IT@ NETWORKING COMMUNICATIONS

Volume 2 / Issue 1

ISSN 1784-0716 / October-December 2008

> Healthcare **Technology:**
> **The Quality Imperative**

> Six Sigma
> The Investment **Dilemma**

> **Special Focus:** Wireless Technology in the ICU
> **Profile:** European Software Institute

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Healthcare IT Management is distributed within the following publications

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Healthcare IT Management
Official Journal of the European Association of Healthcare IT Managers
28, rue de la Loi
B-1040 Brussels, Belgium
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IT@Networking Communications
is a supplement to *(E)Hospital*
and Healthcare IT Management

Production & Printing
Nymoda

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Letter from the Editor

Dear Reader,

In a modern business context, one of the most distinctive features of information technology is the fact that it can add efficiency and value across an entire swathe of processes and specific operational disciplines.

Based on these trends, *(E)Hospital* and Healthcare IT Management have decided to resume their IT@Networking Communications supplement, which appeared for the first time in 2005. This initiative is made possible thanks by the financial support provided by Phillips *(The Netherlands)*.

For this issue, we lined up a variety of topics, which all contribute to a better understanding of healthcare IT trends and endeavours. Our Management Section has a focus on an ever-present challenge in healthcare, namely quality. We provide an expert's overview on the meaning of Six Sigma in the context of healthcare and healthcare IT. An analysis of change management with a focus on the implementation of Six Sigma directly follows. In an effort to address the challenges posed specifically by the hospitals, where every department has specialised needs and working practices, IT@Networking Communications presents a feature on the Capability Maturity Model (CMM) and its advantages.

Trying to answer the concerns of both hospital managers and CIOs about the perceived 'investment dilemma', our next section presents several alternatives for hospitals when public funding is no longer sufficient to fund necessary investment. Making heavy financial decisions can be tough; Tom Jones advises on whether a cost-benefit (CBA) strategy, a return on investment (ROI) strategy or both should be applied.

There has always been an intuitive association between the words 'medicine' and 'emergency'. Modern technology, especially at the cutting edge of IT and communications, has brought wholly new meanings to the ability of the medical profession to manage and respond to emergencies. That is the reason why we have decided to publish an article on how Wireless technology makes ICUs more mobile and introduces new possibilities for enhanced ICU management and medical care.

Finally, in a modern hospital where errors in increasingly complex IT systems can have grave consequences, the advantage of Quality Technology is self-evident. So too is the drive to align software management activities with business goals – especially as hospitals across Europe face pressures to control costs. This issue profiles the European Software Institute, a non-profit technology foundation that not only contributes to the development of the Information Society and increases industry competitiveness but also encourage users to adopt new ICT technologies.

We hope that you will enjoy this new edition of IT@Networking Communications as much as the previous ones and we welcome suggestions and contributions to make this publication a real support to hospital managers and CIOs in their decision-making process.

Yours Faithfully,

Christian Marolt (CM)
Editor-in-Chief Healthcare IT Management

Follow Me – I'm right behind you on this Six Sigma thing...

Healthcare and **Six Sigma**

William LaFollette currently serves on the Board of Directors of the American Society for Quality (ASQ).

Six Sigma can reduce defects in services to unprecedented levels because of its strong emphasis on statistical analysis and measurement in design, manufacturing, and the entire area of patient-oriented activities. It is obvious applying Six Sigma has impacts to how well a business performs, and, in the healthcare area, it has been proved that patients reap benefits from focusing on operational efficiency.

Defining Six Sigma

What exactly is Six Sigma? Put simply, it is a data-driven method for achieving near-perfect quality. What makes Six Sigma different from other quality efforts? It is that the focus is to follow a structured process for defining, measuring, and controlling an opportunity for improvement.

More specifically, it is a disciplined effort that closely examines a company's repetitive processes for product designs, production, suppliers, services, and organisations. Six Sigma is a statistical method of translating a patient's needs into separate tasks and defining the optimum requirement for each depending on how all of the tasks interact. Based on what is revealed, the steps that follow can have a powerful effect on the quality of organisational health, the performance of patient services, and the professional development of employees.

Six Sigma and Healthcare

What does Six Sigma mean to healthcare professionals?

Sadly, in many organisations – not much. There is a misunderstanding of how to apply Six Sigma methodologies. Common responses when a healthcare practitioner hears Six Sigma – "Oh great, another fad. I don't have time for this, I have to see patients. I cannot change. My patients are sicker. We do not have repetitive processes. Every person is different." Sound familiar yet? Six Sigma methodologies are not taking the focus off of the patient and only looking at cost cutting. The methodologies are also not taking away clinical quality and looking for short cuts or 'cookie cutter' medicine.

Why do we need it in healthcare?

There are a number of key elements in achieving Six Sigma:

- First, we must genuinely focus on the patient and identify their key to quality requirements.
- We must ensure that our processes are designed and managed to meet these key to quality requirements, and that we have appropriate measurement in place to understand how well we are meeting the patient requirements and how well the patient feels we are meeting the requirements.
- We need to involve our people, make sure they are effectively equipped so that they are able – and feel able – to challenge their processes and improve the way they work.
- And we need to undertake that improvement using a systematic problem solving and process improvement approach.

We know why we need it, but how do we do this Six Sigma thing?

Practical Tips on Implementation

The most critical step in implementing a successful Six Sigma initiative is to have senior management support. This has to be driven from the top. If the ones determining the future and direction of the organisation are not supporting an initiative, it will not be successful. I say this bluntly and without opinion; it is fact. All too often organisations want to bring Six Sigma into their operations without leadership support and fail miserably. This not only is extremely costly financially, but it is also costly in employee acceptance when another 'program' is thrust at them.

When management has determined Six Sigma is the right approach for the organisation it will take some time and research to ensure the right people are aligned to the right processes. This often requires assistance from someone who has significant experience applying Six Sigma methodology.

This is not a common occurrence in healthcare. There are many healthcare professionals who have made the transition to operational quality with great success. However, in many cases healthcare systems just do not have the resources or ability to stay within the organisation and must look to outside help, at least when building the foundation for Six Sigma. There is a healthcare system in the Midwest (United States) that created a department focused on operational excellence staffed completely with engineers from outside healthcare. The approach was not focusing on clinical but operational improvements. Finding these experts often requires a non-traditional method for recruitment. The American Society for Quality (ASQ) has a job posting board that is a valuable tool for finding quality professionals who can serve in healthcare.

Six Sigma Opportunities

• Flaws in complex interactions among several individuals:

Complex interaction can involve multiple hand-offs between provider and staff and between departments. For example, orthopaedics is sending a patient to x-ray, the patient says he is here for an x-ray on a shoulder and ends up getting an x-ray of a foot. Extreme case, but you get the point. If we lacked a documented process step and did not have some type of process control, the results could be catastrophic. Any time there is a change in process or direction a process control point must be established to ensure consistency of care and direction.

• Problems at the interface of people with sophisticated technologies, products, and organisational systems:

When there are occasions for individuals to interface with new and ever-changing technologies, the opportunity for errors is vast. This is where our subject matter experts, whether Six Sigma or IT professionals, face their greatest challenge. Getting healthcare professionals to utilize new technology is an almost impossible task. The first hurdle we must face is defining the technology, and then we need to explain how that technology will benefit the organisation. Getting healthcare practitioners out of the "that's the way we have always done it" mind set is never easy, but with the right focus and methods the new technologies with proper control can have a significant impact. The case study that follows is one example of how technology improvements and following a Six Sigma path of define, measure, analyse, improve, and control provided one organisation with major improvements to the overall operational health of the organisation.

