PB WORLD PAPER:
How do you see tomorrow? What will keep us relevant in the new global society?

How can we ensure that the restructuring and re-branding of the company delivers the PB vision for the future?

The PB fraternity: what a wonderfully eclectic group of self -motivated and networked team of design and construction knowledge specialists we are! As the champions of modern day Construction and Infrastructure Development we are frequently the evangelist for new or different technologies, processes or solutions.

The current trend of Lego-thinking is supported in what a lot of people think is new technology and leads to solutions copied from experience rather than designed in the light of experience. In this new global culture driven by technology if professionals are not self-aware and self-evaluating there is a real risk of repetition, stagnation and failure to appropriately respond to societal evolution and that could result in the loss of professional status.

Bringing Agility to Construction Practices

A good agile construction professional is defined by his understanding of all the socio-eco-psychological factors, current and future, with an insightful, pragmatic approach to negotiate between conflicting forces. He may act as a bridge between developers, managers and the communities, and must have the ability to convert Paper planning to reality. The goal should be to adapt ideas originating elsewhere, but without losing the ownership of the solution.

Developing and Managing Innovative Construction Technologies

Construction technology innovation is becoming an increasingly important factor for the growth of many large firms. It has become essential that new construction technologies be identified, obtained on the most reasonable terms, and transferred smoothly to the construction site. While conducting the basic task of choosing a new technology, one must confirm that the choices are viable. We must therefore be aware of the alternatives, and factors that choose between them, and understand what technical issues are key to the project's success. The crucial link between innovation and business strategy is based on long-range technology forecasting that integrates action of today with the vision of tomorrow.

"America gets half of its economic growth from industries that barely existed a decade ago – such is the power of innovation" The Economist February 20, 1999.

One PB and Unified Vision

To reflect both developments in the innovation concept and the changing economic environment, PB's policy must take on a broader scope, increasing emphasis on 'technical' as well as 'non-technical' forms of innovation, market driven innovation, knowledge transfer and focus on the firm's capacity to capture and utilize the entire plethora of knowledge accumulated.

"It is increasingly recognized that innovation is possible without conducting R&D, and that the inspiration for many innovations may be market based. Thus, many innovation projects may originate from contact with customers and suppliers, or market analysis, as opposed to new research results or the development of new technologies."[1]

Globalisation has had a large impact on innovation. All international firms have much greater access to information and markets, and are much more easily able to undertake joint projects with firms in other countries. Globalisation has at the same time meant increased *international competition*, making

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1 **Innovation measurement: present and future challenges**, Paper prepared for the Eurostat Conference, "Knowledge Economy – Challenges for Measurement" Luxembourg, December 8-9, 2005 Carter Bloch, Working paper from The Danish Centre for Studies in Research and Research Policy 2005/6

innovation vital for PB to continue to be a leader in the construction industry. Hence, competition on price and efficiency is not enough. We also need to compete on product and services characteristics and marketing methods.

In the organisational context, innovation may be linked to performance and growth through improvements in efficiency, productivity, quality, competitive positioning, market share, etc.
Hence innovations involve a series of scientific, technological, organisational, financial and commercial activities. Innovation typically also involves risk, as a significant discrepancy exists between what companies need and what they actually attain — and that surprisingly, generally accepted customer inputs are the hidden cause of many failed product and service initiatives.

Incremental innovation v Radical Innovation[2]

"**Incremental innovation** is a step forward along a technology trajectory, or from the known to the unknown, with little uncertainty about outcomes and success and is generally minor improvements made by those working day to day with existing methods and technology (both process and product), responding to short term goals."

"**Radical innovation,** involves larger leaps of understanding, perhaps demanding a new way of seeing the whole problem, probably taking a much larger risk. There is often considerable uncertainty about future outcomes. There may be considerable opposition to the proposal and questions about the ethics, practicality or cost of the proposal may be raised. Radical innovation involves considerable change in basic technologies and methods. "

Sources of innovation

"There are two main sources of innovation. In the linear model the traditionally recognized source is *manufacturer innovation*. This is where an agent (person or business) innovates in order to sell the innovation. The other source of innovation, only now becoming widely recognized, is *end-user innovation*. This is where an agent (person or company) develops an innovation for their own (personal or in-house) use because existing products do not meet their needs."[3]

Innovation may be developed by informal practice, through exchange and combination of professional experience and by R & D. The more radical and revolutionary innovations tend to emerge from R&D, while more incremental innovations may emerge from practice .

