

SIEMENS



DIGITAL TRANSFORMATION IN HEALTHCARE

Smart hospital transformation – **Getting started**

An advisory paper from Siemens Financial Services

Index

Drivers of digital transformation in healthcare	4
Patient outcomes and chronic disease	5
Pressure to improve patient journeys and access	6
Staff shortages	7
Inefficient facilities	8
Uncoordinated data	10
Data protection challenges	12
Pressurized budgets	13
Lack of transformation capital	15
Smart hospital solutions: a holistic approach	16
Smart Hospitals: enabled by flexible finance	19
Smart Hospitals: next steps	21
Conclusion: the urgency to act now	21



Summary

The benefits of smart hospitals and digital medicine are becoming widely recognized, partly inspired by the value that digital technologies delivered during the recent pandemic crisis.

These benefits include: improved patient outcomes and experience through digitalized patient journey; managing staff shortages and enhancing productivity through better workflow management; reducing operational costs through digitalized systems, equipment and buildings; and greater availability and sustainability through power resilience and energy efficiency.

Yet embarking on a 'smart hospital' transformation requires a strategic, holistic approach and must be supported by technology partners who are prepared to get involved in the performance targets that such a project entails.

Hospital organizations ideally want to go on a transformation journey that deploys the latest technological developments - in an open, transparent and interoperable technology environment. This enables them to adapt quickly in a fast-changing world and keeps them open for future needs.

For instance, leveraging digital technologies allows a hospital to digitally support its operations and clinical functions to deliver better patient journeys and outcomes and reduce the workload on nursing staff. Digital capabilities also allow hospitals to deliver patient service remotely, improving access to healthcare for all.

After all, with the rising demand for healthcare services all round the world, hospitals are facing continued pressure on their operating finances and are concerned to grasp the real-life clinical performance and operational efficiency enhancements that digital transformation will bring.

This short advisory paper looks at the drivers of change affecting hospital organizations across the world and suggests several guiding principles to begin a rapid transformation journey to 'smart' operations.

Drivers of digital transformation in healthcare

Growing healthcare needs around the world are demanding radical reform of healthcare systems and the way they work, so that rising demand can be met and managed without escalating costs. Independent commentators globally are recognizing the vital role that digitalized hospitals play in this picture of reform.¹

Digitalized hospitals are able to become 'smart'. They can track everything that is happening – embracing patient status, clinical outcomes, infection control, clinician schedules, even staff and equipment usage and location. They deliver patient data at the point of care for patients as well as for clinical staff. They can automatically regulate environments to be ideal for patient comfort and recovery. They can manage prescriptions and monitor patient adherence through sensors and wearables. And they can offer remote clinical and care services so that healthcare is accessible for everyone.

In fact, digitalized solutions help manage the whole patient journey to deliver better outcomes at lower cost. In fact, digitalization can enable hospitals to change and improve their entire operating model. Empowering and engaging patients through digitalization in hospital processes also deliver high levels of patient satisfaction.

The first section of this summary paper covers the drivers of change that are inspiring hospital organizations to transform their operations and seize the clinical, cost, compliance and coordinated data-flow benefits that result.



Patient outcomes and chronic disease

Chronic disease is on the rise as global societies develop. One example is the rising tide of diabetes, from New York to Berlin, and from Delhi to Beijing. Many other chronic conditions are also increasing the demand for healthcare services across the globe, including growing levels of heart disease and cancer.

In order to deal more effectively with these increasing healthcare demands, and in fact to try and catch them in their early stages, a massive investment is needed in smart diagnostic equipment. This technology, especially when made available in the community, can detect disease at an early stage and help reduce the lifetime costs of patient treatment.

Referring to the The European Health Data Space initiative, the European Commission notes that “the work of health professionals will be made easier and more effective.

Telemedicine and remote surgery technology are also helping bring effective healthcare and better patient journeys – both treatment and prevention – to a greater proportion of the population. Yet such technological developments require rapid and substantial investment now, to produce a beneficial return on that investment over a period of years.

Referring to the The European Health Data Space initiative, the European Commission notes that:

“The work of health professionals will be made easier and more effective. With improved interoperability, health professionals will be able to access a patient's medical history across borders, thus increasing the evidence base for decisions on treatment and diagnosis, including when the patients' data is in another EU country.² This will make a major contribution to patient outcomes in the future.”



Pressure to improve **patient journeys** and access

Regulatory pressure to improve journeys and access to healthcare are tightening across the globe. As one U.S. study notes,

“Powerful market and regulatory trends, combined with increasing evidence linking patient experience to important clinical and business outcomes, make a compelling case for improving patient experience.”

