IBM's Plan to Transform University IT Education: And Spur Student Enthusiasm in the Process

Executive Summary

IBM started its Academic Initiative in the 1950s when it helped universities create Information Science programs. It extended this program around specific IT and engineering skills and then, in 2003 added a Service Science, Management and Engineering (SSME) initiative.

This SSME initiative went way beyond the university efforts of IBM—as well as most other vendors—that traditionally focused on "hard" science and technology skills, such as around programming, database design, electrical engineering and physics. SSME, in contrast, emphasizes the needs for universities to encourage multi-disciplinary education and the need to develop T-shaped skills, which combine deep skills in one or more fields, plus a high-level understanding across many others. IBM worked with universities to help professors expand the focus of their own courses and departmental curricula and, most importantly, to coordinate curricula across multiple schools within a university.

For example, IBM encouraged and helped schools refocus engineering education around real-world problems and train engineers to work in multi-disciplinary teams. It also challenged business schools to evolve their traditional focus on management of manufacturing companies (which now accounts for less than 20% of developed-country economies) to developing a similarly rigorous management science around services (which already account for about 60%). Some 40 universities have gone further, creating truly integrated curricula that cross traditionally sacrosanct boundaries—integrating courses across schools including management, information science, engineering and social science. A few have even begun offering new cross-school degree programs around SSME-related themes.

IBM's huge, corporate-wide Smarter Planet initiative is, in many ways, the application of SSME to critical, real-world problems. SSME, after all, is an effort to create a science around decomposing and recomposing service-based processes, optimizing service supply chains and value chains and creating interdisciplinary research centers to design and optimize complex "service systems"—combinations of people, organizational networks and technologies that are aligned around a specific objective, such as designing and managing more livable cities, more effective healthcare systems and more efficient energy networks.

This effectively transforms SSME from an academic discipline into an instrument for addressing societal needs. It provides universities with the tools required to create education tracks and, eventually, degree programs around social goals—thereby attracting and making it easier for students who want to "change the world". Moreover, IBM's efforts to help shape educational curricula across Smarter Planet initiatives now transcends traditional information science, engineering and business schools to reach into areas including mathematics, architecture, healthcare management, public service, urban studies, and others.

Although such programs may not attract those students who are driven to become hedge fund managers or musicians, they do have the potential of attracting and providing "employment-ready" educations for millions of other students with similarly strong drives in other fields.

Virtually all corporate university education programs share a common goal—to facilitate the education of students with the skills and perspective required to address the talent needs of the sponsor corporation, its customers and its partners. It's easy to see the direct benefit that IBM can gain from programs that teach System z mainframe skills, that Intel can gain from multi-core architecture design programs or that Wal-Mart can derive from the University of Arkansas' supply-chain optimization program.

But what benefits will IBM gain from encouraging universities to launch broad, non-vendor specific programs like SSME, healthcare management and transportation system design? The company's logo isn't on or necessarily associated with these programs, nor is IBM the first place most newly-minted graduates would look for a job to solve world hunger—unless, perhaps, you know about IBM's Smarter Food program and its projects to increase agricultural yields, improve sustainability, reduce waste through the optimization of supply chains and improve food inspection processes.

That's where some of IBM's multiple university outreach programs fit in. The company has 4,000 University Ambassadors, typically IBM domain experts, who volunteer to work with universities to engage with faculty members, develop classes around real-world problems, deliver guest lectures, participate in seminars and otherwise engage with professors and students. The company also provides education tools, such as its INNOV8 Business Process Modeling (BPM) simulation game and is adapting many of its other courses to new learning methods, as through support of community portals and wikis, discussion forums, blogs, and Facebook and Twitter communities.

It also has an active university research program through which it funds professors and graduate students to conduct specialized research and all types of fellowship and internship programs in which it works with professors to identify high-potential students. It also partners with universities on IBM's annual Battle of the Brains competition, the most recent of which attracted more than 28,000 students from 2,000 universities worldwide. These competitions engage interdisciplinary teams to tackle real world problems. The theme of these competitions? Would you guess they are typically aligned around one of IBM's 21 (and growing) Smarter Planet themes?

