

gridlines

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Reinventing healthcare infrastructure



Gridlines is PwC's magazine devoted to infrastructure. Stories focus on four areas: emerging trends and technologies driving infrastructure transformation; ways to manage risks and seize opportunities; tactics that can help with day-to-day challenges; and interviews with experts at the heart of thought and action. Gridlines combines PwC's analysis and insight with reporting on critical developments and directions.

As the pulse of social infrastructure strengthens, so does the outlook for the 21st century



R. Carter Pate

Global managing partner—infrastructure and government.

Anyone who has ever been on the doctor's treadmill for a stress test knows it isn't easy, but the pain also delivers a wake-up call to focus on what counts. In that way, the economic downturn caused many to reassess what's important in infrastructure. And in this century, education and healthcare need to be fighting fit to continue socioeconomic advancement.

Of course, rails, roads, energy, information/communications, waste and water—the traditional muscle and backbone of infrastructure—must be built and maintained. But healthcare and education (or, more broadly and appropriately, intellectual capital) need to be primed for the next era of growth.

Social infrastructure represents the heart and spirit of the 21st century. It is impossible to reach the economic potential that we envision in a knowledge economy without strong education offered to all, supported by forward-looking policies in government and business. Similarly, everywhere from Africa to Asia to Appalachia, freedom from disease and early death

should be heightened infrastructural priorities. People need basic healthcare assured to possess the peace of mind and longevity to raise families, prosper and fuel economic progress.

Food enters the social infrastructure picture, too. With a current world population of 7 billion, global supply lines and complex vulnerabilities, agricultural and food risks threaten not only personal wellbeing but the health of companies dependent on their brands and profit margins.

For insight on these issues we went to the vanguard of progress:

New Karolinska Solna University Hospital in Sweden recently completed a record healthcare public-private partnership as it expands one of the world's great centers of healthcare research, education and care. *Gridlines* investigates what is being done and why. We spoke to Dr. Lennart Persson, managing director who oversees the project. And we offer an advance look at PwC's upcoming global study on public-private partnerships in healthcare.

Intellectual capital resembles the Internet before Google, affordable PCs and pervasive broadband: it looks like an idea whose time is coming, but we don't see the amazing shape yet. As a professor and one of the world's first chief knowledge officers, Leif Edvinsson has pioneered thought and action on intellectual capital working with both cities and companies. For our upcoming PwC study, *Cities of Opportunity 2011*, we spoke to him at length. We give you a snapshot in *Gridlines*.

The focus on food safety is heating up as well as the US considers a law to strengthen its inspection and certification process. With America the world's top food importer and 250,000 companies registered as suppliers, governments and companies internationally need to understand the ripple effects in terms of testing and liabilities.

I hope you find this edition of interest and value. Please contact me to discuss any of the issues.

Yours truly,

“The PPP allowed us to concentrate on our core business >

healthcare + research + education”

Reinventing Healthcare for the 21st Century New Karolinska Solna and the Swedish Model

By Paul da Rita and Lars Tvede-Jensen

It is difficult to imagine a policy debate more fraught with concern, for policymakers and citizens alike, than the one that most advanced societies are currently undergoing regarding the provision of healthcare within the constraints of public resources. What has added even more urgency to this discussion is the “demographic issue”: the aging of both the developed world, as seen in Europe and Japan, and the developing one, as in the case of China. The conjunction of these two factors has concentrated policymakers’ minds everywhere on the budgetary implications of aging populations.

An emblematic response to these forces, given the country’s prominence in forging social policy, is taking place in Sweden. New Karolinska Solna University Hospital, to open in 2015, will be the product of a public-private partnership (PPP)—Sweden’s first in the health sector—and is already being seen as a new model for the public provision of healthcare in that country. Its two broad objectives are to serve the needs of Stockholm’s citizens through a meticulously patient-centered organization, while at the same time establishing an education and research base to reinforce and advance medical care. In short, the vision behind New

Karolinska Solna encompasses an enhancement, strengthening, and, to a very real degree, redefinition of social infrastructure for the 21st century.

Government budgets are unquestionably under pressure worldwide. The global financial crisis and its consequences have made healthcare access and provision—and, above all, their cost—primary elements of the current consolidation, rebalancing, and reconstitution of public finances that will be central to public administration during the next several years.¹ Once demographic realities are added into this budgetary mix, we can see why most advanced economies are reviewing their healthcare structures.

The decision by Prime Minister David Cameron’s coalition government in the UK to reduce public spending by 19 percent except in the case of the National Health Service (NHS) confirms just how sensitive, both socially and politically, healthcare provision is. The many issues surrounding healthcare have taken on an

¹ According to *The Economist*, “In 2011, on current plans, the rich world is set for its biggest collective budget cuts in at least 40 years.” “Global economic policy: Monetary illusions” (leader), *The Economist*, September 4th-10th, 2010.

The many issues surrounding healthcare have taken on an immediacy not seen since the post-World War II period.

immediacy not seen since the post-World War II period, when many countries in the West established or consolidated universal healthcare for their citizens.²

Under the circumstances, Sweden remains a powerful example of European social consensus. Indeed, the recent elections confirmed that the changes to the Swedish social model proposed by the Swedish people themselves are improvements of efficiency and responsiveness, not of fundamental design or intention. To take the Swedish approach to healthcare as the example, the underlying rationale of current efforts is not repeal or even revision, but reform and recalibration.³

“In Sweden, the public sector is over 50 percent of GDP,” says Professor Lennart Persson, the managing director of New Karolinska Solna hospital. The precise percentage for 2009 was 55.8.⁴ Interestingly, Sweden was not even top of the chart in this measure: Denmark came first (58.7 percent) and Finland second (56.1 percent), with France just a bit below at 55.6 percent. More to the point, the European Union average as a whole, including the lower-spending countries of the former Soviet bloc, was 50.7 percent, just one-tenth of a point below the eurozone’s 50.8 percent.

These figures were obviously swollen by the emergency spending that had to be made in response to the financial crisis that broke out three years ago and reached its climax following Lehman Brothers’ collapse in September 2008. Indeed, in 2007, the first year of the crisis but before Lehman’s downfall, EU public-sector spending was 45.8 percent of GDP while

Sweden’s was 52 percent. It is obvious that those pre-crisis levels represent the judicious spending and budget consolidation to which every European government wants to return.

This is exactly where public-private partnerships (PPPs) have come in, allowing governments to maintain social infrastructure and even expand it. The construction and development of New Karolinska Solna hospital is a model for this new approach to infrastructure spending, as it proposes a different way of thinking about social investment and public services.

New Karolinska Solna has an illustrious lineage (see page 8). For Swedes, this conspicuous pedigree has led them to pay great attention to its creation. What has particularly captured notice is the PPP that was formed to build the hospital and then maintain its nonclinical

Story continues on page 11

² The NHS was established in 1948. Although France passed initial healthcare legislation in 1928, the social security ordinance of 1945 established the principle of universal coverage. Sweden passed its National Health Insurance Act in 1946, but did not implement it until 1955. Even in the US, President Harry Truman sent a presidential address to Congress inauspiciously proposing national health insurance in November 1945, just three months after V-J Day. On the other hand, the roots of Germany’s national health insurance go back to Otto von Bismarck’s social legislation of the 1880s.

³ See “The consensus in favour of Swedish thinking,” by Ralph Atkins, Frankfurt bureau chief of the *Financial Times*, which anticipated the fact that, regardless of who won the upcoming Swedish elections, “support for Sweden’s economic model is so widespread that nobody really expects much to change.” *Financial Times*, August 22, 2010. Indeed, the day before the balloting, Andrew Ward, the *FT*’s Nordic bureau chief in Stockholm, concluded that, in building up his lead (and ultimately winning the election), “Crucially, Mr. [Fredrik] Reinfeldt [Sweden’s prime minister] has convinced voters he can be trusted to preserve Sweden’s cherished cradle-to-grave welfare system....” “Swedish PM on brink of re-election,” *Financial Times*, September 18/September 19, 2010.