Although methods differ, regulators across Europe measure patient experience as part of their monitoring of standards from healthcare institution to healthcare institution.³ Similar initiatives are taking place on a localized basis in India⁴ and China⁵ and will no doubt gather pace as the healthcare infrastructure continues to rapidly grow in both countries.

The role and potential of digitalized technology in improving patient journeys, experience and access is widely attested. Remote access through telemedicine is naturally most exciting for large countries with many hard-to-reach citizens and a low doctor-patient ratio, such as India.⁶ But even in Europe, the possibilities of remote medicine⁷ and mobile diagnostics⁸ are attracting a lot of interest, attention and early-stage investment.



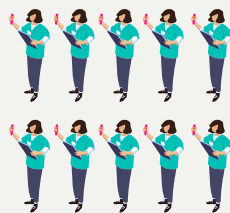
Staff shortages

According to the World Economic Forum Organization, there will be a shortage of some 10 million healthcare workers by 2030.⁹ The World Health Organization puts it higher, at 15 million.¹⁰ If targets for universal healthcare coverage are to be met around the world, another study from the University of Washington School of Medicine estimates the additional need for healthcare workers even higher – at 43 million.¹¹

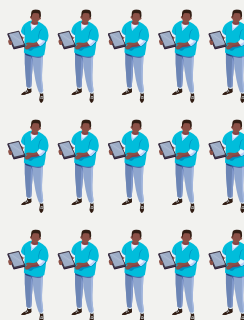
Although the issue is most acute in less developed economies, it is also being experienced in the developed world, including the USA,¹² Europe,¹³ India¹⁴ and China.¹⁵ Therefore, focusing healthcare professionals' time where their expertise and skills can have most impact is critical in containing escalating healthcare demand while also improving patient outcomes.

Technology can help remove or reduce unproductive (but necessary) administrative effort – making technological investment a priority in today's healthcare systems. Staff shortages are unlikely to be solved in the short term, so leveraging digital technologies to apply available staff time more productively is critical.

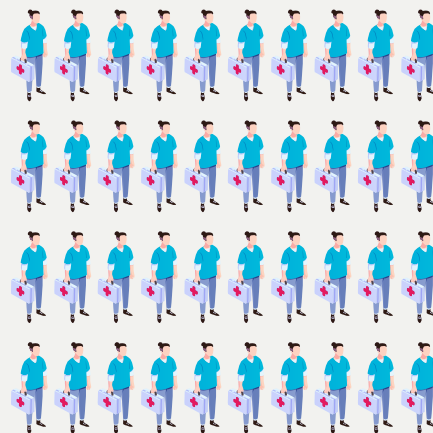
Estimated global shortage of healthcare workers by 2030



-10 million
World Economic
Forum Organization



-15 million
World Health
Organization



-43 million
Universal Healthcare
Targets

Inefficient facilities

The argument continues to rage about whether country health systems and institutions are 'efficient' or 'inefficient' – an argument which has become highly politicized.¹⁶ Nevertheless, most commentators agree that all healthcare systems have considerable potential to become more efficient, with some reforms, advances and technology leaps offering the ability to release sizeable funds for core clinical purposes.

For example, in the UK one independent inquiry estimated that reducing unwarranted variation in procurement and delivery of hospital care could save around £5 billion (\$6.31bn, €5.84bn) each year. Studies in the USA,¹⁷ Europe,¹⁸ India¹⁹ and China²⁰ have all identified major operational, efficiency and financial benefits to be gained through the application of new generation technology.

Smart hospital and clinic buildings also play a vital role in delivering healthcare treatment and aiding rapid patient recovery.²¹ Negative pressure rooms help manage infection control. As well as improving the patient's experience, this can also reduce energy consumption overall. Temperature controls are linked to patient monitoring equipment and can be adjusted remotely by care staff. Security is controlled through digital sensors and access rights can be adjusted via digital dashboards.