IBM will certainly not attract or hire all of the graduates from SSME and Smarter Planet-theme programs. Nor does it want to. Although it hopes, and is positioning itself to identify and recruit some of the most talented, its ultimate objective is to seed the world—its businesses, governments, NGOs and universities—with people who think about the world's needs (and solutions) in much the same way that IBM does, who have been touched by IBM Ambassadors and programs, who understand IBM products, and who recognize that IBM is dedicated to addressing the same types of needs as are they.

This all leaves me with two questions. When will other corporations recognize the long-term payoffs of this broader approach to partnering with universities? And, how will they reach professors and students in the myriad fields that will be increasingly reshaped and redefined by IT?

Key Points

IBM built the IT industry's first and largest university partnership program.

IBM was the first IT vendor to help universities educate students to become IT professionals.

The company is now rapidly extending its university programs beyond IT.

Although most IT vendors continue to focus their university programs almost exclusively around IT and engineering, IBM is extending its program across multiple educational disciplines and schools.

Extension of the university program to support Smarter Planet offers the potential for new benefits.

IBM is challenging universities to rethink how they prepare students for the careers of the future and is challenging students to combine their interests and their ideals into jobs that address social needs.

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Introduction

IBM's Academic Initiative—an approach to partnering with universities, in which the company provides free or greatly discounted hardware, software, courseware and curricula development assistance to university instructors who integrate product training into their courses—is neither fundamentally new nor unique. After all, IBM effectively launched this effort in the 1950s, when it began helping universities teach mainframe programming skills and, more farsightedly, create the type of Information Science curricula that would become the foundational education for generations of IT professionals.

Moreover, as I've discussed in multiple blog posts over the last year, virtually all leading IT hardware, software and service providers now offer university grants and education programs that are intended to encourage and assist universities in teaching skills that are unique to or intrinsic to their product and service offerings.

This type of assistance provides value to all parties:

- Vendors, their partners and their customers gain ongoing access to graduates trained in their products and often (though professor recommendations, involvement in classes, fellowships and internships) early access to the most promising students;
- Students receive specialized, hands-on marketable skills, an advantage in applying to companies that require them and, in some cases, preferential access to the vendor's recruiters; and
- Universities and professors gain access to courseware that prepares students for actual jobs, free or discounted access to resources required to teach these courses, and access to vendor assistance in tuning and teaching classes, and sometimes in funding fellowships and research.

The extension of IBM's Academic Initiative to support its Smarter Planet campaign has the potential of enhancing benefits to each of these constituencies.

Section One: Educating Product Specialists

Most initial IT vendor/university collaboration centered around the education of engineers, scientists and programmers who, once graduated, could be employed by the vendors to design new generations of the vendor's hardware and software products.

Although all leading IT vendors maintain such programs, most vendors have long-since expanded their university programs to facilitate the education of IT professionals who could be employed by the vendor's customers. These professionals understand the vendor's products; help design, manage and support the implementation and ongoing use of these products; and, hopefully, ensure their successful implementation. Ideally, graduates who are steeped in a vendor's offerings will also have a predisposition toward—and over time play a role in driving or influencing their company's purchase of—the vendor's offerings.

IBM, like all other leading IT vendors, offers a broad range of specialized courses, most of which are built around individual hardware and software products. The company's hardware and software groups, and many of the individual product divisions within them, each have their own specialized courseware portfolios. IBM's System z mainframe group alone offers more than 40 courses, ranging from high-level introductory courses through highly specialized programs on security and database management.

Although many such courses are available in traditional audio, self-paced online and instructor-led formats, the company is also adapting its courses to new learning methods, as through the support of community portals and wikis, discussion forums, blogs and Facebook and Twitter communities. It has even begun to incorporate gaming techniques into its courses, as with its software group's interactive, 3D INNOV8 Business Process Modeling (BPM) simulation game. The company, as I discussed in my September 2009 report, IBM's Role in Creating the Workforce of the Future, is also helping professors migrate toward more student-led (in additional to traditional instructor-led) teaching methods.

