation	6.6%	15.8%	11.2%	14.5%	12.6%	10.3%	29.0%	100.0%

Generation * SPEND EVENING WITH FRIENDS Crosstabulation

			SPEND EVENING WITH FRIENDS							Total
			ALMOST DAILY	SEV TIMES A WEEK	SEV TIMES A MNTH	ONCE A MONTH	SEV TIMES A YEAR	ONCE A YEAR	NEVER	
Generation	BB	Count	28.600	242.810	306.280	359.570	291.160	110.220	113.000	1451.640
		% within Generation	2.0%	16.7%	21.1%	24.8%	20.1%	7.6%	7.8%	100.0%
	GenX	Count	73.580	266.290	278.910	261.850	148.030	52.620	56.180	1137.460
		% within Generation	6.5%	23.4%	24.5%	23.0%	13.0%	4.6%	4.9%	100.0%
	Mil	Count	33.870	51.960	46.610	21.290	8.360	1.000	7.680	170.770
		% within Generation	19.8%	30.4%	27.3%	12.5%	4.9%	.6%	4.5%	100.0%
Total		Count	136.050	561.060	631.800	642.710	447.550	163.840	176.860	2759.870
		% within Generation	4.9%	20.3%	22.9%	23.3%	16.2%	5.9%	6.4%	100.0%

Table 8

Generation * IF RICH, CONTINUE OR STOP WORKING Crosstabulation					
			IF RICH, CONTINUE OR STOP WORKING		Total
			CONTINUE WORKING	STOP WORKING	
Generation	BB	Count	766.280	394.670	1160.950
		% within Generation	66.0%	34.0%	100.0%
	GenX	Count	685.870	253.300	939.170
		% within Generation	73.0%	27.0%	100.0%
	Mil	Count	70.040	15.420	85.460
		% within Generation	82.0%	18.0%	100.0%
Total		Count	1522.190	663.390	2185.580
		% within Generation	69.6%	30.4%	100.0%

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APPENDIX B

THE KEY TO COMPANY SUCCESS IN TODAY'S GLOBAL ENVIRONMENT

Patricia D. Galloway, P.E., PMP[1]

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I. Introduction

Surviving in today's construction market is about more than having "technically trained" employees. It is about having employees, managers and executives who have the skill sets to survive in the 21st Century and who have an understanding of what it takes to work on today's mega-projects. Having traveled to nearly 100 countries and worked in more than 60, it comes of no surprise to me why some companies attempting to play in the 21st Century global market place are successful and some are not. Seeing some of the world's largest construction projects from both the front end (e.g. risk management) and the back end (e.g. dispute resolution), it is difficult to understand why so many of my clients have not focused on the critical issues of collaboration and "brain gain" versus "brain drain" that can be acquired by utilizing the talents of engineers all over the world.

Today, Americans are feeling the gradual and subtle effects of globalization that challenge the economic and strategic leadership that the U.S. has enjoyed since World War II. A substantial portion of the U.S. workforce finds

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itself in competition for jobs with lower-wage workers from different parts of the world. Leading-edge engineering work is being accomplished outside the U.S.[2] The previously unchallenged preeminence of Americans in commerce, industry, science and technological innovations has been caught and is being overtaken by competitors throughout the world. Our American society and educational institutions and companies seem to have lost sight of the basic requirement of schooling its young and training of its employees. As the world faces global challenges, companies must recognize that the business landscape of the 21st Century is much different than the landscape of the 19th and 20th Centuries. Knowledge, learning, information, and skilled intelligence are the new raw materials of international commerce and are spreading like wildfire. Learning is the indispensable investment required for success in the "information age" of the 21st Century.[3]

Global construction today requires the knowledge and skill of engineers. If an organization is to succeed in today's global society, one of the fundamental concepts which must be understood, by the CEO, the division manager or the individual engineer, is globalization. Globalization includes the knowledge and ability to:

- Understand that the world economy is tightly linked with much of the change triggered by technology.
- Understand other cultures and social elements.
- Effectively work in multi-national teams.
- Effectively communicate — orally and in writing — in the international business language of English.
- Recognize issues of sustainability.
- Recognize the importance of transparency with the local population.
- Understand the importance of public policy issues around the world and in the country where one is working.
- Understand the principles of project management and risk management.