⁴ See Eurostat’s comparative data listed in the table at <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tec00023&plugin=1>.

Interview



A few words with Dr. Lennart Persson...

Director of the Clinical Neuroscience Centre of University Hospital in Uppsala, a senior scientific adviser to the Swedish National Board of Health and Welfare, and now managing director of New Karolinska Solna University Hospital. Here, Professor Persson discusses the vision for New Karolinska Solna, the need for the public and private sectors to collaborate in healthcare, and the importance of healthcare to social development.

Is it true that the public-private partnership was chosen to finance New Karolinska Solna (NKS) because there was no precedent for public financing of a project of this magnitude, or were there other considerations?

PPP has not been used particularly much in Sweden, and not in larger projects like this one. The idea was that this was such a huge and complex project that we wanted to ensure, as best we could, that the hospital would be finished in time and on budget. And it was thought that, by using the PPP, the risk of delays or increased costs would be minimized. Also, the county council, which owns and will operate the hospital, had no particular experience in large construction projects. When I got this job, it was quite obvious to me that we could never manage all the work to build this hospital. So, the PPP allowed us to concentrate on our core business—which is healthcare, research, and education—which is why we used it.

Did you, as the director of NKS and as a doctor, have any initial reservations about the efficacy or even suitability of a PPP for this project?

At the beginning, to be honest, I didn’t really know what it was. I had heard about it in passing, and I’d read some articles, but it

was not until I got this job that I had to start doing some homework. We also got PwC in very early on. Before we decided on the PPP, we undertook a couple of studies to try to determine if we should do it and, if so, how to do it. At first, I was kind of neutral. I didn’t have any opinion. As I learned about PPPs, I became very positive—but that took awhile.

I noticed that many physicians thought that a PPP controls a lot, or influences healthcare indirectly, or changes focus from healthcare to facility management and costs. You know, putting in angled shelves in windows so people can’t place flowers on them because it is more expensive to clean. There were all these kinds of rumors about how cleaning the hospital was more important than healthcare, for example. But they proved to be false.

There was also some skepticism, especially from UK colleagues whom I knew and talked to. But, in the end, when we looked at the National Audit Office’s audit in the UK, which compared PPP projects with those that were more conventionally financed, it convinced us that this was a good thing, especially if you wanted to finish in time and on budget, which was important.



NKS webcams capture the flow of excavation.



Are you using any metrics, in lieu of more general oversight, to see that the project proceeds according to your needs?

Yes, yes. We have some 300 people involved in various work streams and groups. For example, if you look at radiology, while we will not have a radiology department, we do have radiologists and nurses examining all our needs on that score, so I don't think that's a problem—I'm not afraid of that. This is the first time for all of us, so we'll be very cautious in any case, so that the project does not go in a direction we don't want.

How important do you think this project is for the future of healthcare in Stockholm, and Sweden generally?

I think it is of importance because the Karolinska is the number-one hospital in Sweden. If you look at medical faculties in the world that use the ranking system that we often quote, there are eight American hospitals, but we have only the Karolinska. And then come Cambridge, Oxford, and the French. So Karolinska is a leading hospital. That is why it is important that everyone is very interested in what's going on and follows it closely.

I think PPPs will be the model for the future because we cannot, in the long run, keep a public-sector monopoly in healthcare.

But the reason I got this job was not to manage the PPP or the construction itself, although I'm doing that and have a technical department for it. It was to renew healthcare management in this hospital. That is what we want to do.

Assuming that you open your doors in 2015 as expected, do you see the use of the PPP itself becoming a demonstration project for other, comparable ventures in Sweden?

Yes, I think so. In the case of healthcare, what we hope is to have people concentrate on what

they do best. We [doctors and the professional medical staff] will not be involved in facility management, for example. We will not be involved in logistics. All these things will be managed by people who, we hope, are better suited to do the job, so we can concentrate on taking care of patients, educating students, and research.

So facility management will be an ongoing part of the PPP.

Yes. The cost of the construction is about 14.5 billion kronor. I think that is about roughly \square 1.5 billion. The facility management services for 25 years are around \square 700 billion to \square 800 billion, or close to a billion US dollars. So the facility management services are quite a substantial part of the whole deal: technical support and maintenance of the premises itself, as well as conference services, some information technology, textiles, cleaning, security, and so on. Many of these things will be the responsibility of the PPP special purpose vehicle [Swedish Hospital Partners AB].

Do you think that New Karolinska Solna can serve as a wider model for health infrastructure in the West as a whole?

We hope so, or at least we hope to contribute a little. PPPs are being used more and more. They started in the UK, as you know, but you see them now in Spain and Germany, and Denmark is now at least thinking about them. I think PPPs will be the model for the future because we cannot, in the long run, keep a public-sector monopoly in healthcare.

Do you feel that PPPs are compatible with public oversight of healthcare, especially of the quality of services with which people are being provided?

Yes. Of course, here at New Karolinska, we have not discussed privatizing healthcare, nor is it on the agenda. So we haven't really thought about it or analyzed pros and cons. When we talk about PPP, we mean constructing the facility itself and also managing the facility.

In that sense, I think it is a good thing for Stockholm's citizens, as taxpayers, because this is a good deal for them. I also think the PPP allows us to focus on healthcare and to leave maintenance to the professionals who can take care of it. What we see historically, if I can perhaps generalize a bit, is that, when the public sector has financial problems, the first thing it does is postpone necessary investment in building maintenance, so buildings deteriorate.

Of course, the alternatives are worse. I understand that. But it's clear that it's easier to cut investment in infrastructure than, for example, capping salaries or

reducing staff. If you reduce staff, you have political turmoil. But if you neglect a building, nobody cares. At least with the PPP, when the contract period is over in 2040, we will have an almost new hospital because it will have been maintained over the years.

The New Karolinska Website states: "The final, and detailed definition of healthcare at the new university hospital shall be decided at the latest possible time." Does this mean that the final competencies and organization of the hospital have not been determined?

Yes. It was difficult for many reasons to define the clinical content of the hospital very early on because that would have created problems for current healthcare in Stockholm. Proposing to move various capabilities from other hospitals, for example, would have been very difficult.

Also, our position was that medical science is actually developing. We saw, for example, a case in Oslo where the clinical content was planned in detail very early, but it took so long to finish the hospital that interventional radiology—using catheters instead of open

surgery for diseases of the brain and heart—was more or less left out: because its development was so fast, they had missed it. So they had to build it after the fact.

We didn't want that to happen to us. We are building a hospital that is very flexible, so that it can change.

How important do you think healthcare is to the infrastructure of a society and, by implication, to a society's future?

From a general point of view, healthcare is a major component of a welfare state, of a modern state, so to speak. Society, in a broad sense, should be able to provide its inhabitants with healthcare. I think that is very important. But I can also say that we cannot foresee, for example, in Africa—I don't believe that we will see even in Europe—the development we see in the States, in which healthcare now takes some 16 or 17 percent of your GDP. That is dangerous to a country, to the economy of a country, to have one sector being so dominant.

As for developing countries, they must produce more healthcare

more cheaply. For example, it's been shown that one can train people in Africa for cataract surgery to do these operations very safely, without needing them to first go through university and then five years of specialty in ophthalmology before they start doing surgery. You can take someone from a village, more or less, and train them in a year or so, and produce the same result.

One problem in Western healthcare, therefore, is that we have overqualified health providers. What is needed is a division of labor, with each healthcare provider responsible for a much smaller spectrum of products. Then you can have shorter educational requirements and make it cheaper.