€5.84bn
saving each year by reducing
unwarranted variation in procurement
and delivery of hospital care

Smart buildings also help to eliminate wasted time for clinicians and care professionals alike. One research summary from the University of Cambridge notes how “Digital technologies can help clinicians provide better, more accurate, efficient and cost-effective care for patients...”²² Equally, digitalized asset management systems help nurses and ancillary staff to know the location of equipment, clinicians, medications, even patients, to ensure time spent locating people and technology is minimized and patient care thereby improved.²³

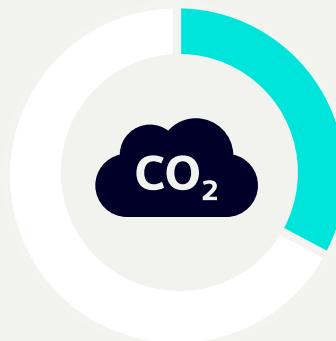


Perhaps the greatest financial impact is being made through energy savings technology – especially important in a time when energy costs are rising across the globe. Hospitals are major energy consumers, by virtue of their 24/7 operating schedule and the need to maintain critical patient environments. Typical energy savings through the application of digitalized buildings technology start at around a 20% reduction but can often be much higher. By engaging with smart energy savings solutions, hospitals save money and also reduce their carbon footprint (a mandatory target in the US and Europe, and strongly encouraged in India and China).

A university hospital in Saxony-Anhalt, Germany, engaged with Siemens to deliver energy savings. Thanks to the joint offering from Siemens Healthineers and Siemens Financial Services, the hospital was able to **reduce energy costs by 44% and CO₂ emissions by 33%**, through a zero-net-cost payment plan. The overall investment was covered by the energy savings.



▼ 44%



▼ 33%

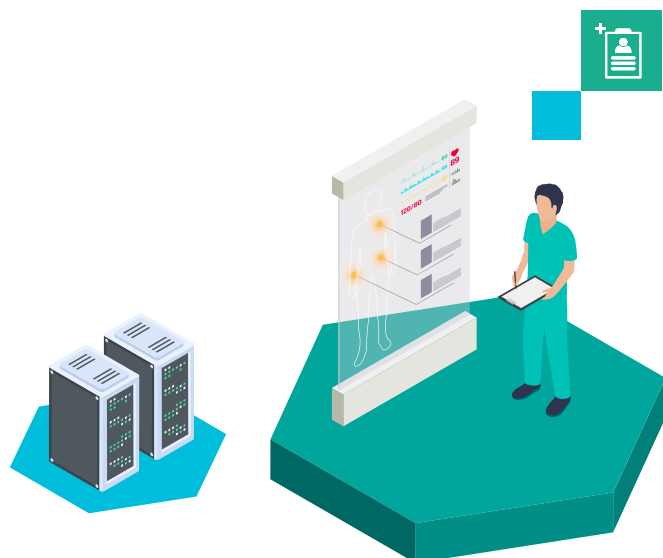
Uncoordinated **data**

Digital medicine requires interoperability. In the words of one academic study on the issue,

“Uncovering the full potential of digital medicine requires an interconnected data infrastructure with fast, reliable and secure interfaces, [and] international standards for data exchange. Most of today’s medical data lack interoperability: hidden in isolated databases, incompatible systems and proprietary software, the data are difficult to exchange, analyze, and interpret. This slows down medical progress.”²⁴

Hospital solution providers therefore need to facilitate a coordinated data environment with open standards, where multiple applications can work seamlessly together and proprietary system limitations are eliminated.

This is summarized in an article published by the Healthcare and Information Management Systems Society which sets out five guiding principles for interoperability in healthcare: data beyond silos; rich data interoperability; real-time, actionable insights; automated workflows; and industry data sharing standards.²⁵



HiMed Cockpit pro+ from Siemens digitizes medical processes at the patient's bedside. The direct link to the hospital information system means that data (e. g. from the electronic patient records) can be accessed securely and viewed by hospital staff directly at the bedside. Doctors can have remote patient consultations via video link and human contact can be minimized where infection control is a critical issue.

The empowerment of the patients to participate digitally in the hospital processes, e.g., by ordering menus, indoor navigation or the digital service call via the bedside tablet, reduces the routes to the bedside of the nursing staff. Digital communication between clinical staff and the patients increases patient satisfaction and reduces the nurse's workload.

Additional revenue can also be generated from the services offered such as telephone, TV, streaming services, digital media and the internet, while optimizing the processes at the patient's bedside enhances the efficiency and attractiveness of the hospital.

HiMed, the open interoperable platform delivers a future proof solution with open standard interfaces to integrate applications to improve the clinical processes at the Point of Care.