Opportunity Identified

The healthcare system identified an opportunity to be more proactive in serving their patients by reducing the amount of paper charts used within the system. The basic flow of getting a provider the information needed to consult with a patient involved a courier pulling paper charts and delivering them to a provider's department.
This can require the transfer of thousands of records across many floors within a 150,000-square-foot facility. It also causes a one-day delay in the process. After delivery, medical staff was required to sort through information and 'prep' for the next day's patients. More delay. When the patient arrives for his or her appointment, the provider reviews the paperwork (delay) and begins treatment. They then have to send handwritten notes to be transcribed. Yet another delay in the process of treating patients. Transcribed notes are then added to the patient's record. Delay.

Opportunity Defined

Determine a method to eliminate paper records needed and eliminate need of a courier to deliver records by hand.

Opportunity Measured and Analysed

The costs associated with the delay in process, manual delivery of records, transcription, transcription errors from hand written notes, collection of records, as well as paper and printing costs, were all calculated. The actual financials are withheld to protect the privacy of the system. However, the cost avoidance and savings were sizable.

Improvements

The system determined electronic medical records loaded, stored, and accessed through tablet PC technology were the most direct and valuable solution. Working with a clinical quality team, business quality team, informatics, and information technology, the type of information along with how it should be presented, how it will be captured from a provider, and how it would be reported was defined. Once the solution was implemented not only were all objectives for the project met, but some unexpected improvements came out. Specifically, the satisfaction of patients showed a marked improvement. This result was attributed to patient satisfaction surveys stating patients were happier to see doctors more focused and spending less time having to seek information from previous visits.
The overall operational impact to the system was considered a major success and has been used as a best practice for implementing electronic medical record technology.

Control

Process controls are in place to review the technology solution and are monitored and reviewed on a continuous basis.
The healthcare industry can benefit greatly from Six Sigma, a disciplined approach to evaluate repetitive process, and the technology solutions that often accompany such improvements.

Managing Change in Healthcare

The Senior Leader's Nondelegable Role

Chip Caldwell is president of Chip Caldwell & Associates, and is the Northern Florida Regent of the American College of Healthcare Executives.

As a consultant and coach to senior leader teams, Black Belts, and physician leaders who are learning to use improvement approaches like lean and Six Sigma in healthcare, Chip Caldwell also takes on the role of translator. "Any quality system involves a lot of jargon," he says, "so the first thing we do is read a three-page glossary of terms."

Caldwell, faculty member and instructor for the American Society for Quality (ASQ) and coauthor of Lean-Six Sigma for Healthcare, finds that translating a lean and Six Sigma vocabulary into a language healthcare workers understand helps establish a foundation for successful change. Once workers see that lean and Six Sigma concepts already exist in their own world, simply under different names, implementation becomes easier.

For instance, introducing lean effectively is often a matter of discussing throughput—a concept hospital workers know well, as accreditation standards require documentation of measures for addressing throughout and patient flow. With Six Sigma, speaking in conventional healthcare terms of "errors" or "bottlenecks" achieves better results than "defects per million opportunities."

Although overcoming communication boundaries is crucial when introducing any change, Caldwell points out that using terminology to establish common ground should not give the impression that a healthcare lean-Six Sigma initiative is like any other initiative in any other industry. Implementation leaders must understand what makes healthcare different.

How Is Healthcare Different?

According to Caldwell, the most important difference between healthcare and non-healthcare implementations is the role the senior leader plays. The active engagement of leadership usually enhances any Six Sigma implementation, but healthcare senior leaders must accept day-to-day ownership for two reasons in particular:

1. The role of physicians must be integrated for a healthcare application to be successful, and senior leaders are the integrators of physician processes.
2. When deployed below the senior leader level, Six Sigma projects have a tendency to become tactical, proceeding project by project without working toward strategic objectives.

Ultimately, Caldwell maintains, to ensure that an implementation avoids a tactical focus and achieves true organizational change, leaders must treat deploying lean-Six Sigma as a "nondelegable" role.

The Three-Year Magic Moment Approach to Projects

Tactical approaches to selecting and scoping projects focus on solving specific problems. Teams identify a problem and then launch a project to uncover causes and implement solutions. Caldwell, however, teaches an approach that places individual projects in a larger context of systemic change. Long-term targets, which he calls "three-year Magic Moments," as opposed to problems, serve as the reasons for conducting projects.

He outlines three questions to consider in order to begin using the three-year Magic Moment approach:

- Three years from now, what results would you like to see? Identify a measurable goal, establishing a target metric—25% improvement in emergency department length-of-stay, for example.
- Which senior leader owns this Magic Moment goal? Find a senior leader who will manage the project work that will realize the goal.
- How many projects will it take to reach the goal? Consider not only the core process or department associated directly with the goal, but other related processes as well. Are hiring and staffing solutions needed? Will new or existing technologies need to be incorporated or implemented?

Example: Approximately 20% of a hospital's discharged patients go home by 2:00 pm. Understanding that the time of day discharged patients leave has enormous impact on overall throughput, the hospital wishes to focus an improvement effort on "time of day."

The Tactical approach:

- The hospital launches a project to identify and implement a process improvement.

- The hospital reviews project results to determine whether improvement occurred or another project is needed.

The Magic Moment approach:

- The hospital identifies a long-term target. The "Magic Moment" will be reached when 80% of patients leave at 2 pm.
- The hospital assigns a senior leader to own the target.
- The senior leader determines a number of projects throughout the organization that will help reach the goal over the next one to three years.

The first project launched as part of the tactical approach may identify an improvement that brings results. The risk, however, is that the solution will not be systemic. "A tactical approach attacks subprocesses, not the system," says Caldwell. "This approach to finding solutions is like throwing wet noodles at a wall to see which ones stick."

Integrating Projects and Processes

An advantage of the Magic Moment approach is that it emphasizes the interrelationships of different functions within an organization. A Magic Moment itself focuses on a strategic area, but all of the organization can be involved in projects selected to help achieve the Magic Moment. As Caldwell says, "Projects integrate everything an organization does for a particular core process to get to the Magic Moment."

Where can hospitals find the best opportunities for Magic Moments that are certain to integrate processes?
1. The emergency department (ED), particularly addressing length of stay/throughput, and the interfaces between the ED and the rest of the enterprise.
2. The surgery, addressing capacity optimization, best measured by "cut to close" hours divided by staffed hours.
3. Nursing floors/patient floors, improving patient care throughput, measured by the percentage of patients discharged by a specified time.
4. Clinical practice, measured by length of stay and percentage adherence to established evidence-based medicine.
5. Staff productivity as it relates to quality, measured by the percentage of "In Quality" staffing levels.

For most hospitals, these strategic areas represent what Caldwell calls "the five lever points." They contain the "vital few" opportunities for improvement but also have hundreds of interfaces throughout hospitals. Every employee at every level can have a role in lean-Six Sigma improvements when change begins with these levers.

Deploy from the Top Down for Real Results

The integration of projects, processes, and employees under the Magic Moment approach makes senior leader involvement indispensable. Senior leaders not only must own individual Magic Moments and identify projects to achieve them, but they also must actively and continually steer the overall implementation, ensuring that the right Magic Moments are pursued at the right time.

At the beginning of a deployment, a hospital's senior leaders must:
- Come together formally as a senior leader team.
- Determine Magic Moment goals for the organization and synergize collective Magic Moments.
- Plan the training and deployment of Black Belts.

Active engagement of senior leaders from the launch of a deployment ensures a strategic focus on the most influential process lever points and on one other factor that, Caldwell states, healthcare staff often neglect—dollar results.

"Senior leaders understand that if the hospital's core process levers are improved, the exhaust will be cost recovery," says Caldwell. Below the senior leader level, healthcare leaders tend to shy away from cost reduction. Physicians and nurses have been trained to think that cost is not part of quality, that improving quality requires adding resources.