That's essentially the same thing Henry Ford did when he started making cars. It's very different, of course, because we're dealing with people, but, essentially, this division of labor will make healthcare cheaper. ■

See the Web at www.pwc.com/gridlines for the full interview with Professor Lennart Persson.

Professor Persson describes his ideal of patient care as "organizing care according to patients' needs."



Karolinska Institute leads by many measures

New Karolinska Solna University Hospital is the successor to Karolinska University Hospital, which is not only the premier teaching hospital in Sweden, but also the affiliated hospital of the Karolinska Institute, the world-renowned medical university founded in 1810. The Karolinska Institute is the highest-ranked university in Sweden, the highest-ranked non-American medical faculty in the world—number nine globally after eight US medical

schools¹—and, most famously, the institution that appoints the annual Nobel Assembly, which awards the Nobel Prize in medicine.²

The New Karolinska Solna facility is designed chiefly for specialized medical care and research-intensive medicine. It will occupy approximately 335,000 square meters in area, although future expansion will be possible, and its staff will include 6,000 professionals supplemented by 1,000 researchers and students.

The most impressive aspect of the hospital's logistics, however, is the focus on patient care.

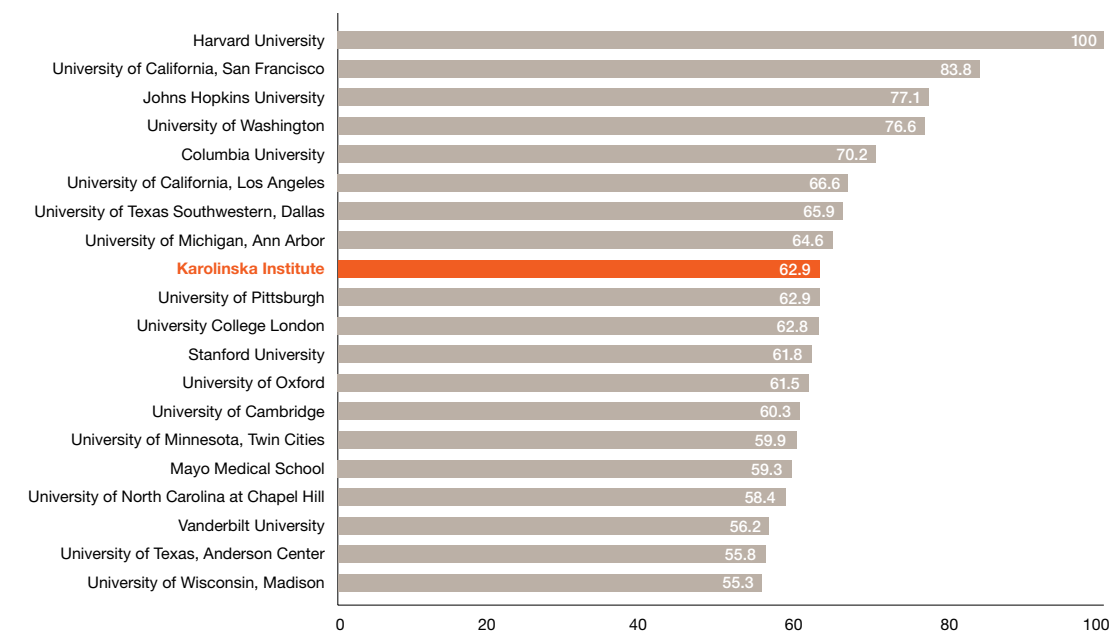
The hospital will contain 600 inpatient beds, including 125 for intensive and 75 for postoperative care, all of which will be in single rooms, in an effort to mitigate hospital-borne infections. There will be an additional 100 outpatient beds, as well as 100 rooms provided as a patient hotel.

The anticipated patient flow is estimated at 480,000 inpatients and 65,000 to 100,000 emergency patients every year. New Karolinska Solna University Hospital is scheduled to open its doors in December 2015.

¹ See the table (with the Top 20 pictured below) in <http://www.arwu.org/FieldMED2010.jsp>, which lists the 2010 rankings of the relevant universities in clinical medicine and pharmacy of the Academic Ranking of World Universities produced annually by Shanghai Jiao Tong University.

² Officially, the Nobel Prize in Physiology or Medicine.

The top 20 university hospitals worldwide



The 2010 Academic Ranking of World Universities (ARWU) places Karolinska Institute in ninth place worldwide based on the achievements of its medical staff in criteria including Nobel Prizes and highly significant research.



Healthcare PPPs expand worldwide and gain new dimensions

In its upcoming study, PwC's Health Research Institute has surveyed the global state of healthcare and distilled its investigation into a revealing analysis. It is clear, according to this new report, that governments throughout the world are increasingly turning to "private capital and expertise...as welcome sources to induce efficiency and innovation" in their healthcare provision.

Although the bulk of this provision is, in most countries, predominantly the responsibility of the public sector, there is not a country in the world today in which healthcare is financed wholly by government. The global financial crisis has ensured that public financing of healthcare will now, of necessity, have to be progressively

augmented by the private sector. What is less evident, according to the report, "is the appropriate ratio of public to private resources in financing and managing health."

Determining the proper balance between public expenditure and private investment—and, therefore, "the best possible return for both taxpayers and the private sector"—is, of course, at the heart of the debate about healthcare provision everywhere in the world today. PPPs have become a critical element in that debate. And while PwC has found "some well-publicized failures" in PPPs in several countries, even the lack of success in these ventures has led to "important lessons" learned and to a PPP model that is being "continually refined and altered."

Consequently, healthcare PPPs are expanding, according to the report. Specifically:

- **In Europe**, *Infrastructure Journal* has reported that \$4 billion in hospital PPPs was announced in the first half of 2010 alone, including the biggest one, New Karolinska Solna University Hospital (worth about €1.5 billion, or \$1.96 billion), which is currently estimated to be the largest hospital PPP in the world. Another large project, the New Hospital de Vigo in Galicia, Spain, which will contain 1,465 beds, is valued at €375 million, or \$490 million.
- **In Canada**, the McGill University Health Centre, Canada's largest hospital PPP to date, is scheduled for completion in 2014 at a cost of \$1.3 billion.
- Finally, and perhaps most noteworthy of all, **in South Africa**, the government has announced the biggest, and surely the most significant, PPP in the history of the continent, which will undertake the "reconstruction, revitalization and upgrading" of Chris Hani Baragwanath Hospital, the largest hospital

in the world. “Bara,” as it is known locally, is the only public hospital serving the 3.5 million people of Soweto. It contains 2,964 beds in 429 buildings that stretch over 173 acres.

Beyond these three examples, PwC’s report examines a number of specific case studies, and offers a detailed analysis of PPPs as they have developed globally, emphasizing both the hazards to avoid and the successes to build upon and refine. This comprehensive examination is summarized by the following seven key findings (with more detail on global market size to be added when the report is released in December):

1. **After two decades of experience** with PPPs in health infrastructure, public authorities are increasingly looking to the private sector as a partner in healthcare delivery and wellness.
2. **As PPPs progress from replacing** outdated, inadequate, and deteriorating inpatient facilities, the impact on costs is far more substantive and sustainable. It is a much more difficult and complex matter, however, to control spiraling medical costs.
3. **While PPPs in health infrastructure were in the past focused primarily** on the mechanics of financing, building, and operating facilities, the new metrics of success in healthcare PPPs will evolve into pragmatic measurements of health outcomes and institutional performance.

4. **In service delivery, PPPs stimulate broader discussions** on creating and sustaining locally based health systems. Public authorities typically consent to an initial overpayment to attract private-sector involvement, but subsequently, in a contractual second phase, allow competition and reduced government payments to improve quality and generate long-term savings.
5. **Local rather than national authorities** are increasingly developing PPPs, as local government is closer to local health needs. However, national governments are critical for setting the policy framework that enables and empowers local authorities.
6. **While technology was often absent** in earlier PPP infrastructure agreements,

it has now become central to a new generation of PPPs in which the technology manufacturers themselves are often risk partners.