II. The Problem

The world has changed more in the past 100 years than in all proceeding years. By the end of the 20th Century, the developed world had become a

2. National Academy of Sciences, National Academy of Engineering and Institute of Medicine, Rising Above the Gathering Storm, Executive Summary (The National Academies Press).

3. The National Commission on Excellence in Education, A Nation At Risk (U.S. Government Printing Office April 1983).

4. National Academy of Engineering, The Engineer of 2020 at 9 (The National Academies Press 2004).

healthier, safer, and more productive place, where engineering and technology had made a permanent imprint.[4] Today's world is, however, fundamentally challenging the way engineering has been practiced in developed nations.[5] Countries around the world are recognizing that merely having an engineering degree is not enough to allow the engineer to take a leadership position in society or to gain public confidence in what an engineer can do to improve the quality of life for an ever-increasing world population. Engineers in many parts of the world have come to be treated as "commodities" or "technicians" and are not necessarily considered to be "professionals" in the same view as those individuals in the medical, legal, and/or accounting professions.

This is especially true of U.S. companies when tackling projects offshore and using engineers from India or China. The underlying thought process for U.S. companies has generally been to use less expensive labor and accomplish the technical work in less time due to the 24/7 availability of the engineering workforce. Unfortunately, there is false belief that U.S. engineers are better trained and possess greater skill sets for advancement into the management ranks for offshore projects. Too often, U.S. companies give little attention to identifying, training and advancing engineers who are not U.S. born, despite several recent studies from the National Science Foundation and National Academies of Engineering, which show that seldom do U.S. engineers possess the right skill sets for offshore work. The National Research Council (NRC) in the United States recently published a report citing three "serious concerns" with U.S. engineering graduates: (1) Many have "little knowledge" of the design process; (2) "inadequate knowledge of the role of technology in their professions;" and (3) "little knowledge of business, economics, and management."[6]

The need for increasing the skill sets of the U.S. engineer has become paramount and is reaching a stage of crisis. A major change in engineering education reform is needed, in the U.S. and around the world. "Engineering education must avoid the cliché of teaching more and more about less and less, until it teaches everything about nothing."[7] Engineering does not operate in a vacuum separate from society, and never is this axiom more true than today. Engineers need to be increasingly aware of the need to work in teams, consider social issues, understand political and economic relations between nations and their peoples, understand intellectual property, project management, multi-lingual influences, cultural diversity, global/international impacts, and

5. Civil Engineering Body of Knowledge for the 21st Century 1 (American Society of Civil Engineers 2004).

6. National Research Council Panel on Undergraduate Education, Committee on the Education and Utilization of the Engineer, Commission on Engineering, Engineering Education and Practice in the Untied States: Engineering Undergraduate Education (National Academy Press 1986).

7. National Academy of Engineering, The Engineer of 2020 at 23 (The National Academies Press 2004).

cost-benefit constraints, as all these factors will drive the engineering practice of the 21st Century.[8] Engineers need to take steps to understand how and when to incorporate social elements into a comprehensive system analysis of their work.[9] Companies need to invest in their engineering employees, to assist them in reaching their full potential and to reward their creativity.

How will U.S. engineers react as the need to have project teams all in one place shrinks, and lower-cost non-domestic engineers from rapidly-expanding technological workforces vie for a piece of the global economic pie? Will economic forces allow the pie to expand, with more work for all engineers, or will barriers be proposed to slow the negative impacts of domestic employment policies? How will U.S. engineers gain the needed knowledge of international business practices, to say nothing of cultural and linguistic issues? If U.S. engineers do not understand and expand their global knowledge and ability, the U.S. engineering community may have a diminishing global role in engineering research, education, and the application of new technology.[10]

III. The Trend in Engineering Practice

The practice of engineering continues to grow increasingly more complex. The rapid rise in information technology exposes all decisions to real-time documentation. The explosion of knowledge and transparency in engineering and construction, enhanced public awareness, and involvement in engineered projects and the growing complexity of civil infrastructure systems have changed the engineer's role. Engineering is now a global profession. Engineers from multiple countries must work together to design and construct today's projects. Interdisciplinary engineering is moving ahead as any project combines multi-disciplines of engineering. This trend is likely to accelerate in the future. Meanwhile, engineers are expected to possess both a greater breadth of capability and greater specialized technical and managerial competence than was required of previous generations. Thus, the future engineering practice will require engineers to take a broader view of their work environment and to regularly interact with the public and policy-makers.