IBM's biggest, and in my mind, most important adaptation, however, is its effort to supplement this specialized product-based education with a growing range of broader, cross-disciplinary courses and curricula that transcend individual product categories, IT functions and academic disciplines.

Section Two: The Need for Service Generalists

IBM's initial move beyond product education began in 2003, with the launch of its Service Science, Management and Engineering (SSME) initiative. This initiative, as the name somewhat implies, is an attempt to develop the same type of discipline and rigor around the design, production and delivery of services, that already exists around the design, production and delivery of products.

The initial motivation for viewing services as a science came from IBM's own business needs. Although services (especially support and consulting) were playing a rapidly growing role in the company's own business, it recognized that its services business could not be managed in the same way as its hardware and software products businesses. They had different value propositions and business models, and required different P&Ls and sales processes. Services, for example, cannot be produced for stock. While products are designed, produced, inventoried and sold, services must typically be designed, produced and delivered simultaneously, and are often co-created with the customer.

Service businesses also require different types of people. Service designers employ less formalized, less structured processes, sales people must promote more intangible value propositions, and services architects and providers typically work closely with customers. They also often require more honed interpersonal skills, empathy and appreciation for organizational cultures and change management processes. This requires different, increasingly multidisciplinary skill sets—what IBM calls "T-shaped" skills, which combine deep skills in one or more fields, plus a high-level understanding across many more.

IBM's needs are not unique. Far more companies count on services for the majority of their revenues than those that focus on products. Even the most product-centric companies have large percentages of their employees (and even larger percentages of their payrolls) focused on providing services.

The same is true for countries. The more developed the economy, the larger the percentage of GDP that is attributable to services. While emerging countries, like China and India count on services for only about one-third of their GDPs, services now represent 60-70% of the economic output of developed countries such as the U.S. and Japan as well as the Western European countries. If developed country companies and countries hope to maintain their economic advantages in the face of growing services competition from lower wage countries, they must continue to differentiate their service offerings and dramatically improve productivity and efficiency.

There are, however, a wide range of services. Consider the huge differences in the services provided by physicists, nurses and waiters. Yet services also have many commonalities. For example, services in virtually all industries—IT, healthcare, restaurant, and so forth—each have unique back-end (production) and front-end (delivery) services and most industries are working to standardize these services to achieve consistency, predictability, repeatability and measurability.

They are also attempting to create the same type of rigor across the entire services value chain (research, production, operations management, finance, marketing and so forth) as they already apply to products. In fact, many industries—led by the IT industry—are increasingly working to "productize" their services by designing pre-defined "service assets". These service assets are more reliable, repeatable and efficient than traditional services, but are just about as flexible, since each can be assembled in different combinations, depending on the requirements. Services are, in other words, becoming more like SOA software components, which can built ahead of time and combined through the use of standard interfaces, as required to meet unique requirements

Section Three: Integrating SSME into University Curricula

IBM, which is among the leaders in assetizing services, has a great need for people to design, sell, architect, assemble and support these services. So do IBM's partners and customers who purchase, resell, enhance or otherwise customize these services.

The company, therefore, is redesigning its training processes and career paths around the specific needs of service professionals and is developing its own formalized service design,

modeling, engineering, optimization, management and marketing processes. However, it cannot do this alone and is enlisting universities to participate in:

- Educating a new generation of SSME professionals; and in
- Conducting research into service science and developing new design, optimization and management models and processes.

But some very big differences exist between developing a university ecosystem that is tuned to developing hardware and software professionals and one that is intended to develop service professionals. Hardware and software models and processes, for example, are already relatively mature and well understood. Service models and processes, by contrast, are still in their infancy. So while IBM is certainly leveraging its established relationships with engineering and information science departments, it is focusing its primary efforts on, and is gaining its greatest traction from business schools—especially graduate business schools.