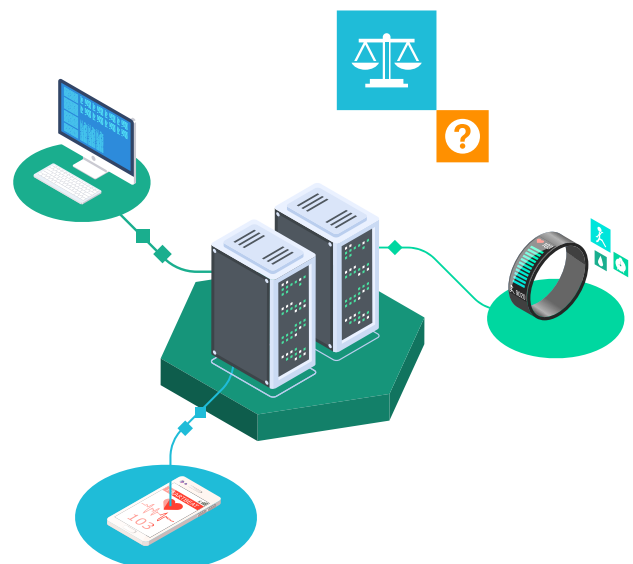
Data protection **challenges**

As digital transformation accelerates, no discussion of the subject would be complete without mentioning the issue of personal data protection.

Digital transformation generates high volumes of data, which offer the possibility of enormous operational benefits as well as a wide range of opportunities for wider operational innovation as well as clinical research. Data protection, however, is becoming more stringent all round the world, even in light-touch' regimes such as the US.

When it comes to patient data, the clear opportunities to improve healthcare and patient outcomes may clash with the requirements under applicable data privacy and protection laws, particularly consent requirements. However, consent as legal basis is administratively burdensome, costly and unreliable, as it can be refused or subsequently revoked by the patient. In most countries, specific legislation is being implemented to cover these issues.

Large volumes of emergency care data are generated through the use of digital technologies – communications, wearables, remote control devices, transport and supervisory systems. In one legislative example, the Bavarian Emergency Medical Services Act²⁶ provides the legal framework for telemedicine emergency care and enables public and nonpublic bodies, organizations and companies to access anonymized, emergency-related patient data and process it for further purposes, such as research and innovation.



Pressurized budgets

At a time when urgent investment in digital transformation is required to make healthcare organizations more effective and more efficient, budgets remain under major restrictive pressures.

In its most recent report on global health spending, the World Health Organization reported that, “sharp increases in government spending on health at all country income levels underpinned the rise in health spending to a new high of US \$9 trillion (approximately 11% of global GDP)...

In contrast to health and social protection, growth in education spending was relatively subdued. Countries face the further challenge of sustaining increased public spending on health and other social sectors in the face of deteriorating macroeconomic conditions and rising debt servicing.”²⁸

Asia is primed for rapid healthcare change, driven by shifting demographics, rising consumer expectations, technological innovations, and limited legacy health infrastructure. Collectively, these factors could enable governments, payers, providers, and consumers to reimagine healthcare delivery and management. In response to these trends, consumer-centric digital health ecosystems are forming across Asia at unprecedented speed and scale. Today, digital health impacts more than a billion lives, and estimates show that digital health in Asia could collectively create up to \$100 billion in value by 2025, up from \$37 billion in 2020.

McKinsey, The future of healthcare in Asia²⁷



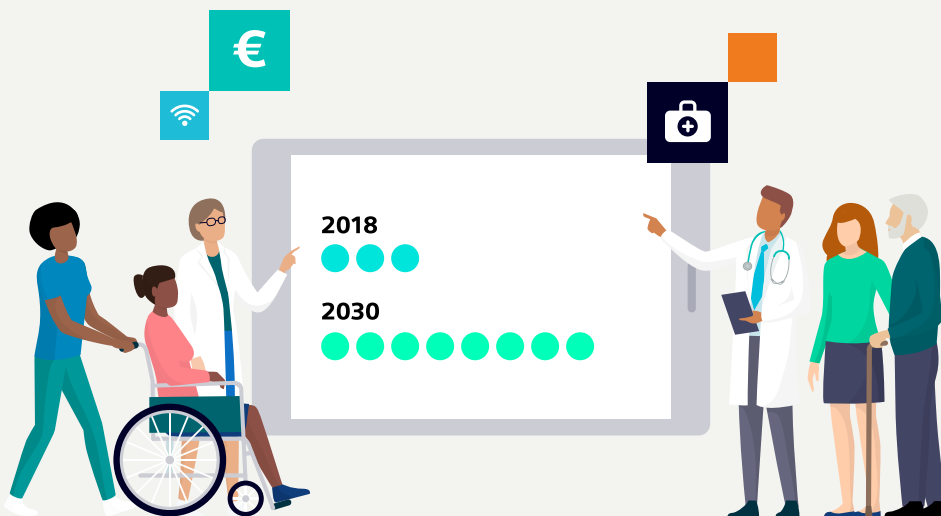
While most commentators now agree that digital transformation delivers major patient outcome, clinical efficiency and financial benefits to the sector, the cost of transformation still presents a headache for senior managers and healthcare finance professionals. Yet the imperative remains.