Globalization has become identified with a number of trends, most of which have developed since World War II. These include greater international movement of commodities, money, information, and people, and the development of technology, organizations, legal systems, and infrastructures to allow this movement. Some of the trends include:[11]

- Increase in international trade at a faster rate than the growth in the world economy.

8. *Id.* at 27.

9. *Id.* at 35.

10. The Vision for Civil Engineering in 2025 (Leadership Summit hosted by the American Society of Civil Engineers, Summit Report June 2006).

11. http://www.file://E:\Kochi University\Globalization- Wikipedia.

- Increase in international flow of capital including foreign investment.
- Greater trans-border data flow, using such technologies such as the Internet, communication satellites and telephones.
- Greater international cultural exchange.
- Spreading multiculturalism and individual access to cultural diversity.
- Erosion of national sovereignty and national borders through international agreements leading to organizations like the WTO.
- Development of global telecommunications infrastructure.
- Development of global financial systems.
- Increase in the share of the world economy controlled by multinational corporations.
- Increased role of international organizations such as WTO, World Intellectual Property Organization (WIPO), and International Monetary Fund (IMF) that deal with international transactions.
- Increase in the number of standards applied globally; e.g. copyright laws and intellectual property rights.

Globalization has led to more companies pursuing the same customers, and customers have become more sophisticated and informed buyers. Information technology enables them to find and analyze services and allows them to make more intelligent choices. The 21st Century will be written in the history books as the era of the knowledge-based society. The knowledge component of services has increased dramatically in importance; it has become the dominant component of customer value. The shift of the primary source of value makes the new economy led by those who manage knowledge technology effectively - who create, find, and input knowledge into new products and service faster than their competitors will survive and thrive.[12]

Today's interdependence among societies—economic, political, and cultural—is unprecedented. Much of engineering projects today are accomplished using a combination of virtual and multi-cultural teams. These teams often function across multiple time zones, multiple cultures, and multiple languages.[13] The productivity of local engineering groups can be markedly enhanced by globally dispersed "round-the-clock" engineering teams.[14]

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12. http://www.file://E:\Kochi University\NEW ECONOMY-Key Features of the New Knowledge –and Innovation-Driven Economy.htm.

13. National Academy of Engineering, The Engineer of 2020 at 33 (The National Academies Press 2004).

14. *Id.* at 39.

IV. The New Business Landscape

There is a new global business landscape. There is not a construction project today that is truly domestic, even if constructed in our home country. Financing, materials, special pieces of equipment, and/or engineering technology come from all over the world. And those who market globally need to recognize that it is essential to understand the financial and commercial structure by which this kind of globalization functions.

Businesses in developed countries have to learn to live in two worlds at the same time: the world economy with transnational money and their own national state where money is "increasingly the servant of short term political goals."[15] Businesses have to start thinking strategically and planning in a world economy rather than in their own domestic economy. The shift to the knowledge worker and the steady upgrading of competence of the workforce represents a very large and almost unprecedented increase in the potential of the human strength in developed countries. Companies, if they are to be on the forefront of this rapid change to a knowledge-based society, must change how their engineers are trained and advanced. Consideration must be given to the multi-national "look" of the teams and management.

While world trade has been growing at a rate of 6.9% annually for both services and manufacturing from 1980 to 2002, the off-shoring of services to emerging markets has been growing at an even faster rate and is projected to grow at thirty percent annually from 2003 to 2008.[16] ost companies that off-shore services have done so primarily due to obtain much lower labor costs. However, companies that find off-shoring difficult generally have company-specific barriers including: operational issues, management attitudes to off-shoring, and structural issues.[17] The management attitude is often the most difficult barrier to overcome. To often the issue lies with those who have little experience working or leading operations abroad or who are unwilling to deal with the new challenges that global operations present.