7. **Most important of all,** perhaps, PPPs are overturning the notion that private healthcare is only for the affluent, and that the poor or even middle classes are condemned to feebly resourced public healthcare. Rather than exacerbating or creating new inequities in healthcare, experience now shows that PPPs can equalize the quality of healthcare for all segments of society.

For copies of the HRI study, complete with market sizing and comprehensive details, please see www.pwc.com/ppphealth in December.

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Continued from page 4

services. Reuters has described it as a “mammoth” venture.⁵ It is the largest healthcare project ever undertaken in Sweden, and the largest hospital in the world to be financed by a PPP.

Construction costs amount to 14.5 billion kronor (□1.5 billion), while the costs of the 25-year service contract, which will begin when the hospital opens in 2015 and can be extended for another 15 years in 2040, are currently calculated at roughly 6.5 billion to 7.5 billion kronor (□700 million to □800 million). This massive investment is being undertaken by Swedish Hospital Partners AB, a consortium co-owned by the Swedish construction firm Skanska and the British investment fund Innisfree. In the view of Professor Persson, it is an investment that will allow him and his colleagues to “concentrate on what [we] do best ... taking care of patients and doing research.”

New Karolinska Solna represents two mutually reinforcing goals. The specific objective is to serve the healthcare needs of Stockholm’s citizens, while the broader purpose is to integrate the hospital into a much wider network of medical and scientific research in Stockholm and Sweden as a whole.

The immediate plan is, of course, to modernize and significantly improve the healthcare resources of the greater Stockholm area: put simply, to create a model, state-of-the-art

medical facility. More important, the aim is to ensure that the hospital can remain a modern facility for many years, or even decades. That is why its administrators have taken the unconventional decision to free it from the usual pre-existing blueprint for clinical procedures. As Professor Persson, former chairman of the department of neurosurgery at Uppsala University and head of neurosurgery at the university’s hospital, explained to *Gridlines*:

“We are building a site that will be used as a hospital for at least 50 years ... and in no way can we decide now what its clinical operations will look like in five years, or 10 years, or 20 or 30 years. Instead, we are building a hospital that is very flexible, so that it can change.”

The point to this flexibility is to allow New Karolinska Solna not simply to adapt its physical space to its patients’ needs, but to improve its patients’ outcomes—and, it is hoped, their lives—because of its continuous integration of the latest medical research into ongoing clinical practice.

Professor Persson has described his ideal of patient care—and a founding principle of New Karolinska Solna—as “organizing care according to patients’ needs,” as opposed to subordinating patients to clinical structures or professional cultures. To illustrate how he and

⁵ “Skanska, Innisfree win mammoth hospital order,” <http://uk.reuters.com/article/idUKLDE6431Z420100504>.

his colleagues expect the hospital to function, he gives the example of a woman who arrives in the morning with a lump in her breast. Within eight hours of admission, she is given a diagnosis, all the related information she needs concerning her condition, the date of surgery, and contact with a social worker and other specialists.⁶

Such a genuinely patient-centered clinical practice would be difficult to achieve, however, without the hospital's second fundamental goal: to function as an advanced medical facility that links basic research and clinical research, and then applies this continual research to the enrichment and improvement of clinical practice. According to Anders Ekblom, AstraZeneca's executive vice president for development, making the hospital "purpose-built to facilitate interaction between research and clinical practice" offers an "opportunity to be world-leading."⁷

This dedicated and comprehensive fusion of patient care, research, and education (this will, after all, be a major European teaching hospital) is a concept that has even shaped the design principles of the architects, White arkitekter AB. "Healthcare, research and education must be so integrated" in New

Karolinska Solna "that they effectively support the development and dissemination of new knowledge for the care of seriously ill and injured patients," reads the first of the firm's six "project goals."⁸

The second project goal points to how humanely this research, and clinical practice generally, are to be applied to daily patient care. "The project," White's architects state, "must create attractive, caring environments with high architectural values, both within and adjacent to the hospital."⁹ The architectural plans for New Karolinska Solna are indeed impressive (see cover and accompanying illustrations), not only for the overall design's environmental beauty, but also for its environmental ambitions. It will be one of the first university hospitals in the world to be environmentally certified, aiming to achieve a minimum certification of LEED Gold.

⁶ See the brief but revealing interview that Professor Persson gave to Swedish journalist Staffan Dopping last year. The video is on the New Karolinska Solna Website at <http://www.nyakarolinskasolna.se/en/The-New-Hospital/Web-TV/The-Vision>.

⁷ See the interview with Anders Ekblom in *Presentation of the New Karolinska Solna University Hospital* at <http://www.nyakarolinskasolna.se/en/The-New-Hospital/Web-TV/Presentation-of-the-New-Karolinska-Solna-University-Hospital>.

⁸ "Unique process creating New Karolinska Solna," <http://en.white.se>.

⁹ "Unique process..."



The design of the hospital...reminds one more of a small, almost idyllic, college campus than of a medical facility.

What is particularly striking about the project is the extent to which nature—that is, a continually present natural world—has been integrated into the aesthetics of the buildings themselves. It is no exaggeration to say that the design of the hospital as it now stands reminds one more of a small, almost idyllic, college campus than of a medical facility. Being designed to "create attractive, caring environments," it can contribute to a healing atmosphere for the patients and a heartening work environment for the professional staff.

This design also reflects the research aspect of the overall vision behind New Karolinska Solna, as it will place the hospital within a new, and much more extensive and dynamic, scientific cluster—Stockholm Science City. The ambition for this hub of research centers and laboratories has been concisely stated by Peter Bramberg, head of life sciences of the Invest in Sweden Agency: "Stockholm as a region has decided to be one of the world-leading scientific clusters in 2025."¹⁰

In addition to the hospital, the major institutions constituting Stockholm Science City,¹¹ which will focus on research in the life sciences, are the Karolinska Institute, the Royal Institute

of Technology, Stockholm University, and Uppsala University. This year, these four institutions established "SciLifeLab," or the Science for Life Laboratory, a global center for genomics and medical research into genetics and proteomics, with branches in both the Solna municipality of Stockholm county and Uppsala.¹²

Another major element of Stockholm Science City, scheduled to be operational within two to three years of New Karolinska Solna's opening, will be a 40,000-square-meter development (approximately four city blocks) just 25 meters from the hospital that will house companies doing research in the life sciences. Clearly, both in the general design and the objectives of Stockholm Science City, New Karolinska Solna will be a major element of a larger and equally dedicated scientific community. It will also benefit greatly as a medical center committed to the most advanced level of patient care and treatment, able to draw on the research efforts of its companion organizations.

At this stage, Professor Persson reminds us, New Karolinska Solna remains a "model" about which very few conclusions can be drawn until it begins its work. Still, it is not difficult to see

in its rigorous planning, design, and development a new blueprint for the public provision of healthcare. In this blueprint, the public and private sectors continually collaborate to find new methods of providing the most effective healthcare at a rational and equitable cost to public budgets. Most important of all, through this collaboration the central focus of healthcare falls on the actual needs of each patient.

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¹⁰ See the interview in *Presentation of the New Karolinska Solna...* <http://www.nyakarolinskasolna.se/en/The-New-Hospital/Web-TV/Presentation-of-the-New-Karolinska-Solna-University-Hospital>.

¹¹ For a more detailed presentation of Stockholm Science City, see "Solna centre for world class life sciences" at <http://www.solna.se/turist1/world-class-life-science/>.

¹² For more information on SciLifeLab's mission and scientific research, see its Website at <http://www.scilifelab.se>.