Another classification of innovation is mainly *supply-pushed* (based on new technological possibilities) *or demand-led* (based on social needs and market requirements).

PB's Commitment To Socially And Environmentally Responsible Practice

"Sustainable development is development which meets the needs of the present without compromising the ability of future generation to meet their own needs." -- World Commission on Environment and Development, Our Common Future, pp. 4, Oxford University Press, New York, 1987" [4]

PB is commited to sustainable development practices, and while its number five on its list of values on the mission statement, it will be the unifying umbrella that will consolidate all its infrastructure development services. PB as a whole aspires to be a*"one-stop" high quality service, provider"* and can accomplish this goal by embedding the concepts of " sustainable practices" at the policy level in all of PB's involvement in Infrastructure Development and Construction Technology. It's our prerogative as market leaders to guide and advice clients and present future professionals with the incentives needed to accelerate innovation and growth in their respective fields. Careful evaluation of Social and Environmental implications should be used as benchmark to assess suitability of future projects.

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[2] http://en.wikipedia.org/wiki/Innovation#Technological_concepts_of_innovation
[3] http://en.wikipedia.org/wiki/Innovation#Technological_concepts_of_innovation
[4] http://www.arch.hku.hk/research/BEER/sustain.htm#1.1

Does Innovation Supports Sustainability?

Since PB sustains its position as a market leader based on its leadership in innovative technology, its imperative that one considers 'Technolgy' under the umberage of 'Sustainability', to help PB retain its position in the Market worldwide. The world is turning towards sustainability as the basic guideline for Design and Construction as it defines how companies can meet the needs of today without compromising those of future genrations. It is documented that the most eco-efficient companies are also the most successful using such measures as the Dow Jones Sustainability Index.

We at PB must set up objectives guided by three sustainability 'pillars' as defined by **WBCSD: *environmental, social, and economic***. We must be involved in businesses that have a positive, or at least no net-negative, ecological impact. And we want to be in businesses that can sustain themselves by accepted financial measures. These principles can also be worked into our corporate code of conduct. Past experiences in the marketplace suggests that sustainability, as an operating principle, doesn't work if it's imposed from outside an organization. It has to be accepted by all inside an organization as a guiding principle.

Innovation and new technology provide a counterweight to business solutions and provide a way to improve our progress through smarter changess of conducting our activities. While sustainabilty makes it possible for this positive rate of change to be maintained indefinitely.

'Sustainability'[5]

SustainAbility was founded by John Elkington and Julia Hailes in 1987, a few months before the Brundtland Commission published its defining report on sustainable development. Two decades on, SustainAbility works with leadership companies around the world and has authored over 40 defining publications – coining terms such as 'the green consumer' and 'the triple bottom line'.

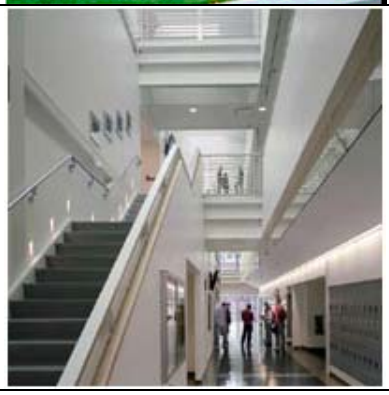
Case Examples:[6]

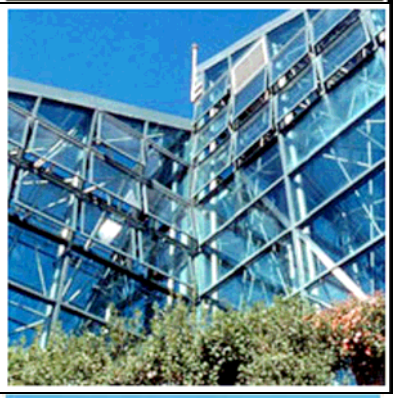
To analyse the interplay between globalisation and critical innovative technology trends supported by sustainable practices, we take up some case examples in the field of Building Design. They are produced by firms committed to engaging the latest technologies to create buildings designed to dramatically reduce their environmental impact and have economic benefits as well.