The opportunities for utilizing global talent are immense. For instance, according to a recent study conducted by the McKinsey Global Institute of eight occupations studied (including engineering), the total number of young university-educated talent in low-wage countries like China, India, and the Philippines, surpasses that in its high wage sampling of countries. India alone was found to have nearly as many young professional engineers as the United States, and China has more than twice as many. By 2008, McKinsey expects the supply of young suitable engineers to be nearly the same between the developing and developed countries. The study further showed that only 13% of the potential job candidates in degree specific occupations could successfully

15. P. Drucker, Managing in Turbulent Times."

16. The Emerging Global Labor Market (McKinsey Global Institute, McKinsey & Company 2005).

17. *Id.*

work at a multinational company. The numbers could be higher, if young people moved to major cities with international airline connections and acquired the skill sets in language, cultural understanding, and team work concepts.[18]

V. Long-Term Strategies

This revelation is the new business landscape. But there is more. There are immense needs in all of the developing and underdeveloped countries, needs driven by rapidly growing populations. Of course, needs alone do not translate into programs and projects in our industry. Active participants in the global engineering and construction industry have known for a long time that to succeed in any part of the world you have to develop and adhere to a long-term strategy. You cannot simply parachute into the region, do your thing, and then disappear. You have to stay, become familiar, and learn. In underdeveloped countries, the economies have always been volatile. Companies need to understand the global economic and financial conditions and barriers before embarking on infrastructure projects. Infrastructure projects are becoming larger and larger—often now referred to as "mega-projects"—and are requiring the resources of companies and engineers from all around the world.[19]

During the 1970s and 1980s many international agencies including the World Bank, became increasingly concerned about the size of some of the major development projects which they were supporting. The main concerns were that:[20]

- Mega projects absorbed enormous amounts of capitals over long periods and therefore, reduced flexibility in development planning.
- Mega projects are extremely complex to manage and seemed in some cases to be beyond anyone's control.
- The sheer size of the projects suggested that the environmental impact would be substantial but probably not readily calculable in advance.

These concerns still remain, but there is no evidence that the size of the mega projects has been constrained. Rather, the reverse has been the case. The largest projects seem to be getting bigger and bigger. Some recent examples of mega projects almost unimaginable a few decades ago are:[21]

- Three Gorges Dam: the world's largest hydropower project with a generating capacity of 18,000 MW; the construction of the world's largest

18. *Id.*

19. Parts of this paper have been taken from a paper entitled Luis E. Rey, Unique Aspects Of Working In Megaproject (The Nielsen Wurster Group, presented at Doing Business in Latin America, Sao Paulo, Brazil June 2006).

20. SMEC-Service Environment Development; Megaprojects.

21. *Id.*

dam has created a reservoir of 600 kilometers in length, permitting ocean-going ships to navigate 2000 kilometers from East China Sea to the inland city of Chongsing; the installation of turbines is scheduled to be completed in 2009.

- World's Largest Man-Made Offshore Islands: Dubai is constructing the world's largest man-made offshore islands at a cost of US$3.5 billion. One of the two islands, 5 kilometers offshore, was completed at the end of 2003 after two years work, and the second is underway. Each eight kilometer long island will support villas, hotels, marinas, and shopping complexes. Everything will be connected by high-speed monorail.
- Intercontinental Gas Pipelines: a US$3 billion gas pipeline from the Papua New Guinea highlands across the seabed under the Torres Strait to Gladstone in central Queensland has been under negotiation for several years; a US$3 billion 1600 kilometers gas pipeline linking Qatar with Pakistan; and a US$6 billion 2600 kilometer pipeline from Iran to India are being planned.
- Channel Tunnel: a twenty kilometer twin tunnel rail link for high speed trains linking England and France; the world's largest private sector infrastructure project to date with a final cost of about US$15 billion (about twice the original estimate); the tunnel is owned by 650,000 shareholders (80% French) and financed by a syndicate of 220 banks.

There are a number of possible explanations of why such projects continue to be developed and often implemented.[22] Development planners and political leaders are often attracted to projects which offer a single solution to massive problems—albeit the price. Decision-makers can often focus better on a single project which may fix the infrastructure problem once and for all than on complex, interdependent combinations of initiatives or programs. Also, mega projects are often calculated to give tangible expression to national aspirations for economic and social development and to demonstrate the government's capacity to deliver development results for the population. Another explanation is that technological innovation makes structures possible which were previously impossible. Last but not least, mega projects can be only implemented if they are bankable.