So far, IBM has developed SSME relationships with more than 400 universities in 50 different countries. The vast majority of these relationships entail integrating SSME-specific modules into established classes or designing specialized, individual courses. While these often entail broad survey courses, a growing number of schools, such as Olin College have pioneered the development of courses that employ project-based learning models to target real-world problems. University of Illinois, meanwhile, created a new multi-year program, called iFoundry, in which all engineering students dedicate two hours per week in their first and second years in learning new ways of listening, asking questions, decomposing problems and working in teams.

About 130 of these schools—primarily graduate business, engineering and computer science schools—have developed formal SSME degree programs. For example, some graduate business schools, such as North Carolina State, Stevens Institute, University of Maryland and Arizona State in the U.S., plus a number in other countries, integrate service science education across disciplines including operations management, finance, marketing, and so forth.

Approximately 40 universities have gone even further, creating truly integrated curricula that cross traditionally sacrosanct departmental boundaries, integrating courses across schools including management, computer science, engineering and social science. Schools including Carnegie Mellon, the University of Michigan and the University of Pennsylvania have pioneered the creation of cross-disciplinary programs that combine courses in their business, engineering and information science schools.

A growing number of professors from these universities are also doing leading-edge research work in, and writing textbooks on the still nascent SSME field.

Section Four: Overcoming SSME Program Obstacles

A number of professors have come to recognize the importance of developing a science focused on services. And, as mentioned, a growing number of universities have created SSME courses and, to a lesser extent, broad curricula and degree programs.

But even when individual professors buy into the need to develop formal studies and a formal science around the service economy, they often face obstacles in launching courses, much less comprehensive, interdisciplinary SSME programs. There are, of course, the problems of academic inertia and academic silos. While individual professors may buy into the concept, getting approval from academic deans, or especially committees, can be problematic. And even if committees do agree, they may have to resolve turf wars over where the courses belong. These issues are multiplied since SSME crosses so many academic boundaries. Different schools (business, engineering, etc.) may claim dominance and the establishment of true multi-school collaboration can be difficult.

Creating formal SSME degree programs face even greater obstacles. While most universities are reluctant to establish new degree programs until they see clear demand from corporate recruiters, few corporations yet recognize the need for a formal services science, and fewer still specify the needs for degrees in this field. This creates something of a chicken and egg situation—particularly in tough economic times when austerity engenders conservatism and makes it tougher to invest in new “markets” for which demand is not yet proven.

Although these obstacles certainly present challenges, all can be overcome. First, all universities and professors recognize that the services sector already dominates the economy, that the requirements for building services businesses are different than those for manufacturing businesses and that many traditional—and increasingly high-value—services professions are being targeted by developing countries with much lower wage rates.

Since all universities want to be able to place graduates in good, secure jobs with strong advancement and earning (and therefore donations to their alma mater) potential, each school usually has a handful of professors anxious to champion the SSME cause. This is particularly true in:

- Business schools, where it is relatively easy to incorporate some SSME elements into traditional courses;
- Engineering and Information Science schools, which are struggling to attract students who are shunning technical fields and to stem large transfers of first and second-year students who become disenchanted with the abstract principles and academic rigor of their coursework; and
- Graduate schools, which tend to have greater flexibility than undergraduate schools in adapting their curricula and in creating new degree programs.

It also helps when:

- Leading corporate technology recruiters including IBM, Cisco, Microsoft, Google, Oracle, Accenture and Xerox actively promote the SSME concept; support professors; offer scholarships, internships and fellowships; recruit graduates; and offer the potential of research contracts;
- Leading corporations from a broad range of other industries, such as Allstate and State Farm in insurance, GlaxoSmithKline in healthcare and even Westvaco in package design, have begun to promote the concept and work with universities;

- Leading universities, such as Carnegie Melon, MIT, University of Pennsylvania and Berkeley have embraced the concept; and when

- A growing number of corporations, university professors and associations (including the Service Research and Innovation Initiative (SRII) and the Association for Services Management International (ASFMI) have developed curricula, courseware and textbooks and offer design assistance and guest lecturers to universities that are looking to introduce SSME into their schools.