The second goal that defines the hospital is its function as an advanced medical facility that...

...links basic research and clinical research

...and then applies this continual research to enrich and improve clinical practice.

Long supply lines and complex risks

Turn up the focus on the global food network

By David Acheson and Kristen Vieira Traynor

This past summer's widely reported recall of 550 million chicken eggs in the United States was the latest in a series of food safety incidents motivating governments around the world to rethink how best to keep contaminants, whether natural or man-made, out of the sprawling international food pipeline. Dangerous bacteria or chemicals have been discovered in products in every aisle of the modern, clean grocery store. Hamburger, dog food, peanut butter, toothpaste, nuts, dairy products, and even items specifically valued for their health benefits—like spinach, seafood and alfalfa sprouts—have made consumers sick, sometimes seriously.

US lawmakers are scrutinizing the food inspection and certification process. The US imports more food than does any other nation¹, so the rules being discussed this fall in Washington could have an impact on how food is made, tested and certified around the globe.

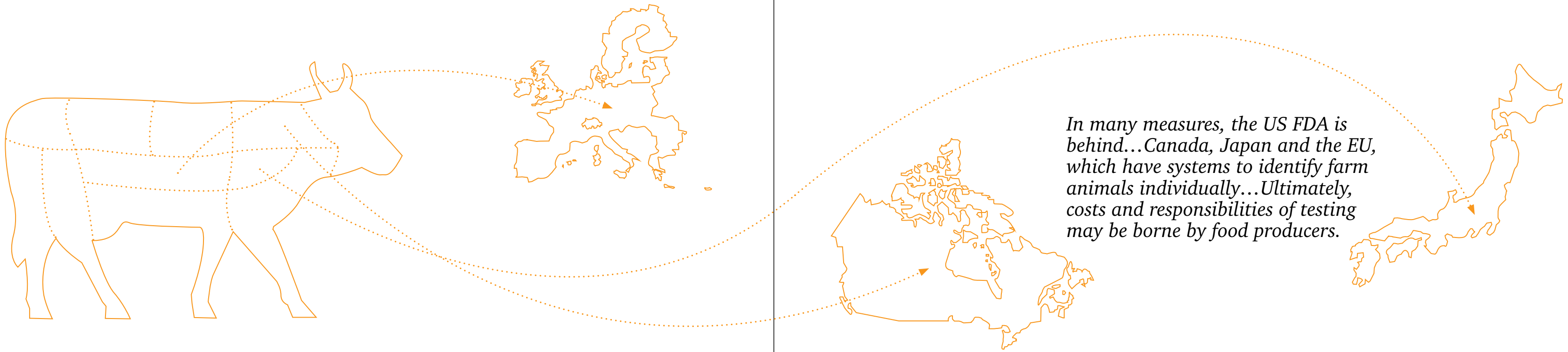
The legal and medical costs of a food recall are of course huge. But the long-term cost to a company's reputation and brand could prove terminal. One thing that may move more quickly around the world than foodstuffs is negative consumer opinion. A brand name goes a long way to assure consumers that a product meets high standards, but that asset can erode abruptly and disastrously because of one media link to unsafe food, whether justifiable or not.

Gauging the total damage caused by foodborne illness internationally, or even in one country, remains difficult. The World Health Organization² has been working for nearly a decade to figure out the global impact of

¹ World Trade Organization, World Trade Statistics, 2009, Section 2.1 Food, Table II-20, http://www.wto.org/english/res_e/statistics_e/its2009_e/its09_merch_trade_product_e.htm.

² World Health Organization, WHO Initiative to Estimate the Global Burden of Foodborne Diseases, 2008, http://www.who.int/food-safety/foodborne_disease/Summary_Doc.pdf.





In many measures, the US FDA is behind...Canada, Japan and the EU, which have systems to identify farm animals individually...Ultimately, costs and responsibilities of testing may be borne by food producers.

food-borne illnesses, including medical costs, lost work time, food recalls, and waste.

Regulators are starting to treat the food supply like the water supply—as public infrastructure that the government has the responsibility to regulate, test and protect as a matter of public health. Food producers and importers and exporters around the world must keep a keen eye on US regulations as they develop over the next months and years. All parties have a stake in installing systems to assess and control risks, physically inspect food, and, if necessary, track and recall dangerous products.

Food regulations are slow to develop and lag behind the rapid evolution of the international food pipeline and the many bacterial and chemical hazards that threaten it. Food producers today must be alert for contaminants that were virtually unheard-of decades ago. Biologists first found H5N1 in 1959, but the form of this bird flu that is deadly to humans did not develop for another 38 years. It is only in the last 50 years that salmonella has gained notoriety for appearing inside eggs and not just on the surface. E. coli has existed for ages, but E. coli O157:H7, the rare form that can be fatal to humans when it clings to meats and vegetables, was first discovered in 1982. Whether the problem is mercury creeping into seafood or a supplier using a risky filler like melamine, threats abound.

The speed and capacity of the international food pipeline have been growing just as quickly as the list of potential hazards. Modern industrial agriculture now feeds a human population of nearly 7 billion, more than double its size just 50 years ago.

By many measures, the US food regulatory system lags behind its counterparts overseas.³ The EU, which as a whole imports even more food than the US, has standards that are more strict. It oversees food from the farmer to the table and can order mandatory recalls. Canada, Japan and the EU can identify farm animals individually, and compared with the US, Japan physically tests a much greater overall share of its food imports.⁴

Under the pending legislation, the US may exceed the standards of Europe and Japan by requiring companies or countries to precertify their food safety systems with the US Food and Drug Administration (FDA). Given the impossibility of testing every food shipment for every potential contaminant, the US may move to a broader standard. Instead of inspecting each shipment of, for example, cheese or cookies, the FDA could require all companies to produce a food safety plan that spells out how they will find and control

³ US Census Bureau, International Data Base. <http://www.census.gov/ipc/www/idb/worldpop.php>.

⁴ Government Accountability Office, "Food Safety: Selected Countries' Systems Can Offer Insights into Ensuring Food Safety and Responding to Foodborne Illness," June, 2008. <http://www.gao.gov/products/GAO-08-794>.

contaminants in general. That's a big step forward from the current requirement of simple registration, which does little more than provide a name and address.

Since approximately 250,000 companies are registered with the US FDA as suppliers of food to Americans, it is not practical for the US government to apply universally the same level of inspection it uses for meat, seafood, and other high-risk edibles. The FDA is planning to step up inspections, but in order to provide any meaningful scrutiny, most industry analysts say, the agency will need to deputize third-party auditors and state or national governments. The US currently imports food from about 150 countries (but meat from only about 30) and may decide to allow some of those nations to certify their own producers. The result will be more of the cost and responsibility of food testing being borne by food producers.

Such a certification system would reflect the underpinnings of an international standard, which the US has not adopted. The non-governmental International Organization for Standards specifications, ISO 22000, are part of the Hazard Analysis and Critical Control Point (HACCP) system. The process was first devised to manage risk for munitions in World War II and has spread to other industries where the danger of a faulty product could prove catastrophic. Using the HACCP approach, a manufacturer may opt to introduce a heat

step in the food manufacturing process in order to kill any bacteria and thus control food safety risks.

Details of the new regulations are a work in progress, and most likely several years from implementation. The US may take up a bill with wide bipartisan support that will offer the first concrete steps in food reform by giving new rule-making powers to the FDA. Currently the US Department of Agriculture (USDA) oversees certain high-risk products it subjects to close inspections—meat, poultry and eggs. The FDA monitors all other food products, but typically only with infrequent inspections of incoming food.⁵ The new regime will most likely blend these techniques, although there is so far no movement to consolidate the 15 federal agencies that oversee food, as other countries have recently done.