The World Economic Forum emphasizes that,

“A number of countries have recognized the transformative potential of digital health technology and have rightly invested significantly in the digital transformation of healthcare – expanding from 3% of the overall healthcare expenditures in 2018 to an estimated 8% by 2030, according to OECD data.”²⁹

And the benefits of digital transformation are well recognized. In a study conducted by Deloitte, around 92% of healthcare professionals and institutes achieved better performance from digital transformation.³⁰

Percentage of digital health technology investment as part of overall healthcare expenditures



Lack of **transformation capital**

Private sector finance is playing a critical role in the transformation of the health sector. As an article published by the World Bank notes, “for transformative impact, the private sector must be integrated across the health system – health financing, service delivery, policy and regulations, and health information systems, among others.”³¹

Digital transformation requires capital. At the moment, whether in the largely private US healthcare system, or the state-run systems in Europe and Asia, that capital is difficult to prioritize when day-to-day operating finance is under such pressure. Finance professionals in the healthcare sector are also wary of making investments in technology where all the performance risk is taken on by the buyer organization (the hospital).

Flexible finance is, however, available from specialist organizations and can be flexed to the exact requirements of the hospital, including low-start payment options, flexible financing periods, and pay-per-use options. Most importantly, solutions providers are prepared to link payment to actual outcomes – such as procedure volumes, energy savings, uptime and others.

The New York Proton Center is creating the gold standard for proton therapy, giving new hope to patients living with cancer. Working in conjunction with Siemens Healthineers, who provided the equipment, Siemens Financial Services (SFS) provided a holistic financial solution that took into account the Center’s business objectives beyond just equipment.

This comprised a unique financing solution that allowed the Center to immediately obtain the necessary equipment but defer payments for 12 months, allowing them to open after construction delays.

“Siemens has been a terrific partner to the New York Proton Center. Their responsive and creative financing structure provided important flexibility during a critical time in the project’s development.”

Jonathan Weinbach, Chief Financial Officer, New York Proton Center

Smart hospital solutions: a holistic approach

Many of the efficiency, clinical and care outcomes that healthcare systems are looking to achieve are made possible by digitalized technology – the underlying enabler of a ‘smart hospital’. And there are many individual areas of hospital activities that are benefiting from digital upgrade.

For instance, digitalized and connected information systems bring both clinical care and patient services to the patient’s bedside. Where infection control is a primary concern, doctors can visit their patient virtually through a bedside video conferencing screen with all the relevant patient records and monitoring data to hand.

Artificial Intelligence (AI) applications are also part of the digital transformation to create a smart hospital. To help manage the worldwide shortage

of radiologists, AI capabilities are presenting radiologists with an initial reading of each scan for them to verify and/or add to, saving laborious manual examination time.

Smart buildings, enabled through digital technologies, provide a setting for greater access to healthcare, improved patient outcomes/throughput, more efficient healthcare delivery, more rapid patient recovery, and reduced costs of healthcare over time.



A large-scale, integrated approach to data is exemplified at The Ankara City Hospital in Turkey. The hospital campus covers a floor area of 1.3 million square meters and currently has more than 4,000 beds and 131 operating rooms. All infrastructure systems are integrated into one common data environment.

