

GLOBALIZATION OF THE ENGINEERING AND CONSTRUCTION INDUSTRY

SESSION 2: “A 20/20 VISION FOR THE FUTURE OF THE AEC FIELD”

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SESSION 2: “A 20/20 VISION FOR THE FUTURE OF THE AEC FIELD”

*In 1899,
Charles Duell of the U.S. Patent Office claimed:
“everything that can be invented, has been invented...”*

*In 1994,
President Clinton said,
“tomorrow’s infrastructure must not be built using today’s technologies...”*

*Now,
according to Henry Michel,
“when companies downsize, they get rid of R&D. . .”*

So what can we look forward to? It’s difficult enough to forecast the past, let alone the future.

Remember some past highly publicized visions. Hudson Institute claimed Japan’s economy would pass the U.S., and France would have the largest European economy; the recent prophets of the “new economy,” MIT and David Halberstrom’s forecast of the demise of Ford and rise of Nissan; Tom Friedman’s forecast in 1999 in the first edition of *“The Lexus and the Olive Tree”* of the rise of Compaq and decline of IBM and *Popular Mechanics Magazine*, forecast in 1949 that “computers in the future may weigh less than a ton and a half.”

Everyone aspires to 20/20 vision, even if it needs a bit of correction to achieve. Let’s see what our 20/20 vision for the Built Environment field by the year 2020 might look like. What changes are occurring? How will they impact the Built Environment, our society and your likely careers?

2. A Vision

To identify the possible changes that we might see confronting our field between now and the year 2020, we need to look at the Built Environment from several perspectives: *first*, the significant changes that have impacted the Built Environment over the past 20 years; *second*, changes that may impact the Built Environment over the next 20 years; *third*, the implications of these changes on our future; and *fourth*, the possible actions we might want to take, or must take, over the coming 20 years to try to influence, shape and benefit from these changes.

But, whatever we do, we must be ready for a major restructuring of the Built Environment – one that is already underway and could prove revolutionary rather than evolutionary.

First, some significant changes in the past 20 years, in your lifetime, that influenced the AEC field.

Technology

1. The application of computer and chip technology, in particular, CADD (Computer-Aided Drafting and Design), GPS (Global Positioning Systems), and the use of satellites as highly accurate surveying tools. Those tools, for example, transformed the design profession from a labor-intensive to a capital-intensive field and, when combined with the internet, reduced the importance of work place/office location and encouraged outsourcing (offshore design offices), as well as distributed planning, design and even construction supervision (e.g., remote cameras).
2. Changes in the packaging, financing, and delivery of projects, as we will discuss in more detail in Sessions 4, 5, 9 and 10 - design/construct, turnkey, BOT, construction management, multi-disciplinary teams, new forms of partnering, etc.
3. Introduction of new, stronger and often lighter, materials - plastics, composites, fiber optics, etc.
4. Increased utilization of preassembled components
5. The shrinking of the globe due to improved communications and information technologies
6. Movement from industrial (low value/high volume) to higher value/lower volume products accompanied by an increase in the percentage of soft costs in manufactures and plant construction and changes in transportation patterns (containers, air freight, overnight parcels, etc.)
7. Rising importance of non-engineering disciplines in the built environment (e.g., law, environmental, sociology, finance, risk management, etc.)
8. Failure to keep up with more dynamic sectors such as telcom, electronics, consumer appliances, aviation and the need to adopt CADD,

IT, materials and other maturing technologies,¹ etc., (technological crossover) from these more dynamic sectors to improve productivity.

Class, any others?

Socio/Political

1. The end of the cold war and rise in local communal and civil conflicts and terrorism
2. The rise in importance of the Pacific Perimeter, decline of the command economies, and emergence of the “Global Economy” and global competitors. Tom Friedman’s claim that we went from friends and enemies during the “Cold War,” to competitors in the “Global”
3. The growing concern for depletion of the world’s natural resources and the need to encourage sustainable development and the emergence of environmental concerns and constraints encouraging the rise of the “regulatory engineer” as discussed in Session 1
4. The rise of antigrowth sentiments, the consumer movement and the growth of a more litigious and adversarial climate in a number of countries
5. The rise of public activism and the demands for increased transparency and broader community/stakeholder participation
6. A significant increase in the numbers of women, immigrants and minorities in the U.S. and many other OECD work forces
7. The weakening of the nation state and rise of monocultural interests and communities

