LEK™

DIAVERUM

CASE STUDY

Reimagining Dialysis Care:

A Best Practise Case Study on Diaverum's Digital Transformation

Key takeaways





01

As a raft of new technology companies enter the global healthcare sector, the challenge for legacy companies across healthcare services, life sciences and medtech is how best to position and transform their business in this fast-changing digital environment.

02

Diaverum's digital transformation best practise case study highlights the work of a global leader that offers a clear path for other healthcare companies to follow. It also demonstrates Diaverum's successful implementation of L.E.K. Consulting's Digital Excellence (DEX) Framework.

03

L.E.K. advises that the most important element for success is a visionary CEO and an engaged leadership team, with the ability to push through a digital strategy and transformation programme and ensure full organisational ownership.

04

L.E.K. believes that Diaverum's digital capabilities and upcoming 'digital twin' platform will have a real impact on patient outcomes, saving lives and reducing cost of care while at the same time driving economic performance and success for the business.

05

L.E.K. considers that global healthcare companies need to develop their digital capabilities as soon as possible.

Recent years have seen a significant increase in venture funding for digital health start-ups, with private companies and the public sector now investing heavily in digital health. This rising investment comes at a time when the global population is becoming older, wealthier and more in need of healthcare. In the U.S., total venture funding for digital health start-ups rose from €0.8 billion in 2011 to nearly €28 billion in 2021 with the average deal size increasing to €40 million, up from €12 million over the same time period.[1]

As a raft of new technology companies enter the global healthcare sector, the challenge for legacy companies across life sciences and medtech sectors is how best to position and transform their business in this fast-changing digital environment.

[1] Source for market figures: Rock Health

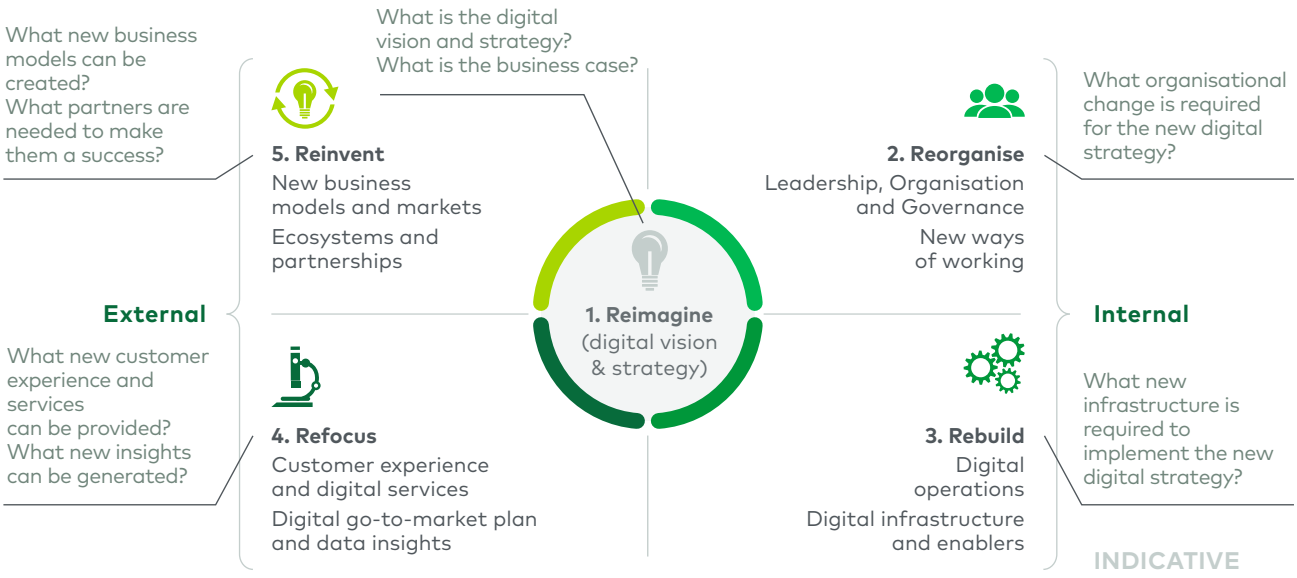
Introducing the L.E.K. Digital Excellence Framework

To help companies reap the rewards of greater digitalisation within their business, L.E.K. has developed the Digital Excellence (DEX) Framework, which identifies five key areas for management, boards and investors to focus on, as shown in Figure 1.