Changing the Terms of Healthcare Quality

Only senior leaders are in the position to change the definition of quality in their organizations. Leaders who do accept active responsibility for lean-Six Sigma will find the results worthwhile, in terms of both improved patient care and dollar savings.

Caldwell describes results he has witnessed at three hospitals:
- Miami Baptist Hospital achieved a 20% improvement in patient care throughput using lean and Six Sigma approaches.
- Morton Plant Hospital in Clearwater, Florida, achieved a three-year Magic Moment of 26% improvement in ED length of stay, capturing over $5 million in cost of quality.
- West Jefferson Medical Center in New Orleans recovered over $5 million in less than six months by focusing on "In Quality" staffing and reduction of hospital-wide process waste.

Hospitals that are ready to consider quality in terms of efficiencies and dollar savings, as well as improvements in care, will find that the keys to achieving lean-Six Sigma results like these are systemic, organization-wide improvements, accomplished through senior leadership involvement.

Lean-Six Sigma for Healthcare: A Senior Leader Guide to Improving Cost and Throughput, by Chip Caldwell, Jim Brexler, and Tom Gillem, is available from ASQ Quality Press.

Capability Maturity Model (CMM)

Catalina Ciolan is Project Director of the European Association of Healthcare IT Managers in Brussels, Belgium.

The Capability Maturity Model (CMM) is a process capability maturity model which helps in the definition and understanding of an organisation's processes. Initially known as Humprey's CMM (name given after IT guru Watts Humprey), it has been actively developed by the SEI (US Department of Defense-backed Software Engineering Institute at Carnegie-Mellon University) since 1986.

When conceived, the CMM model was intended to act as a tool for assessing the ability of government contractors' processes to perform a contracted software project. Besides this initial goal, CMM has been - and is - applied as a model to assist in understanding the process capability maturity of organisations in various areas such as software engineering, system engineering, project management, software maintenance, risk management, system acquisition, information technology (IT), personnel management.

The CMM model was first released in 1990. Although many organisations found these models to be useful, they faced problems caused by overlap, inconsistencies, and integration. Many organisations also confronted conflicting demands between these models and ISO 9001 audits or other process improvement programs.

Structure of the CMM

The CMM presents the following characteristics:

Maturity Levels: A 5-Level process maturity continuum - where the uppermost (5th) level is a notional ideal state where processes would be systematically managed by a combination of process optimization and continuous process improvement.
Key Process Areas: A Key Process Area (KPA) identifies a cluster of related activities that, when performed collectively, achieve a set of goals considered important.
Goals: The goals of a key process area summarize the states that must exist for that key process area to have been implemented in an effective and lasting way.
Common Features: Common features include practices that implement and institutionalize a key process area. There are five types of common features: Commitment to Perform, Ability to Perform, Activities Performed, Measurement and Analysis, and Verifying Implementation.
Key Practices: The key practices describe the elements of infrastructure and practice that contribute most effectively to the implementation and institutionalization of the KPAs.

Five Levels of Software Process Maturity

The CMM defines five levels of software process maturity, based on an organisation's support for certain key process areas (KPAs).

Level 1 (initial) describes an organisation with an immature or undefined process. This provides a chaotic or unstable environment for the processes. As a result, process performance in such organisations is likely to be variable (inconsistent) and depend heavily on past practices and traditions, the institutional knowledge, etc.

Level 2 (repeatable). It includes requirements management; software project planning; software project tracking and oversight; software subcontract management; software quality assurance; software configuration management.

Level 3 (defined). It focuses on organisational process definition, training programs, integrated software management, software product engineering, intergroup coordination, peer reviews. At this level, process management starts to occur using defined documented processes, with mandatory process objectives, and ensures that these objectives are appropriately addressed.

Level 4 (managed) includes process measurement and analysis; quality management; defect prevention. It is characteristic of processes at this level that, using process metrics, management can effectively control the AS-IS process (e.g., for software development).

Level 5 (optimizing) describes organisations with successively higher levels of software process maturity and includes technology innovation, process change management. If at maturity Level 4, processes are addressing special statistical causes of process variation and are also providing statistical predictability of the results, at maturity Level 5, processes are addressing the underlying causes of process variation and are changing the process to improve process performance.

For most organisations the key goal is to achieve a Level 3 maturity. One tool for assessing an organisation's current maturity level is a software capability evaluation (SCE), that evaluates its software process (usually in the form of policy statements) and project practices. However, one of the key issues with the CMM is that it overemphasizes peer reviews, inspections, and traditional Quality Assurance "policing" methods. On the other hand it is also believed that there is no emphasis on the architecting/design process, assessment process, or deployment process, all of which have proven to be key discriminators for project success. Some of these are known to be driven by artisanal/ 'feel' factors, which often produce the breakthroughs that really count.

From CMM to CMMI

Although the CMM model proved useful to many organisations, the use of multiple models has been problematic. Applying multiple models that are not integrated within and across an organisation could be costly in terms of training and improvement activities. As a consequence, the CMM Integration (CMMI) project was formed to sort out the challenge of using multiple CMMs. The source models that served as the basis for the CMMI include:

-CMM for Software V2.0 (Draft C)
-EIA-731 Systems Engineering, and
-IPD CMM (IPD) V0.98a while the old CMM was renamed to Software Engineering CMM (SE-CMM) and organisations accreditations based on SE-CMM expired on 31 December 2007.
The combination of these models into a single improvement framework was intended for use by organisations in their pursuit of enterprise-wide process improvement. These three source models were selected because of their widespread adoption in the software and systems engineering communities and due to their different approaches to improving processes in an organisation.
Although the CMMI remains an activity-based approach (and this is a fundamental flaw), it does integrate many of the industry's modern best practices, and it discourages much of the default alignment with the waterfall mentality. CMMI consists of best practices that address product development and maintenance. It addresses practices that cover the product's life cycle from conception through delivery and maintenance. There is an emphasis on both systems engineering and software engineering and the integration necessary to build and maintain the total product.

The Relationship between Six Sigma to CMMI

The relation of Six Sigma for Software to CMMI/PSP/TSP can be best understood as a difference in level of abstraction. Six Sigma for Software might be used to objectively evaluate the overall effect of CMMI on software product quality, cost, and cycle time as compared to an alternative approach, perhaps one of the 'agile' process definitions such as Extreme Programming or Ken Schwaber's "Scrum" (Schwaber and Beadle 2001).
The relation of Six Sigma for Software to CMMI might also be characterised as a difference in goals, in which the goals of CMMI may be a subset of those associated with Six Sigma for Software. Therefore:

-The primary goals of CMMI are continuous improvement in the performance of software development teams in terms of software product cost, cycle time, and delivered quality;

-The goals of Six Sigma for Software may include the goals of CMMI, but do not specify any particular process definition to achieve those goals. In addition, Six Sigma for Software may be used to achieve many other business objectives (e.g. improved customer service after delivery of the software, or improved customer satisfaction and value realization from the software product delivered). Six Sigma for Software applies to the software process, the software product, and to balancing the needs of the customer to the needs of business in order to maximize overall business value resulting from processes and products.

-An additional difference is that Six Sigma is being applied to selected projects, while CMMI is intended for all projects. Six Sigma may, for example, be used to plan and evaluate pilot implementation of CMMI, while CMMI can provide a defined tool to institutionalise the lessons learned from Six Sigma projects.

CMM and Six Sigma address a challenge posed specifically by hospitals (rather than many other businesses), where every department has specialised needs and working practices – as do different actors and users (nurses, physicians, pathologists and administrators).