¹An excellent definition of mature technology is a technology that is so widely accepted that it is only noticed when it is not functioning. Electricity and telephony are examples and computing is now joining them. Like electricity, and steam before it, computing has matured and become an enabling technology, fostering and supporting developments in other sectors. The initial impact of computing, especially the PC, as rapid as it was unexpected, has now passed. But, the innovations it has fostered will spread for decades to come, as it migrates to all sorts of other activities such as credit cards, packaging, complex management and maintenance functions, bill payments, etc. Many of these changes will incur by inserting computer-like chips into other items and, even more important, introducing computer power to make other, often widely accepted, devices and activities “smarter.”

8. Pressures to reduce governmental size and budgets, accompanied by a reduction in public investments and a trend toward greater privatization of public facilities
9. Growing emphasis on trade barrier reduction – NAFTA, European Union, Microsur, APEC, WTO, OECD

Class, any others?

Secondly, changes that may impact the Built Environment over the next 20 years.

Technology

1. New Technologies
 - Super-efficient cooling coils
 - Microfluidics
 - Switched reluctance motors
 - Biomimicry
 - Advanced Clean Coal Technology (IGCC, Supercritical, etc.) for power plants
 - biotechnology
2. Application of fully automated design and use of remote sensing and camera technologies for QA/QC work
3. Automated roads, rail, aviation and construction equipment and transit operations, e.g., Hartsdale Airport
4. Global professional and enterprise licensing, standards and practices
5. The emergence of true multi-location or multi-office design and global design centers
6. Accelerated adoption of new materials, construction processes and prefabricated components
7. More innovative project delivery and financing systems, e.g., increased facility replication (e.g., standard designs)
8. New power sources (e.g., fusion)

Socio/Political

1. Continued decline in the power of the State, e.g., weaker regulatory and tax regimes
2. Continued reduction in the importance of national boundaries, e.g., freer movement of labor, goods and enterprises possibly accompanied by increased strife and terrorism
3. Growth of global worldwide communities sharing common interests and affiliations
4. Fewer resources for social welfare and public/social investment, and
5. Greater reliance on outsourcing, for example, most professional services will increasingly have integral components outsourced abroad.

Thirdly, what are the implications and concerns for the future of the AEC fields as a result of these changes?

Technology

1. Growing convergence, blurring of discipline distinctions and boundaries and the continued entry of defense contractors, management consultants, law firms, financial and technology houses, and even stage and show designers, into the Built Environment as part of their diversification and/or expansion strategies
2. The increased need for more varied skills, including the ability to address not only technical, but also financial, economic, property management, environmental, societal, political, legal and cultural concerns. Even greater emphasis will be placed on communications, understanding systems, risk and entrepreneurial opportunities.
3. The continued introduction of faster and more innovative delivery systems such as design/build/operate/maintain (DBOM), build/operate/transfer (BOT), multi-site facilities standardization (e.g., standard schools, embassies, hospitals, clinics, hotels), etc.
4. Greater use of more capital-intensive automation in planning, design and construction possibly encouraging consolidation into fewer, but larger, enterprises
5. The introduction of more flexible facilities (schools, warehouses, hospitals, shopping centers, factories, etc.) to deal with increasing product and enterprise uncertainty.

6. The introduction of new, especially lighter, stronger and more fire resistant, materials, as well as greater use of offsite fabrication and assembly, recycled and recyclable materials, and a greater emphasis on reusability (e.g., Germany)
7. A search for scientific breakthroughs to deal with growing energy demands, nuclear and non-nuclear waste management, global warming, recycling, etc.

Socio/Political

1. The increased globalization of at least portions of the AEC and related fields and the need to address standards and certification, cultures and taboos in even greater detail.
2. Continuing trend to increase privatization and outsourcing accompanied by the need to encourage new funding models along with new delivery systems
3. A continued search for broader environmental consensus
4. A continued search for legal reform especially in the U.S. in light of rising litigation costs
5. Increased opportunities for emergency relief, reconstruction, rehabilitation and "nation building"
6. Enhanced credibility for engineers and constructors and a reduction in the current dominance in the U.S. and elsewhere of "regulatory" engineers

Fourth, what are some of the possible actions and challenges in the coming 20 years?

