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New Frontiers for Project Management Nanotechnology

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Professional project management (PM) continues to grow rapidly in usage and demand worldwide, in most organizations and across all industries. This is especially true in high technology and information technology (IT) organizations, but in may other industries as well. The world is also rapidly changing, due to the global economy, climate change and other factors. What do these changes mean to project-based organizations and PM professionals? Most of these changes will require information technologies, offering new challenges and opportunities for both traditional and IT-related project management.

There are many new industries that offer "new frontiers" for projects and PM around the world. Most have been emerging slowly during the last ten years, but are now expanding rapidly due to other forces or converging influences. These new frontiers are also based on some significant emerging forces and trends in economics, technology, or society. Examples of these forces are climate change, nanotechnology, and the drive for future (alternative) energy sources, among others.

These trends that are generating new and growing industries with significant future impact. Trillions of dollars will be invested in these areas in coming decades. Each of these emerging sectors will also have a significant impact on our society, personal lives and professional careers. The demand for project managers, and IT project management in particular, should increase dramatically in these fields.

Last month, we looked at Climate Change. In this month's editorial, we take a quick look at Nanotechnology and it's implications for industries, projects and PM.

Nanotechnology

According to Wikipedia, "Nanotechnology refers broadly to a field of applied science and technology whose unifying theme is the control of matter on the atomic and molecular scale, normally 1 to 100 nanometers, and the fabrication of devices with critical dimensions that lie within that size range. One nanometer (nm) is one billionth, or 10^{-9} of a meter. To put that scale into context, the comparative size of a nanometer to a meter is the same as that of a marble to the size of the earth." (1)

According to Dr. Ralph Merkel, "In the future, nanotechnology will let us … snap together the fundamental building blocks of nature easily, inexpensively and in most of the ways permitted by the laws of physics. This will be essential if we are to continue the revolution in computer hardware beyond about the next decade, and will also let us

fabricate an entire new generation of products that are cleaner, stronger, lighter, and more precise."

He adds in the same paper, "If we are to continue these trends we will have to develop a new manufacturing technology which will let us inexpensively build computer systems with quantities of logic elements that are molecular in both size and precision and are interconnected in complex and highly idiosyncratic patterns. Nanotechnology will let us do this." (2)

According to one investment company, "…more than 600 companies worldwide are already involved in nanotechnology. In the last year alone, corporations and governments worldwide have pumped over $4 billion into research and development in this exciting new sector. More importantly, companies have already applied this technology to a variety of consumer products, including automobile parts, semiconductors, clothing, sports equipment and toys, to name just a few." (3)

Nanotechnology Manufacturing

The manufacturing of semiconductors is one area that is rapidly embracing nanotechnology, with huge repercussions in many areas. On March 2, 2008, Intel announced "The Intel® Atom™ processor will be the name for a new family of low-power processors designed specifically for mobile Internet devices (MIDs) and a new class of simple and affordable Internet-centric computers arriving later this year. Together, these new market segments represent a significant new opportunity to grow the overall market … a chip that measures less than 25 mm², making it Intel's smallest and lowest power processor yet. Up to 11 Intel Atom processor die -- the tiny slivers of silicon packed with 47 million transistors each -- would fit in an area the size of an American penny." (4)

According to the National Center for Environmental Research (U.S. Environmental Protection Agency), "Nanotechnology offers the possibility of changing the manufacturing process in 2 ways: Incorporating nanotechnology for efficient, controlled manufacturing would drastically reduce waste products; and the use of nanomaterials as catalysts for greater efficiency in current manufacturing processes by minimizing or eliminating the use of toxic materials and the generation of undesirable by-products and effluents." (5) In other words, nanotechnology can also contribute to "green manufacturing."

Governmental Involvement

Governments are seriously interested in Nanotechnology. For example, in the USA, the Federal Government's nanotechnology research programs generally fall under the National Nanotechnology Initiative (NNI). Coordination of research in the field takes place through the Nanoscale Science, Engineering, and Technology (NSET)

Subcommittee of the National Science and Technology Council. The National Nanotechnology Coordination Office provides technical and administrative support to the NSET Subcommittee and serves as a central point of contact for the NNI. On February 14, 2008, the NSET Subcommittee announced the release of a document describing the NNI strategy for addressing priority research on the environmental, health, and safety (EHS) aspects of nanomaterials.

According to the press release, "Strategy for Nanotechnology-Related Environmental, Health, and Safety Research presents a path for coordinated interagency implementation of research to address the needs identified in earlier reports. It is based in part on a detailed analysis of the Federal Government's FY 2006 nanotechnology-related EHS research portfolio, a $68 million investment in 246 projects. Experts from the NEHI Working Group analyzed how these activities addressed the priority research needs and then proposed emphasis and sequencing for future research efforts. Agency-specific research and regulatory needs, public comments on the prior documents, and considerations of the state of EHS research in the national and international nanotechnology communities all played an important role in shaping the strategy. (6)

Also on February 14, 2008, a summary of the NNI Fiscal Year 2009 Budget was released by the NSET Subcommittee of the US government. The report was a supplement to the President's Budget for Fiscal Year 2009, providing additional details on the NNI budget request, as well as highlights of planned activities to be conducted under that budget. According to that press release, "Described in the report are the programs and activities taking place across all 25 of the Federal agencies participating in the NNI. The 2009 budget request provides $1.5 billion for the NNI, reflecting steady growth in the NNI investment. This sustained investment in nanotechnology R&D across the Federal Government over the past nine fiscal years of the NNI reflects the broad support of the Administration and of Congress for this program. (7)