1. "With the building form somewhat predetermined, treatments used (the amount and location of glazing and solar protection) responded to the structure's orientation relative to the daily and annual solar path. As a result, north elevations have less than 5% glass, and office areas (to the south) have walls with 50% glass. East-facing windows are protected by a large roof overhang and deciduous trees. Trees provide solar protection through the summer heat and admit winter sun in the morning. South windows are protected by a roof overhang and solar shades. Westfacing windows are screened using a trellis that supports vines. Building materials were selected for their appropriateness to the building typology, the region, and it's climate." **Size:** 6,550 sf **Cost:** $183/sf Annual **Energy Use**: 26.6kbtu/sf **Information:** Busby Perkins + Will US Department of Energy, ArchitectureWeek.com	 City of White Rock Operations Building White Rock, B.C. - Canada

[5] http://www.sustainability.com/twenty/

[6] Sourced from: http://www.architecture2030.org/case_studies/index.html (11 of 13)5/20/2007 5:49:37 PM

2. "The Shanghai Industrial Investment Corporation (SIIC) and Arup recognize the global need to reduce carbon emissions and the importance of taking responsibility for bringing about change. Both SIIC and Arup are committed to reducing carbon emissions on this project. The Shanghai Industrial Investment Corporation (SIIC), vision is to create a development with low energy consumption that is as close to being carbon neutral as possible." -Arup Information: http://www.arup.com/newstem.cfm?pgid=7009 http://www.arup.com/eastasia/project.cfm?pageid=7047	 shanghai investment corp. shanghai, china
3. "Using only energy from the sun, the teams generate enough electricity to run a modern household." -Solar Decathlon Information: http://www.eere.energy.gov/solardecathlon	 solar decathlon washington dc
4. "Lighting-energy use is reduced to 52% of allowable lighting energy per Seattle Energy Code, which additionally reduces cooling load within the building, and total consumption by over 22,000 Btus per square foot per year." -US Department of Energy Information: http://www.millerhull.com/html/institutional/SeattleCenter.htm http://www.eere.energy.gov/buildings/database/overview.cfm?ProjectID=192 http://www.ci.seattle.wa.us/dpd/Planning/Design_Commission/What_We_Do/Visual_Resume/DPD_001996.asp Fisher Pavillion Seattle, WA	
5. "Rinker Hall is anticipated to use 57% less energy than a comparable, baseline building." -USGBC Information: http://www.croxtonarc.com/home.cfm http://www.aiatopten.org/hpb/overview.cfm?ProjectID=286 http://www.architectureweek.com/2005/0309/environment_1-1.html http://leedcasestudies.usgbc.org/energy.cfm?ProjectID=286 Rinker Hall Gainesville, Fl Croxton Collaborative	

6. "Energy self sufficiency is a major goal of the project. Photovoltaic panels (153 square meters in surface area) will provide power for electric boats and the building lighting on a seasonal basis." -Randall Stout Architects Information: http://www.stoutarc.com/Projects/BuiltWorks/SteinhudeSeaRecreationalFacility.htm http://www.aiatopten.org/hpb/process.cfm?ProjectID=195 http://www.eere.energy.gov/buildings/database/overview.cfm?ProjectID=195 Steinhude Sea Facility Steinhude, Germany	
7. "Our goal with this project was to create a building that was environmentally responsible, cost effective, well designed, and built from materials that would otherwise be discarded." -Busby+Associates Information: http://www.busby.ca/clients/9614MatTesting/index.htm https://www.usgbc.org/chapters/cascadia/materials%20test%20lab.pdf http://www.greenbuildingsbc.com/new_buildings/case_studies/Materials_Testing.pdf Materials Testing Facility Vancouver, Bc	
8. "The energy savings from the design of this conservatory means that there is only 1/10th the air pollutants of NOx, SOx, and CO2 associated with a conventional Conservatory that uses natural gas for space heating and coal generated electricity for other energy uses." -Solar Today Information: http://mazria.com/projects/conservatory.html http://www.bizjournals.com/albuquerque/stories/2005/06/20/editorial1.html Rio Grande Conservatory Albuquerque, Nm	
9. "Colorado Court will be one of the first buildings of its type in the United States that is 100% energy independent. Colorado Court distinguishes itself from most conventionally developed projects in that it incorporates energy efficient measures that exceed standard practice, optimize building performance, and ensure reduced energy use during all phases of construction and occupancy" - Pugh+Scarpa Architecture Information: http://www.pugh-scarpa.com/indexmain.html http://leedcasestudies.usgbc.org/images.cfm?ProjectID=188 http://www.pixelmap.com/dma_scarpa_05.html Colorado Court Housing Santa Monica, Ca	