By nature, mega projects are complex and often they are faced with complex problems. However, not every complex problem requires a complex solution. In many cases, complex problems are solved by analyzing the "basics" of the problem, which in turn leads to a simple solution. Most of the success is embedded in the skill sets possessed by the company's employees and its ability to use its world-wide resources effectively, efficiently, and developing the

22. *Id.*

talents of all its employees, no matter what nationality. We are often asked as a company to evaluate the "team" and to provide advice as to why the "team" is not working as effectively and efficiently as planned and in return, producing the ROI anticipated. Time after time, we find that the root cause is not the "technology" but rather the cultural differences between the multi-national team members.

VI. Managing Cultural Differences on Mega Projects

Frequently, the planning and execution of international mega projects requires the formation of joint ventures and other types of associations. Because of the nature of international mega projects, owners, financial agencies, contractors, sub-contractors, vendors, and suppliers, often come from different cultural backgrounds. Differences in approaches, values and experiences have lead to many mega project failures. Therefore, it is imperative to understand the impact of cross-cultural differences among the team players in order for a mega project to be successful.

Project management staffs often have engineering degrees, as well as, the project engineers, and are trained to focus on technical data, scientific evidence and hard facts. Because the laws of physics are universal, they tend to expect that nationality and cultural differences will not play a significant role in the practice of project management and engineering. After all, a power plant is a power plant, and it performs the same function regardless of the location of the plant. However, a mega project involves more players than simply engineers and project managers. Each country, public/private companies, and governmental/financial agencies are regulated by different laws, procedures, standards, rules and regulations. Some of the key components in understanding the cultural differences reside in: miscommunication, problem solving and organizational issues.

A. Miscommunication Resulting from Cultural Differences

Miscommunication across multi-nationals is usually the most important cause of cross-cultural problems. Miscommunication can have several sources, including differences in body language or gestures, different meanings for the same word and different assumptions made in the same situation.[23] Different languages also contribute to the problem, and frequently, the language barriers seem to be ignored, creating confusion and sense of mistrust among the parties.

B. Problem Solving

Another source of cross-cultural problems is related to the approaches used in solving problems. The approaches used by engineers and project managers of different cultural backgrounds to tackle the same technical problem are likely to differ widely. The type of approach used to solve engineering

23. L. Laroche, Managing Cross-Cultural Differences in International Projects.

problems is often a reflection of what is emphasized in educational curricula leading to engineering degrees in various countries. Although there is no absolute right way to approach technical problems, issues are likely to arise when engineers with different inclinations work together to solve them. A French engineer is likely to approach a new problem by writing down all of the relevant differential equations and then trying to simplify them to obtain an analytical solution. Meanwhile, a Canadian engineer is likely to start from the simplest expression of the problem and build a model of it, either physical or numerical. As incredible as it seems, when French and Canadians engineers work together, they are both thinking that the other is wasting time by approaching the problem from the wrong perspective.[24] Project managers from Latin America have the tendency to micro-manage projects, whereas American project managers delegate most of the issues and assemble teams to execute the projects.

C. Organizational Cultures

Cross-cultural problems also arise from differences in organizational cultures. Large companies operate quite different from small companies, and the same occurs with government entities as compared to private ones. Some of the most noticeable differences include: the way information is shared and distributed, the hierarchy of departments, approval and decision making process. Large firms, as well as government agencies have the tendency to be more bureaucratic. However, a large American company is less bureaucratic than a large or even small Latin American company. Similarly, government entities in Latin America are more bureaucratic than American government agencies.

In order to overcome the cross-cultural differences, international joint ventures and other types of associations need to be aware of these differences from the onset of the project. Successful communication is essential, including clarification to ensure that the team players understood everything that needs to be done, as well as getting into the details to avoid the temptation of agreements based on general principles that can create major problems in the long run.

As a general rule, international joint ventures and other types of associations must involve an executive team capable of understanding that cultural differences indeed occur, and, if not addressed promptly and properly, problems will surface. As a minimum, training is required with respect to doing business in a given country, as well as doing business with people with different cultural backgrounds. Selection of the right people and with the right attitude towards international assignments should be a top priority of the executive team. For example, executives on senior management, and project management teams, should include at least one person originally from the location where the project is to be executed.