The five key areas are:

1	2	3	4	5
Reimagine: develop a digital strategy	**Reorganise:** build a digital organisation	**Rebuild:** establish a modern digital infrastructure	**Refocus:** maintain a relentless customer focus	**Reinvent:** continually renew business models

Figure 1
The L.E.K. Digital Excellence Framework helps to structure digital transformation in five pillars: Reimagine, Reorganise, Rebuild, Refocus and Reinvent



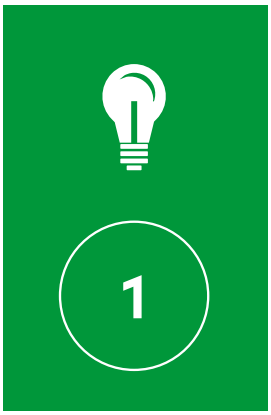
Source: L.E.K. research and analysis

Diaverum's digital transformation is a best practise case study which successfully illustrates L.E.K.'s Digital Excellence Framework.

The company is a leading global provider of renal care services, with a portfolio ranging from preventive care to dialysis and coordination of patient's comorbidities. Diaverum was founded in 1991 in Sweden and today operates more than 440 clinics in 23 countries, treating more than 39,000 patients globally.

Over the past three years, Diaverum went through a comprehensive digital strategy and transformation programme, with significant benefits for stakeholders, patients, healthcare funds and the business.

L.E.K. helped Diaverum to articulate its digital strategy, define stakeholder benefits, operationalise the transformation workstreams and provide organisational direction.



Reimagine: develop a digital strategy
Diaverum is reimagining dialysis care

At the core of L.E.K.'s DEX Framework is Reimagine: What is the digital transformation of your business going to achieve?

In 2018, the new Diaverum CEO, Dimitris Moulavasilis, questioned the lack of digital innovation within the kidney dialysis industry and began to establish a new vision for the digital future of dialysis care.

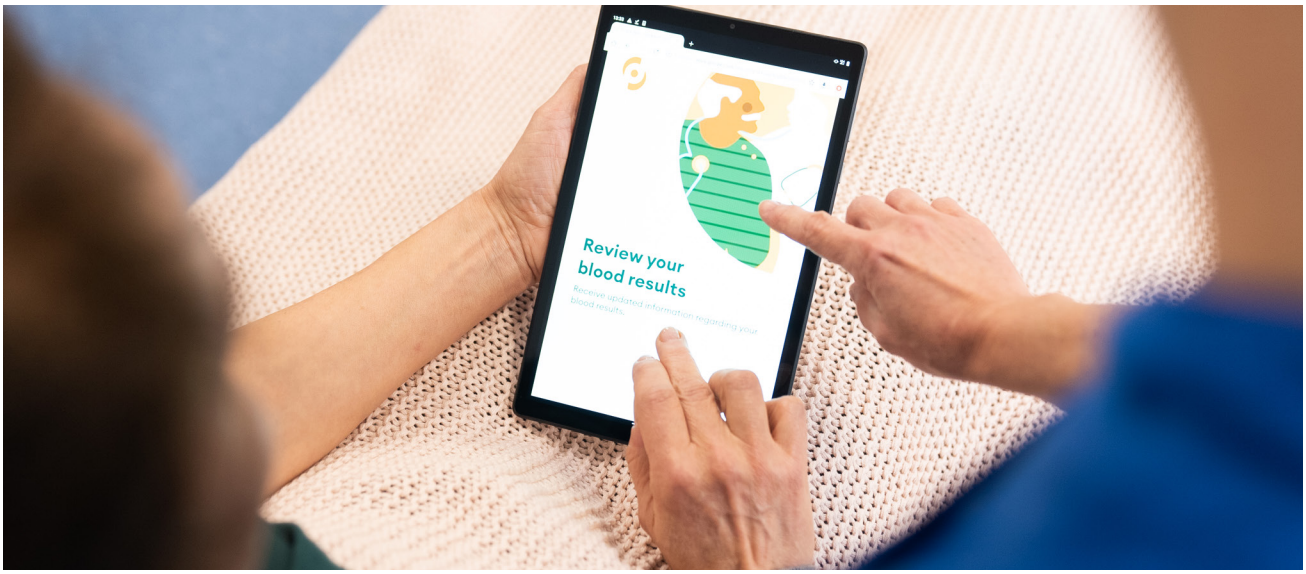
Chronic kidney disease (CKD) is an escalating global challenge. According to L.E.K.'s analysis, the global patient population with Stage 5 CKD — which requires regular dialysis — is growing at a weighted average of 6% per annum. This rising disease burden is also leading to an unsustainable rise in expenditure, which will impact national healthcare systems and patients globally.