Conclusion

For IT managers, the advantage of using these structured methodologies lies in optimizing both existing business and IT processes as well as producing a tangible roadmap for 'systemically' inspiring best practices. Meanwhile, the in-built metrics of CMM and Six Sigma allows hospital administrators to identify and ameliorate organizational bottlenecks and measure (continuous) improvements in process efficiencies over time.

Timeline
1987: SEI-87-TR-24 (SW-CMM questionnaire), released.
1989: Managing the Software Process, published.
1990: SW-CMM v0.2, released.
1991: SW-CMM v1.0, released.
1993: SW-CMM v1.1, released.
1997: SW-CMM revisions halted in support for CMMI.

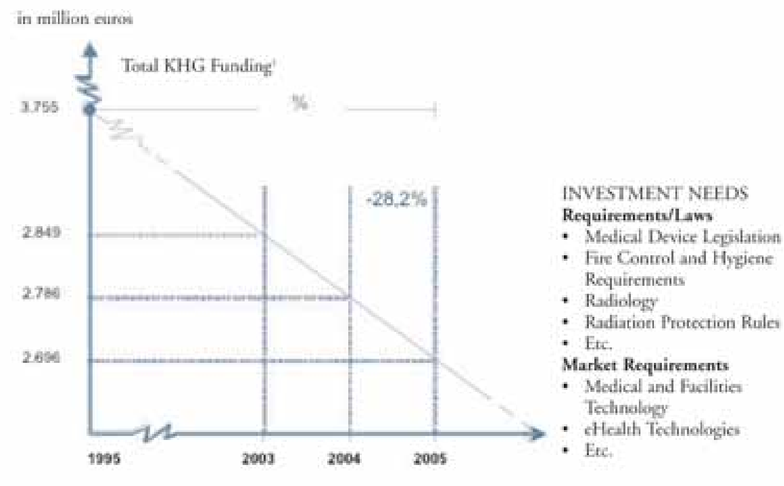
The Investment Dilemma Facing Hospitals

Oliver Rong is Principal at the Competence Centre, "Pharmacy and Healthcare", at Roland Berger Strategy, Berlin,Germany

The current position in Germany The Hospital Financing Law, KHG, of 1972 provided that investment in German hospitals would be allocated from public moneys (Section 4, Paragraph 1 of the KHG). The legislation established the principle of dual financing, under which capital funding is paid from the public purse while hospitals' operating costs are covered by the health insurance providers.

The amount of funding provided by the federal states has declined sharply in recent years. In 1995, the overall financial contribution from this source amounted to € 3.8 billion but by 2005, the figure had dropped to € 2.7 billion, a reduction of 28%.

The sharp decline in financial support from the federal states has been shadowed by an increase in investment requirements. A number of factors have contributed to rising capital costs. They include the imposition of new conditions and legal requirements and pressure on hospitals to consolidate their position in the healthcare market. Economic studies have shown that the current shortfall in investment is between € 30 billion and € 50 billion (Source: The German Hospital Institute – DKI). Even assuming the maintenance of the status quo, i.e. the number of hospitals and volume of infrastructure will remain the same, substantial investment requirements are still anticipated. However, it must be borne in mind that the number of hospitals is set to significantly decline as competition in the market intensifies. This trend will impact first on hospitals with high investment needs arising from infrastructural deficits.



¹ Hospital Financing Law – Individual and Global Funding in Germany

Figure 1: Funding under the Hospital Financing Law and Determinants of Investment Requirements

The Alternatives for Hospitals

When public funding is no longer sufficient to fund necessary investment, hospitals must find alternative means to cover costs. Two options are open to them; they can either fund investment programmes:

- from current operations or
- transfer the costs to new partners.

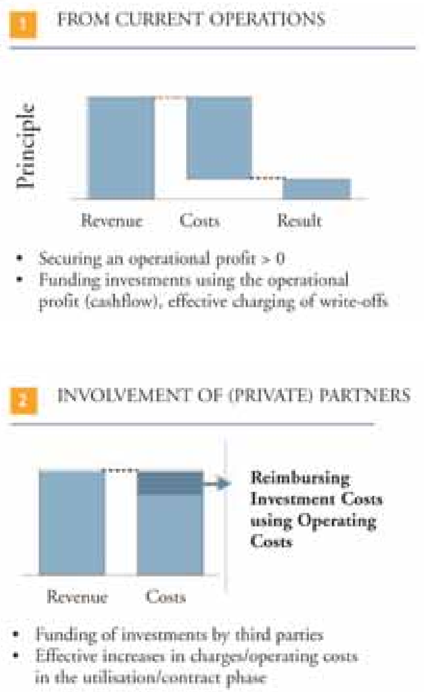
Focused investment frequently delivers improvements in operational processes and procedures, which in turn delivers better financial results for the organisation. It therefore allows hospitals to exploit the positive impact on their bottom line to extend the options available to them.

Involving partners in certain areas of the hospital's operations can shift investment costs to the partner because it undertakes investment projects, thus delivering improvements in processes and reducing costs. This form of cooperation creates a win-win situation for everyone involved. Evidence gathered in a number of strategy projects in hospitals shows that private partners can be integrated into all aspects of the business system.

Public/Private Partnership models (PPPs), long-term, contract-based cooperation arrangements between public or private hospitals and private companies, are an attractive option.

Every aspect of a hospital's business system can and should be examined to identify potential areas of co-operation with industry partners. For example, in the medical supplies division, PPP models could make eco-

Figure 2 : Source of financing of investments



nomic sense in the area of medical technology (for instance, in delivering complex diagnostics and therapies). In the medical services division, hospitals could consider introducing a PPP for laboratory services. In infrastructure, it is conceivable that a hospital might enter into a PPP arrangement with construction companies or service providers operating in the field of infrastructural facility management. Hospital administration also offers the potential to engage private partners in PPPs. From the perspective of the hospital, it is a matter of identifying the most suitable partner for the relevant task and then establishing a contractual relationship with the company in question.

The first step is to identify the model to be used (the type of co-operation arrangement and the area in which it will operate). The right partner must then be found. The hospital shortlists potential partners it believes to be best suited to achieving a set of defined goals. The final and most important step is to carry out an economic appraisal of the project, which entails comparing two variants – one with the participation of a private partner and one without external participation (see Figure 4).

Depending on the form and content of the selected project, it is possible to differentiate between financing models, management models and operator models. A systematic evaluation, using a specific project, should be carried out to determine the most appropriate model for addressing the problems of the individual hospital.

Summary: Exploiting the Potential of PPP Models

In our view, involving partners in the business system of a hospital creates opportunities to significantly reduce investment requirements. Every hospital should critically examine its value chain and identify the points at which positive effects might be expected from collaboration with private partners using a Public/Private Partnership or Private/Private Partnership model. These effects should be quantified in advance to ensure the expectations of partners can be pinpointed during discussions on co-operation. False and unrealistic expectations are one of the greatest obstacles hindering the implementation of sensible co-operation plans.

Figure 3: Options for involving business/ private partners in the hospital's business systems.

POSSIBLE MODELS

BUSINESS AREAS	(Part) Privatisation	PPP	Outsourcing	Management Contract
Inpatient KV	Heart Centre	Proton Therapy Centre		
Outpatient KV			Medical Supply Centre	
Med. Service			Laboratory Medicine	
Infrastructure	Non-medical Services	Digital Hospital		
Administration				Accounts

(Part) Privatisation
Sale of discrete and complete clinical areas or, where applicable, shareholdings.

PPP Public Private Partnership/Private Private Partnership
Long-term, contractually agreed co-operation between a public or private institution and a private company, generally involving an investment role for the private company.

Outsourcing
Award of individual services to a private operator for a specified period.

Management Contracts
Private partner assumes temporary responsibility for management service.