Since worldwide resources are finite, we must:

In Technology

1. More carefully husband and conserve worldwide resources through more effective initial use of those resources, e.g., smaller, more fuel-efficient engines, increased natural gas collection and reduction in flaring, pumped storage of gases or liquids for peak power production, improved pricing of "free goods," improved re-use or recycling e.g., water, plastics, metals and more effective and creative recycling

2. Improve globalization of standards, e.g., plug and play, professional registration, labor practices, water and environmental standards, zoning, etc.
3. Encourage the substitution of more readily available materials such as fiber optics for copper and aluminum cable and wire.
4. Make better use of engineered products throughout the world, for example, normal electric current varies from 100 volts to 250 volts with frequencies of 30, 50 or 60 cycles and there are literally dozens of electric plugs in use for everyday appliances in all parts of our globe.
5. Encourage alternate and new renewable energy sources - solar, wind, water and especially fusion; composites, plastics and lightweight metals for bridges and building structures, etc.
6. Encourage technologic changes, e.g., increased use of information technologies for paperless projects, and B2B commerce; airborne lasers to survey and map remote areas, automated remote controlled transportation and construction equipment, etc.
7. Foster truly multi-office and remote planning and design (the virtual studio).
8. Encourage closer collaboration with the materials and machinery industries. The traditional fragmentation in the AEC and property fields is aggravated by a lack of cooperation and coordination between the developers, constructors, materials and component suppliers and machinery manufacturers, often limiting the sector's ability to respond to new opportunities, e.g., B2B, innovative materials, robotics, etc.
9. Develop improved tools for analyzing life cycle costs and increase owner and society awareness of life cycle issues and costs.
10. Introduce more innovative tax structures - tax consumption, rather than income or investments by introducing:
 - Environmental taxes - for example, on fuel and power consumption, the use of "free goods" such as water, shorelines, wetlands, clean air, etc.
 - Consumption taxes to make every producer responsible for the true cost of:
 - Disposing

- Recycling
- Restoring, etc.

11. Accelerate the reuse of brownfields

Class, any others?

To achieve these goals, we must, as we will discuss in Sessions 5, 6 and 7, bring a number of sectors (e.g., insurance, taxation, laws and legislation, etc.) into closer collaboration with the AEC field in order to accelerate innovations and improve competitiveness.

In the Socio/Political arena

1. Integrate environmental and land-use policies on a global scale and develop increased consensus on critical issues
2. Recognize that uniformity of standards is not an attempt to make one size fit all but, rather, to facilitate improved communications, understanding and competition and provide a more level playing field for all.
3. Develop effective environmental, property and land-use standards with flexible implementation schedules for different areas of the world to assure worldwide sustainable development.
4. Encourage the “haves” and “have-nots” to come to grips with the need to grow and provide a decent standard of living for the citizens of planet earth while avoiding permanent damage to our fragile environment.
5. Protect and balance the rights to a life-sustaining environment for
 - the snail darters of Tennessee,
 - the spotted owls of the Pacific Northwest, and
 - the Wyoming wolves,

with the basic human needs of the

 - Appalachian poor,
 - the Amazonian Amerindians,
 - the nomadic herdsman in the shifting sands of the Sahara, and
 - the Ecuadorian fisherman.

...and all this in the face of current world population growth in excess of 100 million per year, putting further pressures on an already endangered environment.²

6. Reduce litigation costs. Litigation, the result of the continuing erosion of trust in the U.S. society, may kill the goose that lays the golden eggs and is a growing concern in other OECD societies. We must strive to reduce litigation, especially in the U.S., through the introduction of mandatory and cost effective alternative dispute resolution procedures while properly protecting those impacted. We must find better, simpler, more effective ways to resolve real or manufactured disputes, while ensuring transparency and fairness.

3. The Decline of the Nation State

The nation state is a relatively recent phenomenon arising in 17th Century Western Europe. Robert Kaplan and a number of other incisive commentators have noted yet another trend which may significantly influence the Built Environment and your future lives and careers – the decline in the nation state and the rise in global affiliations, much akin to that experienced during the golden age of the Greek city/states, the Renaissance and the Hanseatic League. Increasingly, you will be attracted by, and bonded to, professional and other smaller communities sharing common interests at the expense of the nation state. For example, as late as the 1940s, that boastful, if shabby, institute we share this beautiful city with, drew 70% of its undergraduates from New England and, save the service institutions, no U.S. college could claim to be a truly national university. But now, you are all participating in the rise of leading American, Canadian, English and Japanese universities such as MIT, into truly global establishments.