24. *Id.*

VII. Conclusion

Globalization brings many challenges to companies and engineers in all fields. Globalization also brings the potential for engineering to be shared across borders and cultures.[25] In order for a company to be successful in today's global construction market, the company must recognize that a Project's engineering leader must broaden his/her horizon to not only the design aspect of engineering and construction, but also to how, where and under what context, engineering projects are successfully constructed in today's global environment. Engineers must understand the entire context of how a project is conceived, financed, managed, designed, constructed and operated. The engineer in his or her mission of globalization must recognize the needs of the population and that the needs are different for developed, developing and underdeveloped countries. In doing so, the engineer may undertake these projects within the mindset of sustainability while keeping a balance with the needs of the population and the survival of our planet. The engineer must take an active role in the political and private sectors so as to maintain a position as a decision maker and the leader of the project. Simply stated, the engineer of the 21st Century must possess different skill sets if the company he or she works for is to be successful.

Companies seeking to play a major role in the global marketplace of the 21st Century should concentrate on improving the quality of their talent, not just the quantity of educated workers. In many developing countries, a large potential labor supply could be unlocked by improving the suitability of college graduates, particularly in their language skills. Following the statistics of the McKinsey study, if Chinese engineering graduates were to reach current suitability rate of Indian engineers by 2008, the supply would nearly double, jumping from 212,000 today to 395,000 in 2008. The educational improvements can be coordinated closely with domestic and multinational companies to develop practical skills training in universities as well as external company training programs.[26]

And finally, in order to have a successful project, the company must execute the project under the guidelines of good governance and project management. The 21st Century will be the age of education and knowledge and engineers will play a much larger role in society than merely producing products. They will be able to cultivate and develop new learning systems where people can share their outcomes across their national borders but still maintain their competitive edge. Engineers can and must create new environments

25. K. Hawthorne, Sizing up the Impact of Globalization on Engineering (Engineering Dimensions January-February 1999).

26. The Emerging Global Labor Market (McKinsey Global Institute, McKinsey & Company June 2005).

for global learning.[27] In this manner, engineers will emerge as the leaders of the global infrastructure projects and will continue to build the quality of life in this millennium and millenniums to come. Only with these goals in mind will companies embarking on global engineering and construction mega-projects be successful.

27. S. Fukuda, Global Engineer Education: Importance of Processes of Learning (Tokyo Metropolitan Institute of Technology).

APPENDIX C

ALLIANCING FOR INFRASTRUCTURE PROJECTS

SHARING RISKS AND REWARDS WITH A "NO BLAME" AGREEMENT

Michael Wilke[1]

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Project alliancing was first used in the U.K. in the early 1990's to deliver improved outcomes in the design and construction of offshore oil and gas projects. Alliancing methods have been used to deliver infrastructure in Australia over the past eight years. Australia and New Zealand are leading the use of alliancing to deliver the planning, design and construction of infrastructure projects worldwide. There have been over thirty alliance projects.

I. What Is Alliancing?

A project alliance is a relationship where one or more owners form an alliance through a commercial/legal framework with one or more service providers (designer, constructor, supplier, etc.) for the purpose of delivering a specific project. It should not be confused with other forms of collaborative relationships such as strategic alliances, joint ventures, partnerships, teaming agreements, etc.

Under traditional forms of contract, responsibilities and risk are allocated to different parties with commercial and/or legal consequences for the

1. Chief Operating Officer, PB Americas, New York, NY, USA.

individual parties where they fail to manage their risks or properly discharge their contractual/legal obligations. Under a "pure" alliance, the alliance participants:

- Assume collective responsibility for delivering the project.
- Take collective ownership of all risks associated with the delivery of the project.
- Develop and agree performance targets including the target outturn cost.
- Share in the pain or gain, depending on how actual project outcomes compare with the pre-agreed targets that they have jointly committed to achieve.

II. What Is Different About Alliancing?

Alliances can be differentiated from traditional design and construct delivery methods in the following ways:

A. Contractual Framework.

The contractual framework is the fundamental difference. Without a contract that supports the philosophy of a pure alliance, you are left with something like partnering, which has the track record of sometimes working and sometimes not. Some of the key differences in an alliance agreement include:

- No litigation or arbitration permitted between the alliance participants.
- No or few variations.
- Required alliance behaviors are written into the agreement.
- Insurance is sought for the project.
- There is a full sharing of the risk and reward.