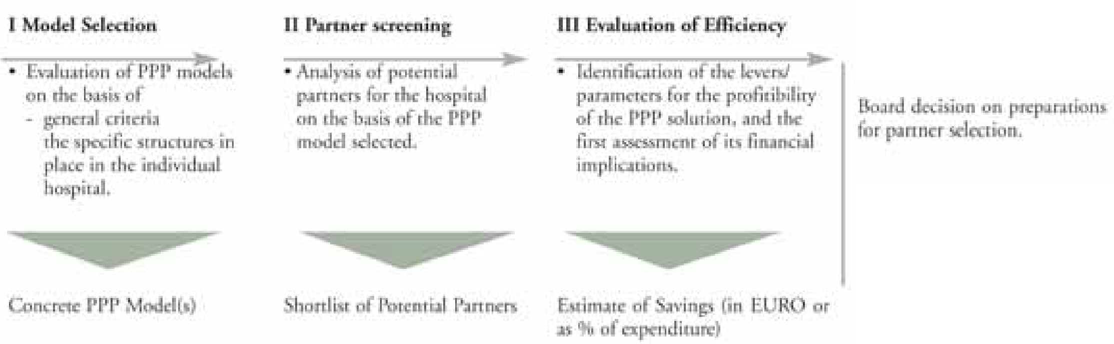


Figure 4: Steps in preparing a PPP project

Cost benefit analysis (CBA), return on investment (ROI), or both?

eHealth Decisions Can Be Tricky

Tom Jones is Director at TanJent Consultancy.

Taking decisions can be tough. Taking complex decisions is even tougher. Most eHealth decisions are probably at the tougher end of the complex. They can affect the performance of healthcare resources, impact patients, and are often linked to changes to clinical and working practices of highly trained, highly aware healthcare professionals. It can also take several years for eHealth to come to fruition, if it ever reaches this stage. In this setting, rigour in decision-taking is critical - so which techniques are helpful?

In business settings, return on investment (ROI) can be used to test the financial benefits of investment options. In services where some of the impacts on citizens can be intangible, cost benefit analysis (CBA) is often seen as more appropriate. A third approach is to use both - CBA + ROI.

ROI can be seen as an accounting model, and applied within the boundaries of the investing entity. It takes the cash generated by a proposed investment over time, and divides it by a value of the investment. This gives the ROI. The option with the best ROI is the one to pick. An obvious criticism of this approach for eHealth is that it omits the costs and benefits to patients, carers, healthcare providers and third-party payers.

CBA is an economic model, and enables the costs and benefits of all groups affected by the proposed investment over time to be valued and a benefit-to-cost ratio to be produced. The option with the best ratio is the one to pick. An obvious limitation of this approach is that the investing entity may not be able to afford the option with the best ratio.

One way to overcome these two limitations, and avoid the choice of CBA or ROI, is to use both. Unfortunately, this makes an already complex decision more complex.

Combining CBA and ROI for a More Informed Decision

The technicalities of using CBA + ROI are no more complicated than using just one of them. Much of the data is common. CBA includes tangible and intangible costs and benefits. For patients, these can include changes to travel costs, waiting times and service quality and safety. For providers, they can include the cost of the eHealth investment, implementation, change management, improved risk management changes in productivity, costs and income. Where new services are created, they can include new types of income. For CBA, taxes such as VATare excluded because they are transfer payments, and depreciation is excluded; the cash flow of the eHealth investment is used instead. For ROI, estimates of tangible income and expenditure changes are needed. Some of these can be copied from the CBA data, then unrecoverable VAT added and, where capital expenditure is needed, an adjustment can be made to convert the capital outlay into annual depreciation and capital finance.

For an investment decision into the future, both CBA and ROI can use discounted cash flow to produce net present values. This reflects the time value of money, and is important for eHealth investment decisions. The European Commission's eHealth Impact(eHI) Study, available at www.ehealth-impact.org, showed that the average time scale to reach a cumulative net benefit for its ten sites was about five years, with a maximum of about eight years. These timescales reinforce the need to us net present values, and so adjust estimates for the different time values of money created by the opportunity to earn interest with the money available.

Three other standard adjustments are needed to the estimated values used for eHealth investment options:

- Optimism bias, where people tend to overstate benefits and under state costs,
- Risk adjustment, to assess the im pact of arrangements faltering, such as cost and time over runs, and
- Sensitivity analysis, to test the rigour of estimating; an essential feature of investment decisions.

All three should be used with CBA and ROI, and so can be used with the CBA + ROI model. The linkages are summarised in figure 1.

There are several related techniques to CBA and ROI, such as cost-effectiveness analysis, internal rates of return and payback periods. If eHealth decision-takers prefer to use these,

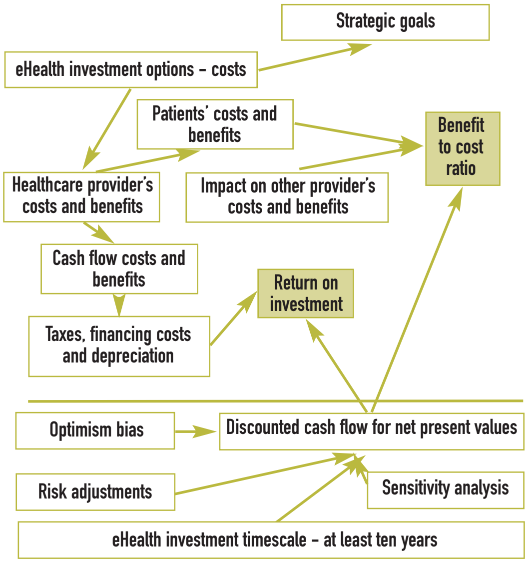


Figure 1

they can be accommodated into the linked model, because they have the similar data and technical overlaps.

Considering the Options

The crunch comes when the linked CBA + ROI model produces data about options. This is when eHealth investment decisions become more complicated, and more realistic. Variables that have to be in place for an eHealth investment decision to have a chance of success must be identified. The eHI study shows the importance of the economic impact of eHealth on citizens, with an average of some 43% of benefits allocated to them. This shows the critical investment feature of eHealth: it is usually an investment where a significant proportion of the returns are for patients, and so is beyond the boundaries of healthcare providers.

This is consistent with other investment decisions in healthcare, such as new drugs and new medical and surgical techniques. It shows the value of CBA and the limitations of using ROI alone, which excludes a significant eHealth impact. This points to the limited strategic fit of ROI in eHealth investment decisions.

Conversely, CBA does not deal with the impact on the income, expenditure and balance sheet of the eHealth investor, often a healthcare provider, and so does not deal with affordability - another critical investment theme. The eHI study also reveals the need to increase expenditure for an eHealth investment to succeed. It can include extra resources needed for outsourced ICT services from suppliers, ICT maintenance, internal ICT teams, project management, change management, training, ICT obsolescence and a continuing investment in an eHealth dynamic. Using ROI can combine these to identify the best, and most affordable, return, and so help to focus on avoiding, or minimising, financial risk, or disaster, from eHealth investments.

One of the outputs from this analysis is often the affordability gap. Additional costs of an eHealth investment may not always be met in full by additional income streams, and so create an affordability gap. This leads to the search for other sources of finance, including reducing costs, liberating cash from improvements in productivity and realigning the entity's overall investment plan to redeploy additional finance from other projects to the eHealth project. These are very tough decisions, often needing medium-term solutions. Ignoring them will only defer the problem, so they must be linked to a CBA perspective.

Often in eHealth investment decisions, CBA models show preferred options which have a good strategic fit, but are different to the options identified by ROI; this is where eHealth decision-takers add value. An optimal match has to be found. The steps are summarised in Figure 2.