² While there is widespread concern over continued population growth, “a closer look at demographic trends shows that the rate of world population growth has fallen by more than 40% since the late 1960s.” Furthermore, “Demographers at the International Institute for Applied Systems Analysis predict that human population will peak (at 9 billion) by 2070 and then start to contract. Long before then, many nations will shrink in absolute size, and the average age of the world’s citizens will shoot up dramatically. Moreover, the populations that will age fastest are in the Middle East and other underdeveloped regions. During the remainder of this century, even sub-Saharan Africa will likely grow older than Europe is today.” The cause is declining Birth rates (a 50% worldwide drop since 1972). No industrialized country is sustaining its population and, worse yet, most are aging. “Germany could easily lose the equivalent of the current population of what was once East Germany over the next half-century. Russia’s population is already contracting by three-quarters of a million a year. Japan’s population, meanwhile, is expected to peak as early as 2005, and then to fall by as much as one-third over the next 50 years – a decline equivalent to that experienced in medieval Europe during the plague.” *2004 Council on Foreign Relations, Inc., Foreign Affairs May/ June 2004, The Global Baby Bust*, Phillip Longman, Vol. 83, No. 3.

As previously noted, the beginning of the decline of the nation state has been accompanied by a decline in the power of governments to tax, encouraging the spread of “open” market-based economies and a decline in the public’s confidence in their government’s ability to successfully intervene and micromanage economies. Coupled with a general desire to reduce the overall role of government, especially its size, these sentiments have already led to the replacement of large, interventionist governments with more modest regimes that are regulatory in nature. Examples include present regimes in Indonesia, New Zealand, Korea, Chile, Uganda and Ghana, while a number of regulatory governments such as those of the United States, the United Kingdom, Ireland, The Republic of South Africa and Australia, are adopting increasingly laissez-faire philosophies.

As governments become smaller and less interventionist, with growing frequency they relinquish to the private sector their claims to the resources necessary to fund and manage ambitious new initiatives. This comes at a time when the private sectors, and particularly the financial subsectors, are increasingly globalized raising issues of the need for oversight and regulation (e.g., Long-Term Capital Management and risk of widespread financial crisis; the recent Asian economic meltdown, etc.).

The technological and financial advances that have fueled these changes also have profound political implications. For example, while we may be entering a multinational and multicultural world, there actually has been a rise in monocultural international communities that are financially, intellectually and technologically bonded to each other, rather than to their respective nation states or cities. Resources such as the Internet, Cable, CNN and international technical societies, associations and conferences have contributed to creating flourishing global cultural villages for a large number of these communities. Most important, this trend is weakening these communities’ allegiance to their native institutions, replaced by bonds to professions, universities, technologies and businesses.

As a result of these Socio/Political changes, we need, as we will discuss throughout this course, to encourage new funding models along with new delivery systems.

- Since not all our public works or public buildings can be financed by tax dollars, many economists and financiers tell us that the answer is privatization – let the private sector do it. But, we must recognize there are periodic swings in infrastructure funding (e.g., we had extensive private infrastructure in the past and found we had to regulate these investments). So, we must proceed with caution.

- We also have to convince the public sector that “profit” is not a bad word, that a reasonable return on an infrastructure investment cannot be compared to a C.D. or passbook rate.

But, we must, at the same time, carefully balance public needs, welfare and interests with the private desire for profit; ensuring competition while properly addressing the difficult issues of quality, value and price, proper but flexible regulation, appropriate but efficient monitoring and protection against monopolies, asset depletions, cronyism and corruption, while encouraging private initiatives and innovation.

4. Research Needs

A frequent complaint in the U.S. and many European nations is that the AEC field is lagging behind other fields in creativity, research and productivity. One recommendation is to encourage accelerated research through tax credits, seed capital, matching funds, incubators, etc., while avoiding corporate welfare (subsidies). Research investment in the U.S. construction sector is especially low. In the United States, less than one-fifth of one percent of revenues is invested. In contrast, in 1999 each one of the six largest Japanese contractors outspent the entire U.S. industry!

The largest Japanese construction firms funded R+D to, hopefully, remain competitive despite relatively high labor costs. They have campus-type research parks engaged in a wide-range of activities. But, what can we learn from this massive level of R+D expenditure by the Japanese construction industry?