Section Five: Smarter Planet—Bringing SSME into the Real World

IBM's huge, corporate-wide Smarter Planet initiative is, in many ways, the application of SSME to critical, real-world problems. It is also a very effective way of making SSME real and compelling to students.

Smarter Planet, as everybody who watches television or reads a newspaper or magazine now knows, is IBM's most recent and one of its most extensive (not to speak of expensive) corporate initiatives. While Smarter Planet is certainly the foundation of the company's current advertizing campaign, it is much more than that. It is also the foundation of the company's solutions and go-to-market strategies—integrating virtually all IBM products and services into solutions to some of the world's most pressing problems, and into some of its customers' most compelling business opportunities.

Just as important for IBM's Academic Initiative and talent recruitment and development efforts, Smarter Planet also provides a compelling way to capture the attention and imagination of Gen Y students who are looking for ways to make a real difference in the world, while simultaneously building sustainable, rewarding careers for themselves. It provides these students with opportunities to apply their own unique interests and skills (whether in science, math, business, architecture, psychology or urban planning) to pressing social objectives, such as building more livable cities, more effective healthcare systems, healthier and more sustainable food and water supplies, and greener, more efficient energy systems.

What is the linkage between these Smarter Planet initiatives and SSME?

Cities, healthcare system and food and energy networks are essentially "service systems", combinations of multiple people, organizational networks and technologies that are designed to accomplish a particular objective. Each consists of hundreds or thousands of people performing individual services which, when combined, produce a result. The more efficient that each service is, the more effective the linkages among them, and the more robust and flexible the technological infrastructure, the more effective and efficient the result, and the more likely it is to produce the desired outcome.

If SSME requires multifaceted "T-shaped" people who combine broad perspectives and deep domain knowledge (as in engineering, chemistry or medicine), Smarter Planet requires even more interdisciplinary perspectives. They must have broad backgrounds, deep domain knowledge (as in math, IT or a relevant science) and a deep understanding of a particular

service system (such as an industry like healthcare, a process like supply chain, or an entity like a city).

So while SSME can benefit from a multi-disciplinary perspective, Smarter Planet mandates it. IBM, therefore, is now attempting to leverage its work in helping universities evolve SSME programs, into Smarter Planet "Research Centers". These research centers identify a specific objective (such as building a smarter city), attract sponsors (such as a city or national government) and combine experts from appropriate disciplines (business, IT, civil engineering, urban planning, etc.) to identify, optimize and implement solutions (i.e., service systems).

Section Six: Aligning University Partners

IBM is currently working with universities to develop multidisciplinary curricula around initiatives including Smarter Cities, Healthcare, Energy, Water, Supply Chain and Transportation. Universities, with IBM's help, are identifying the combinations of skills required to address specific needs, align support among multiple departments and schools, develop project-based courses and case studies around compelling real-world problems and even fund or help find sponsors for research projects.

It can, for example, help a Health Services Management professor create a course around medical records management, work with an information sciences professor to teach medical database design skills, a math professor around medical analytics and so forth. IBM may volunteer its own Global Business Services medical consultant, or may invite an IBM business partner and/or customer to help design and deliver appropriate courses or lectures, or identify companies or government agencies to fund research projects. It will also help the professors identify and build communities of academics and other professionals from around the globe, who have similar or complementary skills and focuses.

It has, for example, helped develop a Supply-Chain Optimization Research Center at the University of Arkansas, a Transportation Research Center at the University of Michigan, and a Water Management Research Center at the University of California at San Diego. Some of these research centers, such as Carnegie-Mellon's Cybersecurity, MIT's Nanotechnology and University of Arkansas' Radio Frequency Identification (RFID) Research Centers, focus on broad, cross-industry, foundational technologies, rather than individual industry needs. Many have strong support of local corporations (such as auto manufactures for Michigan and Wal-Mart for Arkansas) and local governments that hope to leverage university centers into clusters.