The dominant questions for global food producers over the next several years will be:

- How much of the food supply will the FDA inspect?
- Who will do the inspections: the FDA, foreign or state governments, or third-party auditors?
- When will the FDA require a physical inspection, and when will a food safety plan suffice?
- Who will pay for the new measures?

Ultimately, the key issue revolves around whether US rules will become de facto international regulatory standards. Around the world governments have been aligning their food regulations for decades, but there remains a confusing array of food regulatory bodies, and no clear leader. The result for food manufacturers is a frustrating hodgepodge of standards and rules.

Since the 1950s several world bodies have, unbeknown to most people, established food standards and monitoring systems. The International Food Safety Authorities Network (INFOSAN) from Geneva is a network of 177 national and regional food regulators that shares alerts on food risks. Two other groups set voluntary, minimum standards that are sometimes subject to protest, controversy, and conspiracy theories: the UN's Codex Alimentarius Commission and the ISO.

Both rich and poor countries depend on this international food pipeline not only for food delivery, but also for keeping it free of contaminants. Famine today occurs not because the planet lacks sufficient food. Instead, people often go hungry because corruption or administrative failures have disrupted the international food pipeline. In places like North Korea and

⁵ William H. Sperber, Ph.D., and Richard F. Stier, "Special Feature: Happy 50th Birthday to HACCP: Retrospective and Prospective," Food Safety News, December 2009/ January 2010. <http://www.foodsafetymagazine.com/article.asp?id=3481&sub=sub1>

Regulators are starting to treat the food supply like the water supply—as public infrastructure that the government has the responsibility to regulate, test, and protect.

Zimbabwe,⁶ corrupt governments divert food aid. In unstable regions, war and crises disrupt the flow. Russia, Argentina and India, for instance, were forced by natural disasters to cut off the global food pipeline and ban or severely limit the export of various grains.

The pipeline doesn't flow just one way.

No country is totally self-sufficient in its food supply. Even the least-developed countries depend on imports, the USDA reports; as a group, such countries receive 18 percent of their grain from overseas, up from 7 percent in 1970. In six countries (Eritrea, Liberia, Haiti, Georgia, Burundi, and Zimbabwe) people depend on imported grain for more than 40 percent of their diets.⁷

If developing countries cannot manage to export products that meet international standards, they will be unable to pay for the food shipments on which they depend. Consequences can be severe. In the last several years the world has experienced a series of food riots after supplies were delivered to a developing region, but at prices too high for the average family to afford.

In some cases, meeting international standards is a matter of small improvements. For example, farmers in poorer countries may

not even realize that Western consumers will not buy bruised or dirty fruit, according to a recent radio report.⁸ Mango farmers in Haiti, for example, cannot sell a huge portion of their crops because they store mangoes unwashed in piles, often in the sun. Experts believe the crop could grow tenfold if farmers learned to process mangoes to the world's standards. Karen Christiansen, global produce coordinator at Whole Foods Markets, told aid group Haiti Innovation that the grocery store chain would like to buy more Haitian mangoes: "There's a lack of infrastructure in Haiti that makes purchasing there quite challenging," she said. Private industry and the Inter-American Development Bank have waged an extensive educational campaign to teach small farmers to wash fruit, gently pack it in plastic milk crates, and sell it to exporters.

In India, McCormick spice started requiring farmers to sew small tags to their sacks of peppers, indicating their farm of origin and date of harvest. The company made it a

6 Thompson Reuters Foundation, AlertNet, "Zimbabwe Crisis: Agricultural Collapse Ruins Economy," July 27, 2010. http://www.alertnet.org/db/crisisprofiles/ZW_CRI.htm?v=in_detail

7 Stacy Rosen and Shahla Shapouri, USDA, "Rising Food Prices Intensify Food Insecurity in Developing Countries," Amber Waves, February, 2008. <http://www.ers.usda.gov/AmberWaves/February08/Features/RisingFood.htm>.

8 "Island Time," This American Life, May 21, 2010, <http://www.thisamericanlife.org/radio-archives/episode/408/island-time>.

condition of doing business in order to meet the traceability demands of customers worldwide. No regulations were needed, but the promise of more business opportunity spurred the change.

The most difficult hurdle for businesses to overcome in the US system may be its "import alerts."

These "red list" alerts mean that a food shipment is detained on sight and cannot be delivered until it is proved to be free of a contaminant. For example, US inspectors discovered contaminants on Chinese farmed seafood in 2006.⁹ The FDA first put a few companies on import alert, but the chemicals kept appearing. Further tests showed that the problem—fish farmers using carcinogenic chemicals and antibiotics—was not confined to a few companies or to China. The FDA put an import alert on all Chinese farm-raised catfish, basa (a type of catfish), shrimp, dace (similar to carp) and eels as well as the aquaculture of many firms around the globe, especially in Taiwan and Vietnam. Alerts typically only lift when a company demonstrates that they have addressed the problem and have a series of imports that have been tested and found to be negative for the targeted contaminant. Without going to those lengths, products

will only be allowed into the US if they have been tested and the test results vetted and approved by FDA.

In another example of industry consequences from a long-term import alert, the FDA has been scrutinizing rice products from Asia since 1989,¹⁰ when it found animal droppings in many shipments. In the decades since, the agency has kept a close watch on which products were still turning up with contaminants. As a result, the agency still inspects specific products from specific countries, such as rice sticks and rice vermicelli from China and rice flour from Hong Kong. Meanwhile, dozens of companies have navigated the process of getting certified for a "green list" of food producers that are exempt from the ban. The case illustrates that even the most scrupulous food producers can become mired in a food alert just by association. Companies will need to aggressively manage the process of moving off the red list and onto the green one.

Some companies or countries may find the hurdles too high and be forced to give up on the American market. The strongest companies may use their safety standards as a selling point. With a little preparation and

planning, most producers will be able to meet the new regulations. The demand from the international food pipeline is a powerful force. American consumers enjoy buying food at low prices, and out of season, from around the world. Many developing countries depend on the US market. No matter how the rules take shape, American importers and manufacturers are looking at increased scrutiny and new requirements to evaluate the potential risks of their foods, conduct tests for contamination, and formulate plans for keeping food safe.