Definitions of R+D

The term R+D is often used loosely and it may be useful if you better understand this term, as well as the closely related concept of productivity.

Edward Land claimed invention is “a sudden cessation of stupidity.” And, while we all recognize the results when we learn of a discovery or breakthrough, R+D, as we know and deal with it, is essentially a financial or accounting term. Government agencies and private enterprises typically define and establish research and development costs. Not only do we have a difficult time separating research from development, but we have an equally difficult time separating creative marketing, strategic planning, reverse or competitive engineering and on-site planning, redesign or modification from R+D. Is a team in a service sector, preparing a detailed proposal, marketing (selling) or doing R+D (studying and testing new and innovative techniques and solutions) for the proposal? Is the on-site testing and introduction of new construction techniques and procedures, material applications or even equipment

modifications, a form of R+D? Obviously, it is. Thus, the proper coding and categorizing of these activities is an accounting, not a scientific, task. When governments such as Japan, Canada or the U.S. encourage R+D by offering attractive “tax credits, incentives or subsidies” to the private sector or in the case of government-recognition, the players quickly respond with a rapid growth in “R+D.” Thus, R+D statistics are clearly subject to distortions and misunderstandings.

Introducing R+D

Furthermore, new discoveries and technologies do not become innovations unless they are put into practice. Discovering the technology and perfecting it are only the first steps in an often-arduous innovation or, equally important, technological migration process.

Innovation

While pure science is clearly important and attractive, societies benefit best from the successful application of scientific breakthroughs - the development side of R+D. The results are often addressed under the term “innovation.”

While everyone recognizes innovation, discovery and invention, they are often, as noted, illusive and difficult to properly define, study and most importantly, foster and replicate. Causation is often not clear and “obviously” beneficial policies such as:

- Industrial strategies (MITI in Japan)
- Targeted research and development
- Protection of intellectual property rights, etc.,

to foster innovation, are often difficult to target, refine and successfully implement.

Clearly, research and development and technology breakthroughs accelerate during wartime and historically, there have been great periods of innovation and discovery (Tang China, the Renaissance, 19th Century Great Britain and Germany, the Cordoban, Abbasid, Bokharan and Mogul dynasties, both Classic and Hellenic Greece and late 1800s/early 1900s U.S., to name a few).

Why did these periods flourish? Why were intellectual breakthroughs so readily accompanied by practical and useful applications in some periods and not others?

During these periods of rapid growth, innovation seems to feed on and reinforce itself. For example, Thomas Alva Edison and Elmer Sperry both followed U.S. patent office filings, despite Charles Duell’s early warnings that

there would be no new innovation, to seek areas of widespread concern to guide and focus their own research, a policy faithfully followed by present-day Cisco and Microsoft.

Thus, we should ask the following questions:

- What is R+D?
- Is it a positive force? Are you in favor of it?
- How do you define it?
- Is there a difference between successful research and development, and innovation?
- How successful in recent years has Japan been in R+D?
- Why have some of the most important private research facilities in the United States – Lucent (Bell Labs), Xerox, former RCA/Sarnoff Labs - had difficulty developing successful products, and practical initiatives for the companies that sponsored them?
- Are there other models for research and development? Cisco, for example, tries to buy innovative R+D-oriented companies rather than fund its own R+D.
- Is research and development most likely to achieve success at large or small facilities?

In recent times, comparing the rapid progress in the fields of physics, chemistry, astronomy, nuclear sciences and especially the recent advancements in biology, electronics and computer engineering, to developments in construction materials and processes, it is difficult to understand why more new construction materials and processes have not appeared. **What are your views?**

Measuring Productivity

A clear goal and one way to measure the success of R+D is gains in “productivity.” But, like the weather, everyone talks about productivity but few of us “do anything about it.”

Properly measuring productivity is difficult due to a lack of professional and academic consensus on appropriate measurement techniques and the meaning

of the findings. Still, we have a general sense of long-term productivity trends in the United States. The same cannot be said for the construction industry, in part as discussed in the BFC White Paper, “Measuring Productivity and Evaluating Innovation in the U.S. Construction Industry,” because of difficulties in accurately measuring real inputs and outputs in service sectors in general, and the AEC field in particular. Nevertheless, most observers feel productivity growth in the U.S. construction sector was above average in the 1960s but, for the most part, lagged since then.