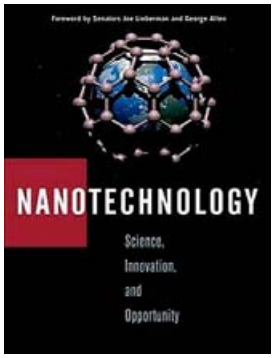
In the European Union (EU), nanotechnology represents an important area of research, funding and political support. According to European Commissioner for Science & Research, Janez Potonik (pictured), "*Nanotechnology is an area which has highly promising prospects for turning fundamental research into successful innovations. Not only to boost the competitiveness of our industry but also to create new products that will make positive changes in the lives of our citizens, be it in medicine, environment, electronics or any other field*." (8)

Some of the Nanotechnology projects being funded by the EU include (9):

- Life sciences, genomics and biotechnology for health
- Aeronautics and space
- Food quality and safety
- Sustainable development, global change and ecosystems
- Industrial and materials technologies
- Biomedicines and science

In China, according to a report found on Azonano.com," The rapid development of China's nanotech industry is due in large part to the intervention of the central government. Apparently added to a list of priority technologies at the end of the 1990s, nanotech has enjoyed state funding since then through National 863 Hi-Tech R&D Plan. The plan provided huge investments for nanotech projects from both the central and local governments. It seems that the Chinese leadership had plans to transform their nanotech industry by 2010 - with the hope of making it comparable to China's microelectronics, telecom, and other high-tech industries." (10)

According to this same report, "At the present time, some thirty institutions are engaged in basic nanotech research. These include CAS Physical Institute, CAS Chemical Institute, CAS Solid Physics Institute (Hefei), Tsinghua University (Beijing), Beijing University, Hangzhou University, Nanjing University, and several universities in Shanghai. In addition, Shanghai, Beijing, and Shenzhen have each created their own Nanotech Centers, uniting local R&D structures. In terms of basic nanotech R&D, China has reached the most advanced levels in the world, rivaling even the capacities of the United States." (10)



Future Impact

Rather than delving further into the political, scientific and technical aspects of nanotechnology, let me suggest that nanotechnology will transform the world we live in, also allowing for the manufacture of smart products with embedded computers. While we are used to computer chips embedded in smart cards, they will now be embedded in nearly everything, including construction materials, clothing, machinery and equipment, and end products, ranging from everyday appliances to mobile electronics.

The implications are significant for PM, as nearly every industry and manufacturing sector will be affected in the future. Not only will new products be manufactured, but manufacturing processes, machinery and knowledge must be updated. In addition, the markets for all of the products and services will change and grow, offering additional opportunities for projects and PM in such nontraditional industries as advertising, marketing, publicity and in government and science.

Nanoengineered products for the food sector -- including a smart RFID nano sensor -- took centre stage at a two day conference held 20-21 November 2007 in Braga, Portugal to discuss the science of the miniscule. Hosted by the European Commission the conference, held 20-21 November targeted the commercialisation of products derived from techniques derived from the science of the miniscule. Scientists and developers at the conference revealed some of the developments that could be important to the food sector if these are commercialised. Nanotechnology is championed by several manufacturers for use in packaging to extend shelf life, or more controversially, for improving the nutritional content and impact of foods. (11)

The most obvious impact on PM is that there will be a huge number of new programs and projects launched based on nanotechnology and its impact. This should lead to an increase in the use of modern PM in the industries and organizations affected, and an increased demand for PM professionals.

But there are other implications as well. Many of these projects will involve basic and applied science. Most will be complex projects, involving "new science". Most will involve scientists in lead roles on project teams. And most will involve short time frames – technology and markets are changing so rapidly that most new products must be developed within 12 months. These projects also involve global teams, virtual communications and massive data transfer needs.

New and better PM applications and tools are needed for these types of projects, and new experiences will be revealed. This is an area that deserves attention and research in the PM field.

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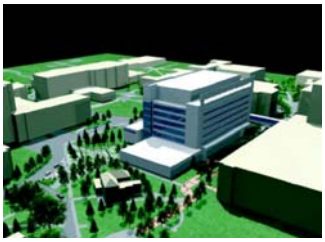

Meanwhile, nanotechnology is creating projects that need PM. Take for example, the National Institute of Nanotechnology (NINT) in Canada. NINT is a collaborative project of the National Research Council of Canada (NRC), the University of Alberta, and the Province of Alberta. This facility is a world class centre for nanotechnology research that will attract a core of the world's best minds in a field expected to revolutionize everything from computing and communications to medicine, energy and manufacturing. Completed in 2006 and constructed on the campus of the University of Alberta, the project included 21,086 square metres (7 storys with a penthouse) and had a budget of $52,000,000. The project managers were Gordon Driedger and Jim Hinger. (12)

According to the Nanotechnology Research Center of the Research Institute of Petroleum Industry of Iran, "Nanotechnology is perhaps today's most advanced manufacturing technology. It is so rapidly emerging that most thinkers and scientists working on this field predict that nano will change our world in the next 100 years more than all the changes that we have seen in the last half of a millennium.

Nanotechnology is the design, characterization, production, and application of structures, devices and systems by controlling the shape and size at the nanometer scale. Since at nano-scale, the properties of materials differ in fundamental and valuable ways from the properties of individual atoms and molecules or bulk matter, nanotechnology has a wide-range of applications

in different fields such as electronics, pharmaceuticals, materials, polymers, chemical and petroleum industry.

In the petroleum industry, nanotechnology can affect both the upstream and downstream sectors. For example, in the upstream sector nanotechnology can help improve oil and gas production through improved understanding of processes at the molecular level. It can also help develop new metering techniques with tiny sensors to provide improved information about the reservoir. Moreover, applying nano-materials such as nano-particles and hydro-gel nano-composites could enhance the recovery rate of oil." (13)

This is an exciting Frontier for Project Management, with many new developments, projects and opportunities to come.

Good luck on your projects!

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