Making It All Add Up

Squaring circles has to be achieved. At its simplest, investing in eHealth and failing to achieve strategic goals is not a good idea. An unaffordable eHealth investment with an unacceptable ROI is not a good idea either. The goal for eHealth decision-takers is to keep all the themes linked and to iterate, test and find the scope for an optimal fit. The CBA or ROI choice is not relevant in this setting. Finding an eHealth investment that meets strategic goals over time, will be economically successful, is affordable, and can contribute to the future eHealth dynamic of the organisation is the preferred outcome.

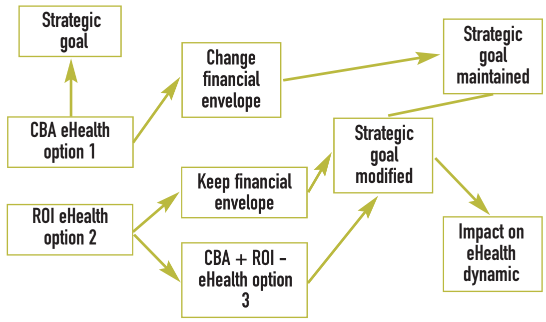


Figure 2: eHealth Decision Choices with CBA + Roi

Another important feature of CBA + ROI is the scope to include the resources and steps needed to realise the benefits. CBA and ROI can be used to identify preferred options for eHealth investment. On its own, this is limited. The CBA + ROI options must include the resources, activities and timing needed to realise the benefits. Another feature of the eHI study is that benefits from eHealth are not always realised just by using the eHealth application. Other factors have to change too, often clinical and working practices. In these cases, these changes have to be managed over realistic timescales.

Using CBA + ROI offers a more balanced diet for eHealth decision-takers, and avoids indigestion from over-indulgence in a single theme. It also avoids overemphasising the techniques over the decisions.

Managing Security Access
in today Healthcare Institutions

Chris Sullivan is Vice President, Customer Solutions at Courion Corporation.

With aging populations, healthcare continues to expand into one of the largest industries across the European Union. Along with this have come vast changes in both organisational structures and supporting technologies. This, in turn, has driven tremendous complexity into the way access is granted, controlled, and revoked for both patients and those who care for them.

The Task Seems Daunting but the Solution is Not

The good news is that these problems can now be solved. Automated provisioning and compliance solutions are enterprise ready and there's a growing body of best practices that can be applied to yield real benefits. As we explore these approaches, keep in mind that the benefits of effectively managing access come in three measurable forms – speed, sustained efficiency and transparent control.

Speed means that we can accelerate the way care is provided by giving individual clinicians what they need more quickly, or by enabling an acquiring organisation to integrate a new facility in less time.
Sustained efficiency means achieving operational savings without the solution being worse than the cure. Done correctly, dramatic savings can be pumped back into care. Done incorrectly, the provisioning system itself can become a white elephant that consumes more time and energy than it is worth.

Finally, transparent control means embedding preventative and detective controls into day-to-day processes in a way that reduces risk without imposing additional burden on the clinicians.

Best Practices for Managing Access

(1) Crawl Before You Walk
Let's get started with best practice area number one. Do not try to implement a comprehensive Identity and Access Management (IAM) programme as one massive project. I've seen no evidence that this has ever succeeded. What you are really about to automate are detailed processes for staff on-boarding, change, termination, and periodic review. These processes are dependent on security and operations policies that will vary by type of care, location and even management level. This can't be done in one monolithic effort for two simple reasons:
- Most organisations don't understand their own policies well enough to spec-out a solution; and
- Even if they could define things in sufficient detail to coordinate a army of offshore .NET and Java developers, it would take years to complete – by then, the problem will have changed.

A more natural approach is to define a programme around a vision for efficiency and control and then begin with concrete projects that support specific goals. Each of these projects should be measured in business terms (to garner support), be simple and bounded (to minimise risk) and extensible towards the longer term goals.
Delivering value quickly and consistently will build support and momentum.

(2) Always Move the Ball Forward
As you consider initiatives, evaluate their impact on speed, efficiency and transparent control. You should always be advancing one of these things and it will be common to advance all three. Deploying an account request process with more formal approvals will only decrease risk if the staff actually uses it. If it's harder for end-users, they will find a way to circumvent the process and there will be less control. If you are creative, you will find a way to reduce risk and hassle.

Remember, incremental progress is better than delayed or unattainable perfection!

(3) Know What People Have
Any business school will tell you that you can't manage what you can't see and this holds true for identities. If you don't have a current map of who has access to what, then how do you know if people are over-credentialed? How do you disable their access when

they leave? How do you even help them when they call the service desk?

Building this map can be difficult because most legacy environments are not very consistent, but there are effective tools that can help:
1. Establish a unique ID for all users;
2. Pull accounts and attribute information from core systems;
3. Map those account names to the unique ID:
• Consider policies that were in place when the accounts were created;
• Balance accuracy against the risk of making the wrong association;
4. Claim accounts that you cannot automatically map. If I am the only Sullivan at Courion then it's probably safe to assume that the AD account csullivan belongs to me, but if there's also a Clarice, you might have us identify and authenticate these against our accounts to claim them; and
5. Keep these mappings current with maintenance scripts.

Congratulations, you've just implemented some important controls and you are well positioned to automate disables completely!

(4) There is a Role for Roles
I've seen many successful role implementations and many unsuccessful ones. Roles are hard because you must work out what each person should get access to and then you must validate that with application owners to validate that access. However, since you should be figuring this out EVERY time you change someone's access anyway, why not do it once?

Start small and build an approach that will both scale and accommodate change. For your first foray into roles:
1. Select a modest population, perhaps legal;
2.Work with them to define a representative set of job functions;
3. Assign appropriate access rights to them. In practice no one will know just what to assign, so ask them for representative users and consider what they have;
4. Scrutinise roles against security policies.
Now you can redirect legal requestors to a simpler workflow that simply asks them to choose a pre-approved role and access can be securely granted without additional approval. Going forward, you'll have to scale what you learned. As your approach matures, you'll want to be thinking about the following:

• Keep the number of roles manageable. Perhaps 200-300 for a 40,000 person organisation;
• Roles should be dynamic and rights assigned based on policies. In this way, when the policies change, you don't need to re-engineer the roles;
• Select tools that can automate provisioning and compliance with or without roles and be sure that they support role lifecycle management (developing, creating, changing, periodic review, governance and change control);
• Implement a governance process; and
• Avoid temptation. Under and over-credentialing are simple, but the former doesn't add much value and the latter creates risk.

Advanced Techniques

I have friends and colleagues who have implemented robust identity management programmes that are doing everything that we've discussed here. They have deployed enterprise roles for 80%+ of their users with only 200 roles. They have provisioned 5,000 new users from an acquired institution over a single weekend. They have reduced security administration staff by →70% and cut millions in operating costs. They've cut service levels from weeks to minutes, all while reducing the effort expended for internal and external audits to a fraction of what it had been.

Today, they are leveraging their infrastructures in ways that you might not have imagined. Since they've automated the employee on-boarding process, why not add in physical security and manage access badges to the floor and door level? Now that you have decided what rights a specific type of user should be granted, why not go back and track what they actually use? I have one customer who found that they provisioned 17,000 accounts in the last year for a application that was only used by a few people – that's a lot of labour and unnecessary risk.

Back to Basics

Remember, it is better to have incremental progress before delayed perfection. In this case, progress is defined in terms of speed, efficiency and transparent controls. Make sure you know the clinical and technical context that you're dealing with and execute short, successful projects that will build on each other to advance your goals.