An alliance agreement would typically contain the following:

- Setting the tone - behavioral commitments.
- Governance and decision making.
  - The leadership team.
  - Owner reserved powers.
  - Alliance management team.
  - Dealing with conflicts of interest.
  - Compensation, invoicing and payment.
- Dealing with variations in cost and time.

- The principle of "no blame."
  - No Dispute.
  - Willful default.
- Indemnities and insurance.
- Termination for convenience.
- Defects correction period.

B. Commercial Framework.

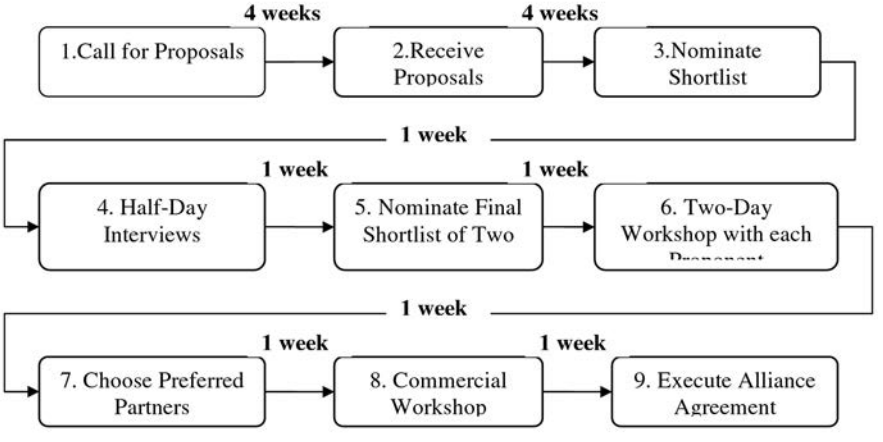
The commercial model is constructed to drive the appropriate behaviors of the alliance participants. Typically a three-limb model is used:

- Limb 1: 100 percent of what is expended directly on the work, including project-specific overheads
- Limb 2: A fixed, lump-sum fee to cover corporate overheads and normal profit
- Limb 3: An equitable sharing among all alliance participants of the gain/pain, subject to the overriding principles that:
  - All payments are 100 percent open-book and subject to validation by independent audit
  - The maximum risk for the non-owner participants under limb 3 is the loss of their fee described in limb 2. In other words, the worst outcome would be that they recover limb 1 costs only. Traditionally, the client has taken fifty percent of the gain/pain share and the constructor and designer have divided the remaining fifty percent share on an 80/20 basis.

C. Selection Process.

The selection process for the alliance team is very robust (Figure 1), and an enormous effort is put into choosing the right partners. Selection is typically based on choosing the team that has the greatest potential to achieve outstanding outcomes. The commercial aspects are not considered by the client in choosing its preferred alliance partner.

Figure 1: The Process of Selecting the Alliance Team



D. Project Team Structure and Performance.

The project team structure is substantially different for alliances. The key differences are:

- The integrated alliance team (IAT) that delivers the project is a virtual organization with no company boundaries—the focus is clearly on project processes and outcomes.
- The IAT is usually located under one roof. The integration and innovation benefits from this simple measure are significant.
- The project is led and governed by an alliance leadership team (ALT) or board comprised of senior managers from each participant. The ALT concept ensures participation from the senior decision-makers from each participant at the project level from day one.
- Alliance coaches are often used to increase the leadership skills of key people and provide tools to enable the team to excel.

A key to the success of an alliance project is how well alignment on goals is achieved and maintained between the partners. The alliance provides the environment where trust is created and knowledge freely shared and where communication between all participants is open, straight and honest.

E. Scope and Budget Development.

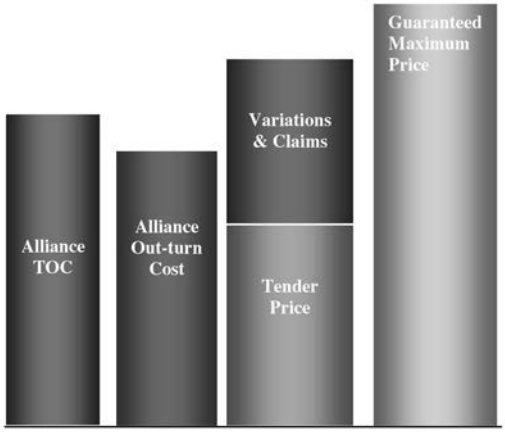
Sitting with the client and developing the scope and budget together may seem logical, but this rarely happens under traditional delivery methods. There are many benefits from this exercise, including the ability to truly understand the functional requirements of the project and then provide a "fit for purpose" scope and standards. The scope of the project incorporates:

- Functional requirements to be delivered including levels of service, standards and timeframe for delivery.
- Form of the project including costs and risks; dimensions, location and work activities.
- Environment that the project is delivered in including permitting requirements.