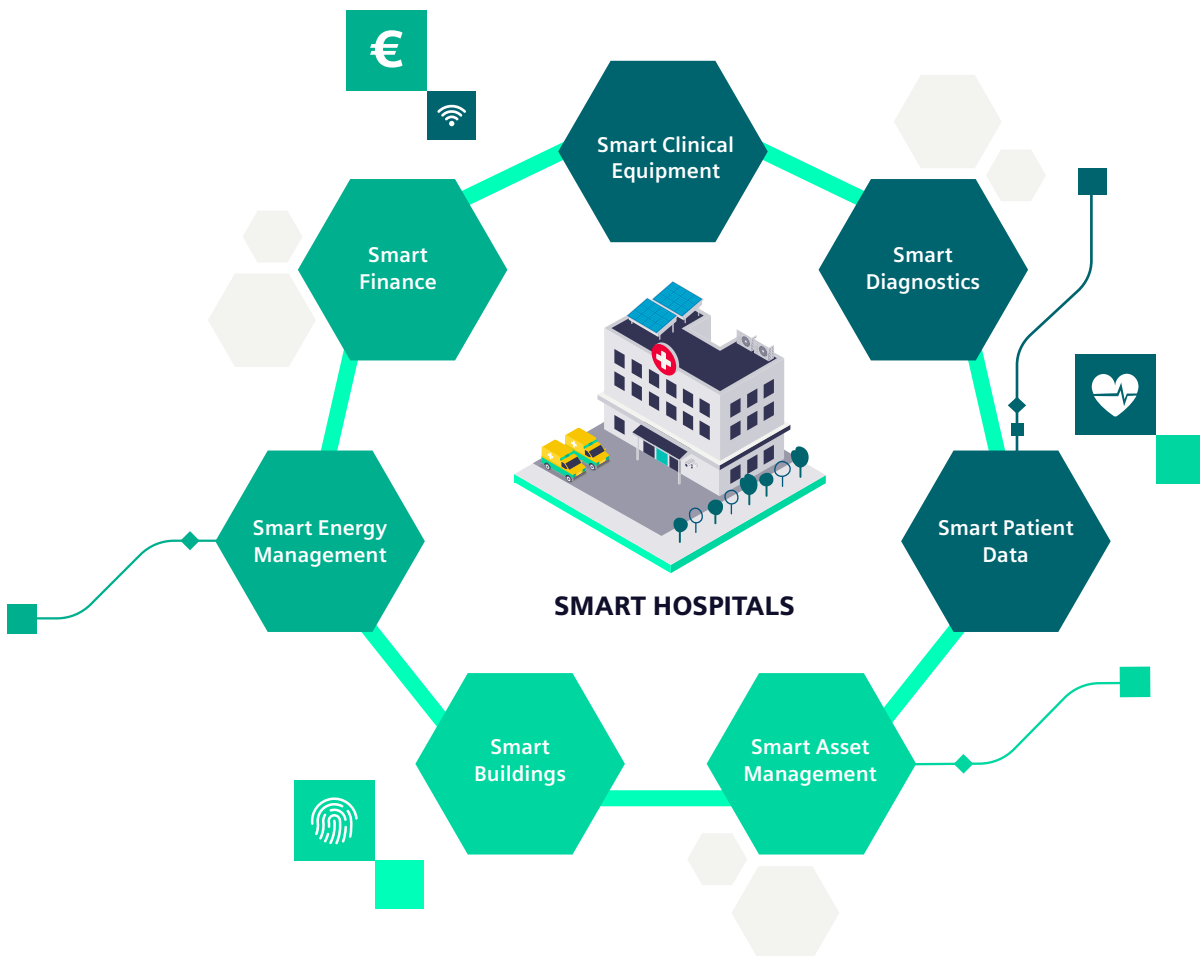
In the Ankara City Hospital one single management platform, Desigo CC from Siemens, monitors and controls 22 hospital subsystems with more than 800,000 data points coming from among others energy supply, fire protection, HVAC, lightning, access control, and CCTV. This approach to integration is scalable from small facilities to very large ones – as well as to facilities spread out over a region.

However, depending on patient needs, budget pressures, geography, and a number of other factors, individual healthcare institutions may wish to start their transformation journey at different points and pursue that journey in the sequence that suits their particular needs. The diagram below indicates the main potential entry points for digital transformation.

Because a hospital's digital transformation has many possible perspectives and stages, and because those stages are interconnected and inter-dependent, it is important that they are delivered under a single, coherent strategy.

No single technology supply-side organization can provide every aspect of digital transformation themselves.

However, there are a handful of strategic solution partners across the world who can offer a global experience of managing this transformation, guiding hospitals on their optimum journey and bringing together best-in-class technology options to facilitate transformation success.



In the best cases, technology, expertise, advisory and finance are all available via a single source, coordinating the best available technologies from multiple providers in an open ecosystem.

The inclusion of flexible financing facilities then brings all elements of a holistic solution together and makes them affordable and financially manageable for the hospital.

The following section of this short paper describes some of the ways in which flexible finance enables smart hospital transformation.



Admiraal De Ruyter Ziekenhuis (ADRZ) in the Netherlands is working with Siemens Healthineers in a 10-year-long strategic partnership that includes providing medical equipment, building works, financing, and management services.

This collaboration has yielded and will continue to yield significant clinical, operational, and financial outcomes.

- Design, construction, and leasing of six standardized operating rooms to improve quality of health services to patients
- Efficient primary care offered to roughly 248,000 people in the region
- 10% lower turnkey investment compared with conventional solutions
- Rapid availability of the new infrastructure (15 months from preparation to completion)
- €11.7 million capital freed up through embedded financing solution for other urgently needed investments



Smart Hospitals: enabled by flexible finance

Even once a hospital organization has decided to embark on digital transformation, the issue of how to afford the necessary investment can still provide an obstacle to progress.