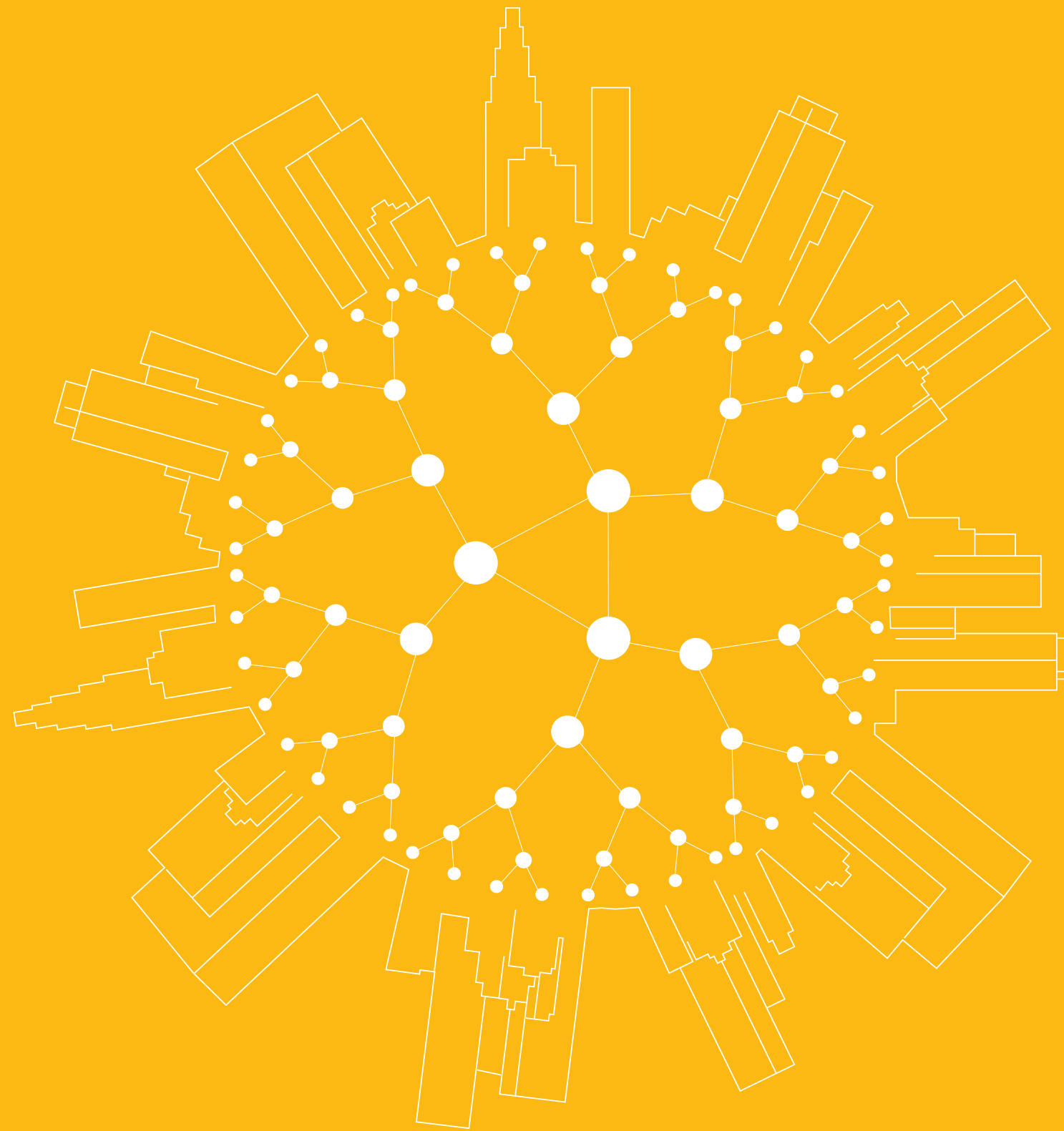
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9 FDA, "CFR—Questions and Answers on FDA's Import Alert on Farm-Raised Seafood From China," <http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/Seafood/ucm119105.htm>. FDA Import Alert 16-124, "Detention Without Physical Examination Of Aquaculture Seafood Products Due to Unapproved Drugs," last published September 15, 2010. http://www.accessdata.fda.gov/cms_ia/importalert_27.html.

10 FDA Import Alert 02-02, "Detention Without Physical Examination of Processed Rice-Based Products Due to Filth," last published August 2, 2010. http://www.accessdata.fda.gov/cms_ia/importalert_2.html.





“We have to start thinking about the city as a cell—a stem cell, with tremendous potential. But also one that you can kill by not giving it energy, by not giving it relationships.” —LEIF EDVINSSON

“From cities of hardware to cities of mindware” **Intellectual capital will fuel the economies of the future**

By Hazem Galal

Education is widely accepted as a pillar of 21st-century infrastructure: without adequate, continually advancing education, offered in egalitarian measure, neither mature nor emerging economies can prosper in the globalized world. In *Cities of Opportunity 2010*, Mayor Gilberto Kassab summed this up first-hand from his perspective in São Paulo:

“Professional qualification ... is the most difficult knot that Brazil has to untangle to consolidate its position as an economic power. Education is the key to enhancing the skills of future workers from São Paulo and the rest of Brazil. In São Paulo we are addressing this challenge in partnership with the state government and with private initiative...There are many projects that must be carried out in many sectors in a short time, and this requires well-educated professionals... Throughout the 20th century, São Paulo

carried out an extraordinary effort to train its workforce and the result was a prodigious growth in industry, commerce, services and technology. We need to make an even greater effort now.

The challenge transcends education alone. A modern city or nation, any community, advances on the strength of its holistic intellectual capital—the fully developed, functional, professional, and social intelligence of its people—together with strong quality of life. The economic downturn shined a light on this by giving governments and businesses pause to reassess directions.

This coming March, *Cities of Opportunity*, the fourth annual edition of a study cosponsored by PwC and the Partnership for New York City, focuses on the intellectual capital of the 26 cities we are analyzing—looking not just at

education but also at the entire intellectual infrastructure of a city—from its ability to attract skilled persons and develop their skills to the cultural institutions and opportunities available to citizens.

Here Leif Edvinsson, a leader for 20 years in recognizing the centrality of intellectual capital and working with cities and companies to shape their future, frames the topic for *Cities of Opportunity 2011* in a wide-ranging conversation (excerpted for *Gridlines* in the next pages and available in entirety at www.pwc.com/gridlines).

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A few words with Leif Edvinsson...

...on the “brain or neural planning” through which cities can prepare for a knowledge-centered future—an economy where value is created by intangibles and networks of minds rather than machines. Edvinsson pioneered the understanding of the concept of intellectual capital in modern companies and communities as a professor at Lund University in Sweden and the Hong Kong Polytechnic University as well as the first Chief Knowledge Officer at the insurer Skandia. Here, he discusses intellectual capital in various contexts as well as the successes and challenges of particular cities building intellectual capital for the future.

Do you see the physical quality of life in a city related to the quality of intellectual capital?

Absolutely. That’s why this might be the way we progress: from cities of hardware to cities of mindware. But that is the quality dimension. This year’s *Monocle* rankings of the most livable cities in the world were Munich at number one; number two, Copenhagen; and number three, Zurich. All small cities with easy access. You can bike around, and it’s easy to build relationships in such cities.

In last year’s Cities of Opportunity, some of the top, most livable cities were Stockholm, Toronto, Sydney, Chicago, and Frankfurt. Will the model of the functional city of the future, which smart young people will want to live in and help build, be more like Copenhagen, Stockholm, or Toronto?

Yes, if there is a good airport.

Why is that?

Because you have a growing migration of brains in correlation to network relationships. Some studies show, for example, that it’s easier to get into and out of European cities than Asian cities. So, good airports close by are becoming essential. MIT found that a

city needs a good university and a good airport.

Is this for people moving into and out of different companies and universities, or does it include more general migration?

It might be that, down the road, we will have more nomads. People who, for example, work at CERN in Geneva for, say, three years. They might bring their families or, if not, commute from where they live. Which means the commuting possibilities become very important, and temporary migration becomes a kind of norm.

How do you envision the intelligent city of the future? What will its government, thinkers, business and social leaders be doing in areas like intellectual capital to assure continuing socioeconomic well-being for everyone?

There are at least three dimensions to this question. The long-term, visionary perspective is that the future city, 25 years down the road, will be like a brain, where urban planning becomes brain or neural planning. And we will be looking at how to nourish the synapses between brains by creating special mind zones instead of shopping centers. So, since the shopping center will be replaced by mind zones, the second

dimension will require upgrading the skill of urban planners to the levels of neuroscience.

The third dimension is a focus on drawing the maps of urban value creation, to determine where value creation takes place in cities. It used to be the harbor. It used to be the industrial areas. It used to be the offices. In the city of the future, it will probably be the networks, which will not be captured in traditional statistics. So you need to develop the social and city intelligence to create maps to see where value creation is taking place.

How would you describe these mind zones? What are they?

A mind zone is a kind of open space, an arena or Ba, as [Professor] Nonoka calls it, where the traditional square is replaced with a kind of quality-of-life meeting space. The closest illustration we have today is the knowledge café. But in Toronto, as well as here in Scandinavia, because of the climate during the winter, we need a kind of built-in meeting space, but still open. A kind of open innovation system, where people go in—you don’t know who you’ll meet, but you’ll probably enjoy being there. It’s like going to the Starbucks of tomorrow.