10. "Lake/Flato, in assocation with BNIM Architects, created a project that achieved a LEED GOLD rating with 50% recycled materials and a 40% reduction in energy usage. The design approach incorporated low embodied energy, local materials, effective natural day lighting, 60% reduced building water consumption and gray / black water natural treatment systems." -Lake/Flato Architects

Information:
http://www.bnim.com/fmi/xsl/portfolio/index.xsl?-token.pnum=00032&-token.pid=pr6-4&-token.cat=cat-6
http://www.lakeflato.com/
http://www.architecturemag.com/architecture/search/article_display.jsp?schema=&vnu_content_id=1000825882

School Of Nursing
Houston, Tx

11. "BedZED provides the ingredients for a new kind of solar urbanism, with housing facing south, and commercial space facing north. This creates single-aspect dwellings looking south over their own gardens, with high daylight levels maintained in a deep plan by triple glazed roof lights over stair voids." -Bill Dunster

Information:
http://www.zedfactory.com/bedzed/bedzed.html
http://www.arup.com/DOWNLOADBANK/download68.pdf
http://www.opendemocracy.net/debates/article-6-129-2470.jsp

Bedzed
London, UK

12. "The form of the building itself affords great energy savings. Interior volumes are shaded by the large photovoltaic roof, which minimizes direct heat gains. The narrow plan, together with the space between the two roofs, allows cross ventilation to keep the building cool while providing daylight and views." -US Department of Energy

Information:
http://femp.buildinggreen.com/overview.cfm?ProjectID=263

Stri Research Center
Boca Del Toro, Panama

13. "The thermal mass of the walls and a highly efficient mechanical system cut energy usage to one-third the amount initially projected by city planners and utility experts." -Will Bruder Architects

Information:
http://www.willbruder.com/workcultural_pcl.htm
http://www.phoenixpubliclibrary.org/branchinfo.jsp?bid=BBB
http://www.taitsolar.com/html/Projects/Phxlib.htm

Phoenix Public Library
Phoenix, Az

14. "A large section of the west façade of the building was designed as a naturally vented "double skin" façade, composed of two separate planes of glass separated by a 30-inch air space. This curtainwall allows penetration of light to the interior while minimizing heat gain. This air space has automatically controlled louvers at the roof level to release or retain heat gain as required. Interior lightshelves at each floor of the curtainwall act as shading devices. ' -U.S. Department of Energy Information: http://www.nbbj.com/whatwedo/markets/civic/ http://www.eere.energy.gov/buildings/database/overview.cfm?ProjectID=225 http://www.djc.com/news/co/11138816.html Seattle Judicial Building Seattle, Wa	
15. "China's first Low Energy Demo (LED) building, featuring nearly 100 of the most energy-efficient technologies and products." -Tsinghua University News Information: http://news.tsinghua.edu.cn/eng__news.php?id=811 http://www.chinaembassy.org.ro/rom/kjwh/t197056.htm Tsinghua University Tsinghua China	

In conclusion, in view of the global expansion, our Firm PB, to continue its trend of being a global leader in Infrastructure and construction development must focus on both the built environment's innovation and sustainability and its final management. Includes building life management, life based procurement practice together with the facility's associated life care needs. Adopting such a practice would permit and encourage our professionals to actively improve their building techniques and the companies portfolios. Pursuing sustainable goals means that one must also both embrace the respective project's building material and component supply chain and include its respective waste stream's impact at that point of the facility's life time cycle. Finally, both in a sustainability and in a business excellence sense, our organization needs to find ways to bring the various innovative techniques it pursues in its respective projects into marketable framework and keep a watching brief on developing their responses to an inevitable green-built future.

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3. http://www.arch.hku.hk/research/BEER/sustain.htm#1.1
4. http://www.sustainability.com/twenty/
5. All case studies Sourced from: http://www.architecture2030.org/case_studies/index.html (11 of 13) 5/20/2007 5:49:37 PM