New-generation technology and a holistic approach to transformation therefore need to be accompanied by access to flexible financing techniques. Smart finance makes it possible for a hospital to acquire its optimal digital transformation pathway at a cost and a payment schedule which matches its cash flow needs. In essence, smart finance aligns payments with the rate of benefits (capacity, efficiency, patient outcomes, costs) gained from smart transformation.

Chennai Scans in India is a diagnostic center established by four radiologists. The center wanted to upgrade its MRI technology to a model from Siemens Healthineers and was looking for flexible financing options to facilitate the investment. Specifically, the organization needed financing terms that could match projected cash flows for the first year. In collaboration with Siemens Healthineers, Siemens Financial Services was able to offer a uniquely tailored financing solution for Chennai Scans. SFS provided a six-year arrangement to make monthly costs manageable, and further customized the repayment structure to align with expected flows. To make the transition as smooth as possible, the first six instalments were set at a lower rate.

“With Siemens, we received the equipment on time and could establish our diagnostic center. They understood our timelines and cash flow requirements well and supported us all the way in achieving our goals.”

Dr. Mubarak RM, Director, Chennai Scans

The various forms of flexible finance for smart hospitals can be summarized as follows.



Pay as you use: Replace aging or obsolete equipment and technology. Specialist financing partners will flex financing periods to help fit digital equipment upgrades into current and projected cash flow requirements.



Tech refresh: Options that enable periodic replacement of equipment with 'new-phase' versions or alternatives – during the original financing period.



Equipment disposal/repurposing: Specialist asset finance providers have an international network set up to dispose of/repurpose/re-market equipment at its end of life.



Retrofit: This allows healthcare equipment to be digitally upgraded (software, sensors, etc.) to enable extended capabilities while retaining the core hardware platform.



Technology and buildings/facility adaptation: A single arrangement will include the technology, its installation, and the buildings technology that makes the whole facility work.



Managed services: In such arrangements, the technology provider agrees on a service level that it commits to provide – encompassing equipment/technology maintenance, service, uptime, and sometimes even human skills and outsourced peak demand management.



Energy efficiency: Smart financing arrangements make it possible to harness future energy savings and bring them forward to fund the energy efficiency installation project itself. No up-front capital is required, and the organization achieves sustainable goals at zero net cost.



Smart buildings technology: Smart buildings technology can improve the capacity and efficient throughput of healthcare facilities – a key target as healthcare demand continues to rise. Smart financing allows buildings to be made smart without the need to tie up capital.



Smart Buildings as a Service: This is a form of managed service agreement where performance criteria are built into the operating agreement. These criteria may include energy use, buildings occupancy, asset visibility, cleaning efficiency, patient satisfaction, and more.



Smart Hospitals: next steps

In short, this summary has demonstrated that the smart hospital revolution is under way, right across the globe. The clear benefits are widely recognized and institutions that do not grasp the advantages of digital technologies are likely to be left behind – both in the private and public sectors.

This paper recommends the following next steps for hospital organizations considering smart hospital transformation.

- Identify your starting point for smart transformation. Where can you gain the most benefit quickly? Is it through patient data at point of care? Is it through energy efficiency? Is it through asset tracking to make better use of precious staff time?
- Look for a holistic supplier-partner with deep experience of healthcare transformation and a strong pedigree in technology that delivers outcomes and value. Do they offer an open environment which allows you to receive a combination of best-in-class solutions? Do they offer process and enterprise consultancy which allows you to improve your processes, not just your technology?
- Ask whether financing is integrated as part of the solution. Can you flex financial options to fit your cash flow needs? Can you finance buildings and technology from a single source? Can financing be aligned to real-world outcomes, such as procedures delivered, patient throughput or energy savings?



Siemens Xcelerator is an open environment that enables the integration of systems from multiple vendors. This is crucial to deliver holistic and coordinated solutions for smart hospital transformation.

This initiative is delivering major benefits to healthcare institutions, including:

- More efficient hospitals through clinical data exchange and intelligent buildings
- MT, OT and IT that communicates effectively through open standards
- Transparent operations: costs, building performance, and delivered services
- Spaces and asset/people tracking that maximize productivity through data insights
- Flexible spaces that can adapt to the changing needs of operations, staff, and patients
- Compliant spaces: meeting regulatory demands
- Safe places: Systems help to prevent unauthorized access, track at-risk patients, and prevent and manage dangerous situations
- Environments that support healing through optimal conditions in critical treatment areas
- More sustainable energy: minimizing consumption and maximizing energy from renewable and local sources
- Reliable energy: ensuring energy supply needed to run effectively and best support energy resiliency and patient outcomes