We know today, for example, from a discovery made during the nineties in Italy by Professor Giacomo Rizzolatti, that when you sit next to a person in a Starbucks, your neurons jump from your brain to the other one. This is called “mirroring neurons.” It used to be called a “meeting of minds.” But now you can actually measure this with technical devices, which means you can visualize it.

Historically, when societies and governments thought about infrastructure, it was rails and roads, energy, waste, water. Today, education and healthcare seem to demand equal attention. Are they as important, or less so?

What you see is a shift in investment flows. Federal Reserve statistics show that investment in intangibles in the US has surpassed investment in tangibles for the last 25 to 30 years. But no one knows, really, how to leverage this. Therefore, we’re still guiding and navigating the economy based on the tangibles, not the intangibles. That’s why we had the financial crisis, actually.

That’s why we have to start thinking about the city as a cell—a stem cell, with tremendous potential. But also one that you can kill by not giving it energy, by not giving it relationships. That’s why relational capital is so important for the nourishment and growth of intellectual capital.

And what specifically, tangibly, is relational capital?

It’s endless. It’s a multiplier function. Paul Romer called it the law of increasing rate of return. But traditional investment calculations are based on the opposite. The law of diminishing marginal utility divides everything into ever smaller pieces, which is why you amortize cars and houses and computers. Actually, though, the value of a computer increases if you load it with software.

What are the critical ingredients—the particular collaborations, capacities, resource priorities—that a city should synchronize and focus on in order to generate not only greater intellectual capital, but real socioeconomic progress?

It starts with relational capital, and moves from relational capital to cultural capital—like soil for growing a young tree. And that leads to the notion of social capital as a kind of collective value creation, which will probably lead to traditional currencies such as the dollar being replaced by network capital, like the old bonds of a guild society. If you’ve noticed, China has proposed replacing the dollar as the chief global reserve currency with SDRs, the IMF’s Special Drawing Rights created over 40 years ago. But SDRs are bonds of mutual trust, which is relational capital.

What recommendations would you give to city governments and city policymakers, or to businesses or universities operating in cities?

Three steps. Number one is, start asking some good questions about the social intelligence of a city. Observe the signals. The second is, draw a new type of urban map, one based not on houses and streets and flow of water, but flow of knowledge—which will probably lead to urban planning that focuses on the in-between spaces.

What’s an in-between space?

What’s in between buildings. What’s in between floors. What’s in between people. It’s like an old inverted photo, sort of a negative, where you see the non-tangible dimension.

Finally, the third step is to build and visualize the city as a mind or a brain. Consequently, you need to have neuroscientists come and work in urban-planning units.

Has that occurred anywhere?

A little bit, in a city called Solna, here in Sweden, where PwC ran a sustainable city development project two years ago. And the discussions were very much about developing a new type of city plan for the in-between spaces. But the most tangible example of what I’m talking about so far is the city of Helsingborg, which

has inaugurated a project called H+, with “H” for Helsingborg. One of the three architectural firms finally chosen by the city to work on the project, White arkitekter AB, in whose team I participated, actually calls its proposal “Mindzone”—which is about developing an urban mind zone, as I described it above, instead of a shopping center.

It seems that the rise of intellectual capital as a key engine in economic growth, globalization, urbanization, and the tremendous speed and universal connectedness we have, are generating mental strains and confusion over conflicting messages: quality of life on one hand, and the need to succeed on the other. Do you believe we’re working too hard today, and that mass burnout is a threat to creative thinking?

It definitely is, actually. The Karolinska Institute has a very good stress-research team, which has shown that if you get severe stress illness, you develop genetic faults that will be inherited by the next generation. So there are very severe consequences when you do not create the right context for intellectuals, for brain workers.

That being established, how do we make it better? How do we strike a balance in work life? In life?

It is related to the fact that we are moving from an industrial economy—which we left, actually,

The long-term, visionary perspective is that the future city will be like a brain, where urban planning becomes brain or neural planning. And we will be looking at how to nourish the synapses between brains by creating special mind zones instead of shopping centers.

Shenzhen's experience confirms that you have to prototype [a knowledge zone or innovation zone or urban-enterprise zone] because that reduces the risk level for urban planners: you run a little prototype, which might fail or be successful, and then gradually scale up the successful part. Shenzhen had around 30,000 people in 1979 and has more than nine million today, as well as a number of major universities.

30 years ago—into a knowledge economy. We don't have a taxonomy for it yet, but all the statistics show that, while we have left the industrial economy, our organizational system is still modeled along the lines of industrial society. Our accounting system, for example, is still based on the old Catholic accounting system born in 1494.

Yet we're living in times of continual change.

Three hundred years ago, the most important jobs were actually those of the navigators. Today, we have replaced them with financial quants—which is not a good thing because it's actually reducing the collective wealth. Therefore, we need to develop a whole new job description and career for the intellectual economy.

Looking at cities in different parts of the world, what do you think a mature city in the US or the EU should be doing? Or is that too obvious a question?

It's probably the most complex one. One of the most appealing cases I know of is Shenzhen, which is, as you know, the formerly little city north of Hong Kong that was selected by Deng Xiaoping in 1979 as the prototype for transforming China from communist to capitalist. Its experience confirms that you have to prototype because that reduces the risk level for urban planners: you run

a little prototype, which might fail or be successful, and then gradually scale up the successful part. Shenzhen had around 30,000 people in 1979 and has more than nine million today, as well as a number of major universities. Now it's being integrated with Hong Kong into an innovation zone. So the recommendation is probably to prototype a knowledge zone or innovation zone or urban-enterprise zone.

What do you think older, industrial cities such as Detroit might do to revitalize themselves? In Sweden, Malmö and Luleå, for instance, are both doing fairly well after difficult times. Why do you think that is?

The heart of it is to have the courage for renewal. Gothenburg has been very good. They have renewed their harbor. Malmö has also been fairly good in renewing its harbor, but it has lost social capital because it didn't balance its immigration. It just opened its doors to a lot of people, without seeking an immigration of brain power.

What you need is urban planning that moves from tangibles to intangibles. In Japan, they started to do that on a national level 25 to 30 years ago, when they began working on what is now called softnomics, or soft economics. They formed a research center, the Softnomics Center, with the big players, the big financial

institutions, and the big industrial companies, as they were all quarreling with each other about the future. But a unanimous outlook developed by mapping the future potential of Japan.

The last family of cities we should mention comprises the teeming emerging cities in Asia, Africa, and Latin America. It seems as if there's this tremendous tension between the hope and the challenge. What would you do to build intellectual capital in Mumbai, Johannesburg, and other cities in the developing world?

Brain import, localize structural capital, and commercialize it into markets that are both near and far away. For example, today, China is buying a lot of land in Africa as well as leasing land in Mexico for food production. That will have an impact on the trade of food between Africa and China, and will also upgrade the quality of food production in Africa.

In "Economic Possibilities for our Grandchildren," written in 1930, Keynes envisioned that, 100 years later, the economic challenges of sustaining life would be solved and our new challenge would be to become creative, to use our time constructively for ourselves and others. Will we ever graduate to that?

To some extent, I think the intellectual-capital nations are there already. If you take ordinary

Swedes, they work perhaps 30 years of their lifetime—which is about 85 years. In other words, they already spend close to 65 percent of their lifetime on something else other than going to a job. So, perhaps, we are witnessing this creative, quality-of-life existence already. ■

For the full interview with Leif Edvinsson see www.pwc.com/gridlines. In March 2011, see the new Cities of Opportunity at www.pwc.com/cities complete with this and other interviews as well as final results and analysis for this year's comparison of 26 cities worldwide.

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