Nor are such activities limited to the U.S. As I discussed in my December 13 and December 20 blogs on IBM's National Roadmaps, the company is working with leading universities to develop research centers in dozens of countries around the world. And since some of these research centers focus on key national development objectives, such as jumpstarting a country's IT service industry or developing alternative energy technologies, they often garner strong support from local, regional and even national governments. Countries including Germany, Finland, Korea and Taiwan actively embrace and are funding research into SSME and at least one European business association (Networked European Software and Services Initiative, or NESSI) works to coordinate SSME efforts among corporations, universities and government organizations.

Although many such Smarter Planet efforts are focused on helping multiple departments or schools within individual universities to address common needs, some initiatives span multiple universities. Multiple universities, for example, may partner in developing courses or research centers. Many of the courses that are developed under IBM grants are available to other universities. Such collaboration can also cross borders. IBM often helps to connect faculties of developing-country universities with those of counterparts in developed countries that are working on similar issues, such as in energy management and food production.

Section Seven: Creating Opportunities for Students

IBM is certainly attempting to use SSME and Smarter Planet to attract professors and universities to support the company's Academic Initiative. Its primary interest, however, is in attracting students.

Emerging-country students are already rushing to study STEM-related disciplines, which they view as their most effective route to good jobs and upper-middle class lifestyles. Developed-country students, by contrast, are abandoning STEM studies in droves, preferring to focus on business, finance, law and other non-technical areas of study. One result is that recent college graduates are facing some of the lowest recruitment rates in history, while thousands of STEM-based jobs go begging for qualified applicants. This is true not just in the North America, but also in Europe and, to a lesser extent, Japan.

This is bad not just for IBM's own recruitment efforts, but also for its customers, its partners and IBM's own long-term business prospects. Nor, as I argue in my January 10 blog, is it particularly helpful for the IT industry, developed-country economies or their workforces.

Most leading IT hardware, software and service companies already have aggressive programs for stimulating student interest in STEM studies. Some of the more farsighted programs are going further by demonstrating how STEM and, especially, math and IT skills are becoming indispensible in all disciplines and professions. IBM, with its SSME, and especially Smarter Planet Academic Initiatives, is going further.

Although its ultimate goal is certainly to entice students into STEM studies, it is attempting to do so by engaging their imaginations and their desire to make a difference in the world. UC Berkeley, students, for example, spend their own time travelling highways and assessing traffic problems as a means of helping the city design smarter traffic solutions.

IBM is certainly helping these students indirectly by helping professors develop courses and universities develop research centers. It is also helping students directly by sending thousands of IBM Academic Ambassadors to work directly with professors and students, and by sponsoring scholarships, fellowships, contests and internships.

The company's recently completed Battle of the Brains competition, for example, attracted more than 28,000 students from 2,000 universities worldwide to work in interdisciplinary teams to tackle real-world problems in designing Smarter Cities, governments and healthcare systems. Such competitions attract not just students, but also IBM recruiters. They often target winners and other promising finalists for IBM internships. And guess what these intern projects consist

of? They group interns into interdisciplinary teams that are tasked with developing solutions to big, real-world Smarter Planet problems.

A recent crop of interns, for example, spent their internships designing traffic optimization systems for Beijing. At the end of the presentation, teams were brought together before IBM executives—including CEO Sam Palmisano—to present their findings. When they finished, they attended an IBM job fair designed specifically for them.

This focus on real world problems continues once graduates begin working for IBM. In “the old days”, new hires were sequestered in months of classes in preparation for work. Initial projects often entailed relatively solitary work in cubicles, writing code, crunching numbers and so forth. No more. Today’s hires are thrown right into real-world projects, integrated into multi-disciplinary teams and often, posted at a client’s site. This, as discussed in my report, IBM’s Role in Creating the Workforce of the Future, is just the first step in a career that is likely to span multiple disciplines, job functions, departments, and increasingly countries.

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Beyond IT's founder and author of this report is Tom Kucharvy an over 30-year IT industry analyst veteran with an impressive record of anticipating trends—and helping clients drive and prepare for industry-shaping change. Whether or not you agree with Tom's out-of-the-box thinking, his honest, objective analysis is guaranteed to open your eyes to new possibilities.