Moulavasilis argued that the response to high expenditure and a rising disease burden should be the greater use of digital technology in renal care, making dialysis more personalised, more efficient and more affordable. He further proposed that the future of dialysis care would involve a combination of physical clinics, digital platforms, artificial intelligence (AI)-augmented treatment plans and mobile apps, leading to scalable, personalised, holistic, predictive and efficient care delivery.

The goal ultimately announced was to convert Diaverum's 30 years of dialysis know-how into a single digital platform which will connect with clinics around the world, enabling a new level of dialysis care. Diaverum labelled this new platform its 'digital twin.'

Diaverum's Digital Strategy

This new digital strategy was to be based on five pillars of transformation.



1. Establish a connected care environment, **connecting electronic healthcare records, operations systems, dialysis monitors** via Internet of Things (IoT) sensors, and patients via wearables and mobile apps
2. Introduction of innovative digital solutions to **digitalise clinical workflows**, minimise variation in standards of care, and drive automation and efficiencies
3. Full care delivery **datafication** — turning different care components and individual patients' health data into insightful and structured data, stored centrally
4. Introduction of **novel clinical insights** at the individual patient level that are easily aggregated at clinic and country levels, instantly available online, and enable physicians to deliver precision medicine
5. **AI solutions and predictive analytics** to augment physicians' clinical capability, drive predictive medical care and push the boundaries of medical outcomes and efficiencies

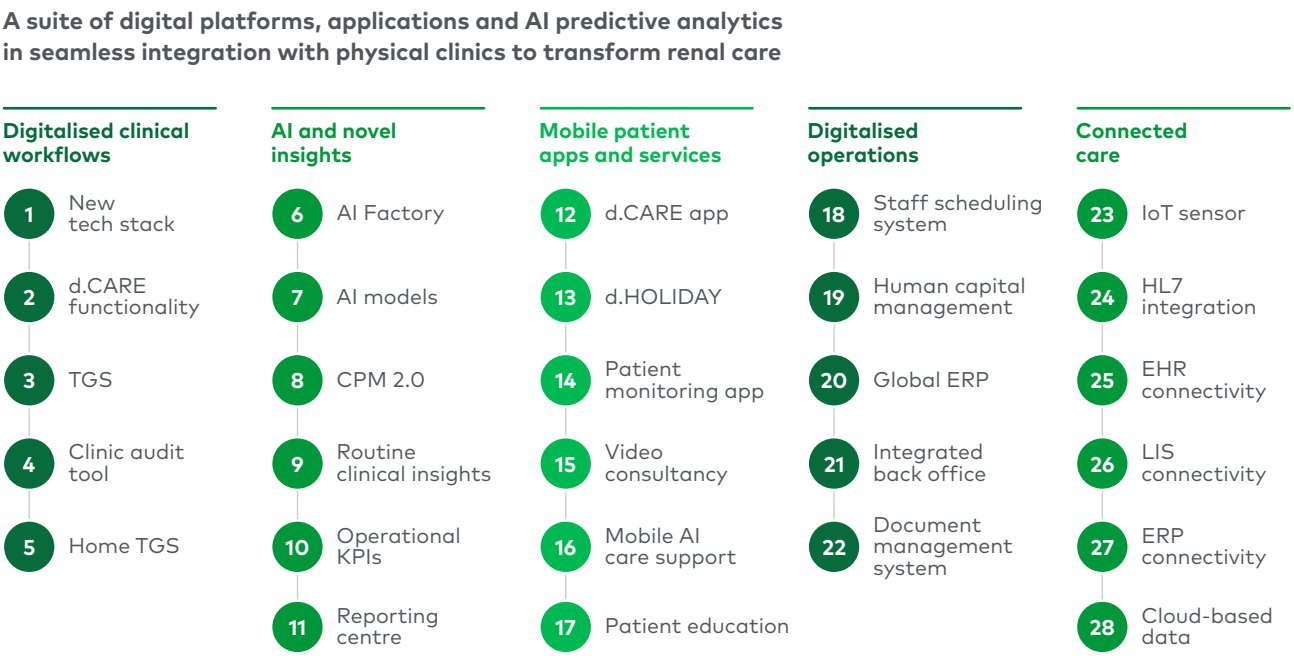
L.E.K. supported the Diaverum management team by:

- Helping to articulate, fine-tune and align the CEO's digital vision and strategy
- Simplifying and aligning the number of required IT projects and key workstreams
- Defining the overall structure of the business reorganisation programme and the goals and responsibilities for each workstream
- Designing a benefit-focused approach for the programme for relevant stakeholders

This joint work resulted in an updated comprehensive digital transformation strategy paper outlining the systems and digital solutions to be developed. Digital transformation was organised across five digital programmes and 28 workstreams (Figure 2), each with a clearly defined scope, ownership, timeline, necessary investment and expected benefits.

This process of digital transformation involves medical, management and digital teams across Diaverum and would necessitate a complete reorganisation of both the human and digital capabilities within its business.

Figure 2
Structure of the digital transformation programme



Source: L.E.K. research and analysis:

TGS=Treatment Guidance System, CPM=Clinical Performance Measurement, KPI=key performance indicator, ERP=enterprise resource planning, IoT=Internet of Things, HL7=Health Level Seven, EHR=electronic health record, LIS=lab information system

2

Reorganise: build a digital organisation
Diaverum's reorganisation to embrace digital

Diaverum began executing its strategy in 2019. The first step was the appointment of a new Chief Transformation Officer, Zoltan Szepesi, to drive the overall business transformation. At the same time, a programme management office was established to coordinate the execution of different projects.

It was clear to Diaverum that this would not only be the digital team's work, but would also represent a fundamental change in the way the wider organisation would operate going forward. With that in mind, the company's digital transformation projects involved medical, digital and operations experts, while senior leadership team members from around the world were encouraged to join different workstreams.

To encourage wider organisational ownership for the digital transformation, a monthly board update meeting was introduced, where the respective project leaders could report their progress to the CEO and the executive leadership team. Comprehensive internal communications were also launched, providing frequent updates and celebrating quick wins within the wider digital transformation journey.

It became evident that innovative digital solutions pave the way for care delivery innovation. In Diaverum's case, the availability of real-time data allowed its medical leadership to review its patient care measurement system, aiming to create more value for the patient and enhance treatment outcomes.

As a result, in early 2020 Diaverum's Chief Medical Officer, Dr. Fernando Macario, launched a new clinical performance measurement system (CPM 2.0), comprising 31 weighted parameters from eight areas of care. CPM 2.0 allows for the real-time measurement of data, giving each patient a CPM 2.0 score which can be monitored over time to track care delivery — then this score can be aggregated and reported at the clinic, country or group level.

Moreover, new outcomes of value had been defined and, in addition to mortality rates and average hospitalisation days, Diaverum started tracking health-related quality of life data and patients' reported perception of care.