If you are just getting started:
• Build and maintain an identity map. It will help you in more ways than you can imagine;
• Scrutinise orphaned accounts. If you can't map them, they probably shouldn't be there;
• Automate the disable function. Granting new rights quickly and efficiently can be challenging because you need to understand how policies translate to system attributes. If you have an identity map, disabling is pretty easy – set the revoke attribute; and
• Get started with roles.

Finally, measure results! Institutions value patient safety and care and will support those who can show how they

Wirelessness for Mobility

Wireless Technology in the ICU: Improving Patient Care

Neil A. Halpern is Chief of Critical Care Medicine, Department of Anesthesiology and Critical Care Medicine, Memorial Sloan Kettering Cancer Center, New York and Professor of Clinical Medicine, Weill Medical College of Cornell University, New York.

Wireless technology offers a viable opportunity to make ICUs more mobile and introduces new possibilities for enhanced ICU management and medical care.

Introduction

The intensive care unit (ICU) relies on a variety of bedside devices to deliver care to critically ill patients. These devices include physiological monitors, ventilators, infusion pumps and bedside computer terminals, among others. Each device offers a critical medical service to the patient or reports the patient's condition to the medical staff. Traditionally, these devices are attached to the patient, the bedside head walls and to the hospital networks through a maze of wires and cables, which provide medical service to the patient and electricity and/or data network connectivity to the device. As a result, contemporary ICUs are often choked with cables and wires, limiting the mobility of the patient and the bedside devices attached to them, and the nursing and physician staffs who must navigate the jungle of wires to provide care. Wireless technology offers a viable solution to these problems and opens opportunities for enhanced medical care and device and personnel mobility.

Increased Mobility and Other Advantages

Introducing wireless connectivity into the ICU offers many advantages. First and foremost, wireless technology allows the ICU to eliminate the tangle of wires at each bedside. This allows the medical staff to relocate devices and even the patients as needed. It also creates a tidier, safer ICU room. Because wireless technology offers new opportunities for mobility, a wireless ICU can better manage its space and equipment, optimizing the number of patients served and the number of medical services available to patients throughout the ICU.

Wireless technology may also be used to integrate, through a consolidated wireless network, a variety of bedside devices, which, in a traditional ICU, are typically not networked together. This enhances the ICU's ability to collect, manage and analyze data from bedside devices, which in turn enables ICU managers to easily make decisions based on comprehensive medical data from their own ICU. Specifically, this data could help managers tailor ICU policies and procedures to local caseload and patient flow, further facilitating the operations in their particular ICU.

Placing data from multiple bedside devices onto one, integrated network also enables the ICU to efficiently and effectively communicate its comprehensive patient data to other areas of the hospital. ICU doctors and nursing staff may also take advantage of the networked data to access information about patient status remotely from home or from a nursing station, thus allowing them to respond more quickly to changes in a patient's condition, even when they are not immediately available at a patient's bedside.

Installing a Wireless ICU Network

Converting to a wireless ICU clearly offers medical mobility and management advantages, but the thought of modifying or doing away with traditional, hard-wired devices may seem futuristic and daunting to many ICU managers. Creating a wireless ICU requires physical modifications to the existing, traditional ICU. The key to wireless networking is the installation of access points; these units are bi-directional "Wi-Fi" (802.11) transmitters that provide zones of wireless coverage. The access points link the medical devices wirelessly to the hospital network and enable device data to be accessible beyond the bedside. Because an ICU usually occupies a substantial amount of space, it may be necessary to install multiple access points, each providing wireless coverage for the devices in their zone (e.g., one ICU room). Thus, although the wireless ICU looks significantly less "busy" than a traditional ICU, it must be "wired for wireless" through the installation of the access points.

Wireless networking poses its own unique set of challenges. Physical changes in the area of wireless coverage may cause coverage limitations. Wireless zones may become overloaded with transmissions, thus slowing down data throughput. Access points themselves may fail. Security may become problematic as "hackers" attempt to engage the wireless network without proper rights. Thus for wireless to function properly, a 24/7 monitoring system must be developed.

Moving to Wireless

Once the ICU has installed a wireless coverage sufficient to meet its needs, it can begin the transition to wireless operations. All typical ICU devices are now available in wireless formats. The wired and wireless systems can co-exist, as well. The following are a few examples of common bedside devices available in wireless format:

- Monitors

Physiological monitors are among the most common ICU devices and are typically networked together through wired connectivity. Monitoring companies also support wireless integration and many of their devices already in the marketplace contain wireless technology installed directly within the monitor. Thus peripheral or external wireless transceivers are not required to link the monitor to the ICU's wireless data network. Electrocardiogram (EKG) leads and pulse-oximetry devices are also available in wireless format. Invasive blood pressure monitoring is one of the few monitoring capabilities that has lagged behind and remains wireless-incompatible; however, research into adding this capability to invasive monitoring is currently underway.

- Ventilators

Ventilators are typically stand-alone devices and are not networked with a data management system. However, since it is nonetheless important to track the status of ventilated patients and to receive remote alarms when significant changes occur, wireless ventilator management systems that can transmit data on a wireless ventilator network are now available. A wireless transmitter however, must be externally attached to the ventilator. Using this technology, ICU doctors can review patient and ventilator data within their facility via any computer or handheld device with access to the wireless network. The ventilators in turn, can transmit alarm notifications of changes in a patient's condition to remote paging devices.

- Infusion Pumps

Intravenous infusion pumps, like mechanical ventilators, have largely been used and viewed as stand-alone devices. To date, the pumps have had minimal programming capabilities; today, however, the newer generation of infusion pumps, referred to as "smart pumps" incorporate multiple comprehensive drug libraries and infusion error reduction systems. Wireless connectivity, however, is recommended to optimally use, maintain, and update the pumps and their software. Wireless also permits the infusion pumps to continuously link to the patient, pharmacy and information management systems. Thus smart infusion pumps are available with integrated wireless connectivity to enable them to function under a care model that enhances patient safety.

- Bedside Terminals

Traditionally, each ICU bedside has a computer terminal, which is stand-alone, immobile and difficult to see. To be efficient, an ICU needs computers that are both mobile and visible. A decade ago, mobile terminals were rare and expensive. Today, vendors offer wireless carts that provide mobility and connectivity throughout the wireless ICU. In our ICU, we have even introduced telephonic capabilities through the wireless computer carts.

Two conceptual wireless ICU constructs thus emerge. First, the wireless medical devices at the bedside can be grouped with the patient and caregivers to form a cohesive "bedside" patient-device-provider network that is linked to the hospital-wide information system. Second, each group of wireless devices (monitors, ventilators, infusion pumps, etc.), while scattered throughout the ICU, can be viewed remotely as their own virtual device communities.

New Technologies, New Possibilities

In addition to the traditional bedside devices mentioned above, hospitals are introducing non-traditional applications for wireless connectivity into their ICU environments. For example, some hospitals have introduced remote-presence robots, which enable ICU doctors to complete patient rounds remotely. Live images of the patient and bedside devices are transmitted via the wireless network to the doctor's computer. A live feed of the doctor, in turn, is transmitted through the network to the robot's screen, adding a personal touch to a remote visit. Other hospitals have used their wireless network to support patient bar-coding initiatives. Through bar coding, the medical staff can identify the patient, link the patient to the medical or nursing caregivers and to the bedside devices and transmit patient-specific medication orders to the infusion pumps throughout the wireless coverage area.

Conclusion

In conclusion, wireless technology has unique applications in the ICU. Wireless networking applies to the patient, the ICU itself, and the entire hospital. It allows for centralization of devices that previously lacked interoperability, creating better data and device management possibilities, and enhanced mobility throughout the ICU. However, wireless networks require access point installation, introduction of wireless connectivity to medical devices and plans to overcome security and maintenance challenges that are different from those encountered in a traditional, wired ICU. Nevertheless, the benefits of a wireless ICU demand that we consider moving towards wireless technology in the near future.