Arriving at a target outturn cost (TOC) that everyone can align with can be difficult and testing. Significant commitment of time and effort is required by all participants. This aspect of alliancing places extreme pressure on the participants and the industry expert employed by the client to independently assess the TOC. The TOC is an estimate of out-turn costs and, therefore, may exceed what tender prices might be under traditional delivery methods.

The gain/pain arrangements are built around the actual out-turn cost compared with the TOC (Figure 2). An under-run activates a Limb 3 return to the alliance participants. An over-run causes a reduction in Limb 2 payment to the alliance participants.

Figure 2: Costs under traditional delivery compared to delivery through an alliance.



F. Outcomes.

Traditionally, a specification sets a minimum performance standard that becomes the target in most circumstances, whether the standard is appropriate or not. With alliances, the participants are rewarded for outstanding outcomes for predetermined key result areas. Clients must be willing to pay for better than "business as usual" performance in the key result areas. On the downside, there are considerable penalties for performance below business as usual. Key results would include safety, community, environment, traffic management, time, and quality.

III. Alliance Experience: Port of Brisbane Motorway

The project involved the Port of Brisbane Motorway connecting the Gateway Motorway with the Port of Brisbane. An alliance was formed between Queensland Motorways Ltd, Leighton Contractors, PB and Coffey Geosciences to deliver the design and construction. The alliance scope of work, which had a TOC of AU$112 million, are summarized below.

- 4.5 km (2.7 miles) of limited access motorway.
- Twelve major new bridges.
- A multilevel interchange over the Gateway Motorway.
- Modification of three existing bridges.
- Forty year life heavy-duty pavements.

The reasons for forming an alliance included a complex scope and difficult ground conditions along with the fact that delivery was required within a very tight time frame. In addition, the ultimate owner of the project, Queensland Department of Main Roads, was committed to relationship contracting and had the desire to find a better way to deliver large, complex projects.

The project got off to a difficult start, with the TOC well above a budget that was set in the preliminary planning stages of the project. Some early mistrust in the development of the TOC was replaced by positive working relationships, which saw the project team excel and meet all challenges.

The success of the project was due to an integrated high-performance team that continually searched for a better way. The project also benefited from starting the construction six months late forcing the constructor to do more planning in conjunction with the designer. The project opened to traffic six months ahead of schedule. The final out-turn costs were AU$15 million below the TOC.

An independent assessment was undertaken to test "value for money" from the project outcome. This report concluded better value had been achieved than possible by any other delivery method.

IV. Benefits from Alliancing

There are many benefits from using the project alliance approach including:

- Early constructor involvement.
- Better functionality at reduced costs.
- Enhanced relationships between all parties.
- Potentially good financial returns for all participants.
- The ability to test different life-cycle options during development of the target cost estimate.
- Budgets that are not likely to be exceeded.

- Enhanced performance in key result areas such as safety, community and environment.
- Delivery ahead of schedule.
- Professional and personal growth and development of most staff involved, and tools to develop excellent leadership and management.
- Enhanced management systems.
- A return to good engineering practice as opposed to relying on industry standards, long established practices and general conservatism.

V. Conclusion

The potential benefits of alliancing far outweigh most disadvantages. Considerable benefits have been achieved from the design and construction alliances. A few challenges face alliancing if it is to remain as a delivery method of choice. These include:

- Overusing alliancing and, in particular, using it for the wrong projects. It is best for fast track projects with complex risks and many unknowns.
- Ensuring that the TOC is developed through a robust process and everyone agrees that it represents good value for money.
- Ensuring that whole-of-life aspects are adequately addressed and catered for in the project.
- Seeing that the owner has meaningful representation on the alliance team. The owner must be committed to providing some staff members full-time for the alliance.

One of the best pointers to the success of alliancing is that most of the companies and clients involved have introduced many of the alliance methods and philosophies into their normal business practices.

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