As noted in “Measuring Productivity and Evaluating Innovation in the U.S. Construction Industry,” future studies of construction industry productivity are clearly needed to better define appropriate measurements of inputs and outputs, and address the unique characteristics of the Built Environment and the AEC field. These studies should also address such recent industry innovations as off-site fabrication which is often included in manufacturing sector accounts and the introduction of new materials, and attempt to better gauge the impact of these innovations on construction productivity.

Were you surprised at the difficulties in defining R+D and measuring productivity?

5. Life Cycle Strategies

Most modern economies are excessively concerned with “First Cost.” Often budgets are set separately for capital, operating and maintenance costs leading to excessive consumption of new product inputs at the expense of longer life and/or recycled or recyclable products.

The accounting profession does not require reporting on how well one manages their physical assets, but does require one to report on how well one manages their financial assets. Similarly, the public sector rarely separates capital and annual expenditures, discouraging proper stewardship, though this may change in the U.S. with the adoption of GASB 34. Those two approaches combine to create an atmosphere where all that seems to matter is how much or how little your initial investment needs to be.

However, what truly matters is the life cycle cost of any facility: How much does it cost to finance, to build, to operate, to maintain and dismantle over the planned life of the facility, be it 10 years for a research laboratory or 100 years for a river crossing?

This may require:

- A higher first cost to ensure greater quality
- Better and longer material and equipment warranties

- Greater staff training and improved operating skills
- More attention to corrective maintenance

But, life cycle costs are difficult to establish (e.g., the DoD is always claiming such savings for ambitious new weapons systems.)

6. Class Discussion

One or more volunteer(s) will discuss:

- Their **Vision** of the Future of the AEC Community Over the Next 20 Years
- **ENR'S "Greatest Construction Projects Over the Past 125 Years"**

Note the Bias –

- Over 68% of the projects were located in the U.S.
- Yet six of the last seven, and seven of the last ten, were not in the U.S.
- Over 80% (30 projects) were infrastructure

Winning Categories

U.S.	24½
Infrastructure	30
Bridges	8½
Tunnels	7½
Dams	6
Water & Sewage	3
Canals	2
Pipeline	1
Harbors	1
Sea Barriers	1

- Only five were buildings and one a monument.
- What projects, in your opinion, are missing?
- What are your best guesses for the “Greatest Construction Projects” over the next 20 years?

- In our first session, we discussed the inevitability of globalization. But, the *Olive Tree* (traditionalism) is striking back, e.g., the anti-globalization backlash we have seen in Seattle; Genoa, the rise of religious fundamentalism; and the attacks on the World Trade Center and Pentagon, etc. What is causing it? Ellen Frost, Senior Research Fellow at the Institute of International Economics, claims that “globalization has clearly been both oversold and demonized and globalization becomes a scapegoat for things that would have happened anyway.” Those who believe in the value of globalization must be cautious not to claim for it more benefits than it provides. What are your views?
- During the U.S.-Canadian NAFTA negotiations, George Schultz said he could understand why the Canadian AFL-CIO might oppose the agreement. He also could understand why the U.S. AFL opposed it. But, he couldn’t fathom how they both could at the same time!

Who are the foes? Why do these foes include such varied groups as religious fundamentalists, the disenfranchised, greens, wealthy, intellectuals, supporters of the slow food movement (Italy), opponents of GMO? Why are they protesting? Are the opponents reasonable?

- Finally, from the readings in “*The Lexus and the Olive Tree*,” Chapters 3 and 4:
 - How can nations preserve identity, home and community, while successfully globalizing?
 - How are technology, finance and information democratizing?

7. Session 3: “The Growing Globalization of the Architecture, Engineering and Construction (AEC) Fields” *Fred Moavenzadeh*

Session 3 will focus on Globalization. We will identify the three main dimensions of globalization in the construction industry – namely, geographic distribution, outsourcing and procurement on a global basis, and distribution of international activities of a firm in different regions of the world. We will discuss the forces driving globalization of the construction industry.

Please read the paper “Globalization Strategies of Selected E+C Firms.” There will also be selected readings from *Making Globalization Work* and *Globalization and Its Discontents*, both by Joseph E. Stiglitz. Both books can be purchased on Amazon.com. or found in the library.