European Software Institute (ESI)

Caroline Hommez is Managing Editor of *(E)Hospital*, the Official Journal of the European Association of Hospital Managers in Brussels, Belgium.

ESI-Tecnalia was set up in 1993 as a non-profit technology foundation by the European Commission with the support of Spain's provincial Basque Government. Its key mission is to contribute to the development of the Information Society and increase industry competitiveness, by means of knowledge, innovation, continuous improvement and the promotion and dissemination of Information Technology.

ESI's main activities are focused, on the one hand, on helping the software industry to produce better software, with a higher quality, more cost-effectiveness and efficiency, and do this with the shortest time-to-market cycles.. On the other hand, ESI also develops a wide range of initiatives directed at promoting the acceptance of the Information Society through the use of ICT by citizens and enterprises, above all SMEs and micro-enterprises which traditionally face the highest barriers to adoption.

In line with its mission, ESI focuses its technical activities in a select set of technological areas with two main objectives:

- Increasing industry competitiveness in software-intensive organisations.

Technologies for IT Competitiveness help companies to increase their capacity to produce and deliver high quality software systems and services in time and within budget and thereby improve their competitive advantage.

- Contributing to the development of the Information Society through the adoption of information technologies.

This objective of the ESI focuses on the development of the Information Society, with specific, regional-based efforts on closing the digital gap which prevents citizens and companies from fully harnessing the immense, value-adding advantages of IT. Its four main planks are Digital Enterprise, Information Security, Knowledge Certification and Accessibility.

ESI and EU R&D Projects

R&D Projects are carried out by close cooperation between ESI members and partners and leading European companies in order to develop high-quality technology, addressing current and future market needs. Project results are packaged into technology transfer products and services, with an emphasis on ensuring their real-world effectiveness by means of experimental trials and pilot projects.
Furthermore, ESI is also committed to the establishment of Technology Platforms as a way to closely coordinate and establish synergies with EU framework research programs (such as FP7). An outline presentation of the R&D Technology Platforms and key initiatives at both Spanish and European levels is presented below:

	European Technology Platforms	Spanish Platforms
Embedded Systems	ARTEMIS: Advanced Research and Technology for Embedded Intelligence and Systems	PROMETEO: Sistemas Inteligentes Integrados
Software and Services	NESSI: Networked European Software and Services Initiative	INES: Iniciativa Española de Software y Servicios
Mobility	eMobility: Mobile and Wireless Communications	Comunicaciones Móviles
Multimedia	NEM: Networked and Electronic Media	Sistemas Audiovisuales
Security	None	Seguridad y Confianza
Nanoelectronics	ENIAC: European Nanoelectronics Initiative Advisory Council	Micro y nano sistemas

Conclusion

The ESI's efforts have both immediate and long-term relevance for the healthcare environment in Europe. In a modern hospital, where errors in increasingly-complex IT systems can have grave consequences, the advantage of Quality Technology is self-evident; so too is the drive to align software management activities with business goals – especially as hospitals across Europe face pressures to control costs. Meanwhile, in the fast-emerging, real-time e-Health environment, the role of Productivity Technologies which aim at flexibility and interoperability of heterogeneous devices and equipment sourced from a diverse range of vendors, is also difficult to underestimate. The emphasis on reuse and model-based development is also in line with nascent trends across the globe to componentize software processes, while service-centric engineering, in the shape of SoA, is now widely held to be the cornerstone of the futuristic 'digital hospital'.
In the final analysis, the ESI's efforts to encourage users (all kinds of users – young and old, tech-savvy and tech-shy) to adopt new ICT technologies, is among its most laudable attributes. This is, in fact, a shining example of the utilitarian, universalist European model, one which stands in stark contrast to the Darwinian winner-takes-it-all approach in vogue across much of the world.

For more information, please visit http://www.esi.es/

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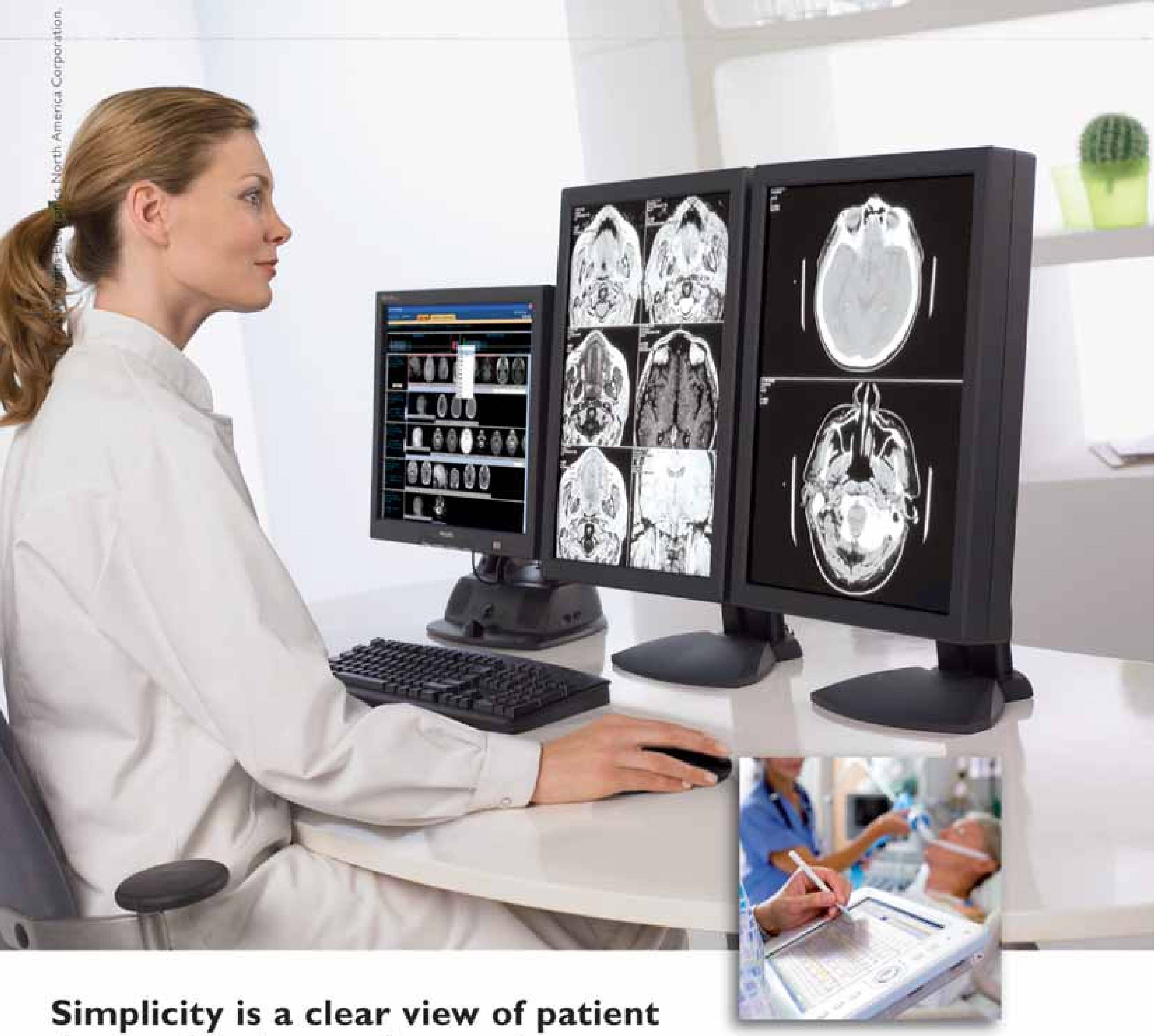

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