If you would like to talk to Siemens about a holistic approach to smart hospital transformation, please contact:



Melanie Schmidt, Vertical Sales Manager
Siemens Financial Services, Commercial Finance
melanie.schmidt@siemens.com
+49 (173) 6208744



Alihan Arol, Global Portfolio Vertical Market
Manager for Healthcare, Siemens Infrastructure RSS
alihan.arol@siemens.com
+90 (216) 4592451

References

1. For instance: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8177960/>; <https://www.who.int/docs/default-source/documents/g54dhdaa2a9f352b0445bafbc79ca799dce4d.pdf>; <https://www.sciencedirect.com/science/article/pii/S2414644719300508>
2. https://ec.europa.eu/commission/presscorner/detail/en/qanda_22_2712
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7677115/>
4. <https://www.bmj.com/company/international-expert-roundtable-bmj-india/>
5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7986498/>
6. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10085457/>
7. <https://www.frontiersin.org/articles/10.3389/fpubh.2022.846641/full>
8. <https://www.htworld.co.uk/news/are-we-on-the-verge-of-a-quantum-leap-in-taking-diagnostics-to-patients/>
9. <https://www.weforum.org/agenda/2023/01/medical-recruitment-crisis-davos23/>
10. <https://mphdegree.usc.edu/blog/staffing-shortages-in-health-care/>
11. <https://www.healthdata.org/news-release/worldwide-shortage-health-workers-threatens-effective-health-coverage>
12. <https://www.forbes.com/sites/saibala/2022/08/26/the-healthcare-industry-is-crumbling-due-to-staffing-shortages/>
13. <https://www.politico.eu/article/europe-deep-health-care-staff-crisis/>
14. [https://www.thelancet.com/journals/lanseal/article/PIIS2772-3682\(22\)00100-7/fulltext](https://www.thelancet.com/journals/lanseal/article/PIIS2772-3682(22)00100-7/fulltext)
15. <https://www.scmp.com/news/china/politics/article/3203170/beijing-hospitals-battle-staff-shortage-and-patient-influx-after-chinas-sudden-zero-covid-switch>
16. See, for instance: <https://www.kingsfund.org.uk/publications/health-and-social-care-england-myths>; <https://www.sciencedirect.com/science/article/pii/S2590229620300198>; <https://www.health.harvard.edu/blog/is-our-healthcare-system-broken-202107132542>
17. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9403754/>
18. https://ec.europa.eu/commission/presscorner/detail/en/qanda_22_2712
19. <https://economictimes.indiatimes.com/small-biz/sme-sector/india-to-see-80-increase-in-investment-of-digital-healthcare-tools-in-the-next-5-years-mos-jitendra-singh/articleshow/95158469.cms>
20. <https://www2.deloitte.com/content/dam/Deloitte/cn/Documents/life-sciences-health-care/deloitte-cn-lshc-china-health-ecosystem-2030-en-220623.pdf> pp.16
21. https://www.ey.com/en_uk/smart-health/how-you-know-a-hospital-is-smart
22. <https://www.cdbb.cam.ac.uk/news/research-profile-smart-hospital-future-digital-technologies-service-innovation-and-hospital>
23. <https://www.digitalmarketplace.service.gov.uk/digital-outcomes-and-specialists/opportunities/16322>
24. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6702215/>
25. <https://www.himss.org/resources/guiding-principles-better-data-interoperability-healthcare>
26. <https://www.gesetze-bayern.de/Content/Document/BayRDG/true>
27. <https://www.mckinsey.com/industries/healthcare/our-insights/the-future-of-healthcare-in-asia-digital-health-ecosystems>
28. <https://www.who.int/publications/i/item/9789240064911>
29. <https://www.weforum.org/agenda/2023/01/healthcare-digital-transformation-infrastructure-davos23/>
30. <https://www2.deloitte.com/us/en/insights/industry/health-care/digital-transformation-in-healthcare.html>
31. <https://blogs.worldbank.org/health/unlocking-power-private-sector-build-resilient-and-equitable-health-systems>



All rights reserved. All trademarks used are owned by Siemens or their respective owners.

Published by

Siemens AG 2023

Siemens Financial Services
80200 Munich, Germany

For more information:

Phone: +49 89 636 40019


E-mail: communications.sfs@siemens.com

Updated (unless stated otherwise):

Autumn 2023

[siemens.com/finance](https://www.siemens.com/finance)

Follow us

 [linkedin.com/showcase/siemens-financial-services](https://www.linkedin.com/showcase/siemens-financial-services)