In the field of **artificial intelligence**, there was a need for a bigger leap.

Diaverum engaged with an external data scientist to develop, operationalise and instill AI capability and introduce the relevant know-how to the development team while at the same time strengthening the organisation with new talent in data science and machine learning operations (MLOps).

Diaverum recognised three important ingredients for successful value creation through AI:

- The formation of a multidisciplinary AI team (data scientists, data engineers, business analysts, clinical ambassadors)
- The formulation of a clear and concise AI governance framework
- The development of a versatile MLOps platform

The latter, named Diaverum AI Factory, comprises several subsystems that can receive raw data, process it in the data warehouse and transform it into features readily available for use in AI model training.

3

Rebuild: establish a modern digital infrastructure

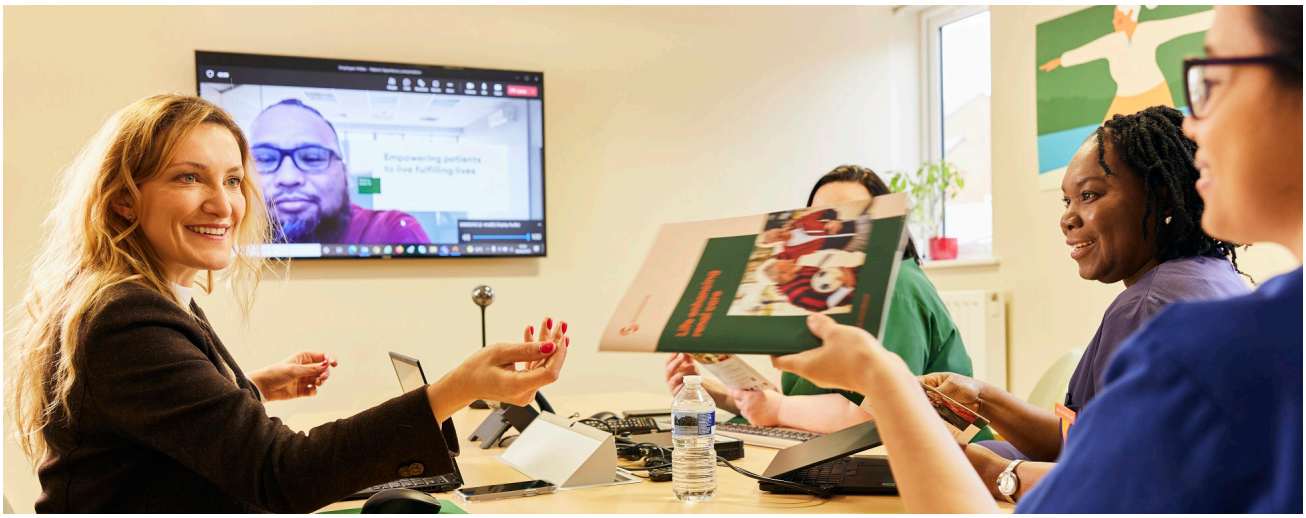
The new Diaverum "digital twin" platform

After 48 months of development work, Diaverum produced a new digital suite of healthcare solutions, applications and insights as part of its new digital platform.

To begin with, Diaverum established the new proprietary d.CONNECT connected care system, a fully automated solution for data collection encompassing dialysis monitors and weighing scales as well as IoT sensors, wearable tech and mobile applications. Data could then automatically populate systems to drive clinical workflows.

At the core of the transformation was the d.CARE platform, a novel renal information management system that contains data related to clinical management, medical reporting, and clinic processes and administration. The d.CARE platform goes beyond the traditional electronic health record system concept, as it drives all clinical workflows, providing prompt and relevant information for clinical decision-making at any time of care provision, supported by smart algorithms.

Diaverum then developed the d.CARE mobile app and the online Treatment Guidance System (TGS), both based on the d.CARE platform. The TGS — accessed via a tablet near the patient's chair or bed — collects information throughout the dialysis session, supporting

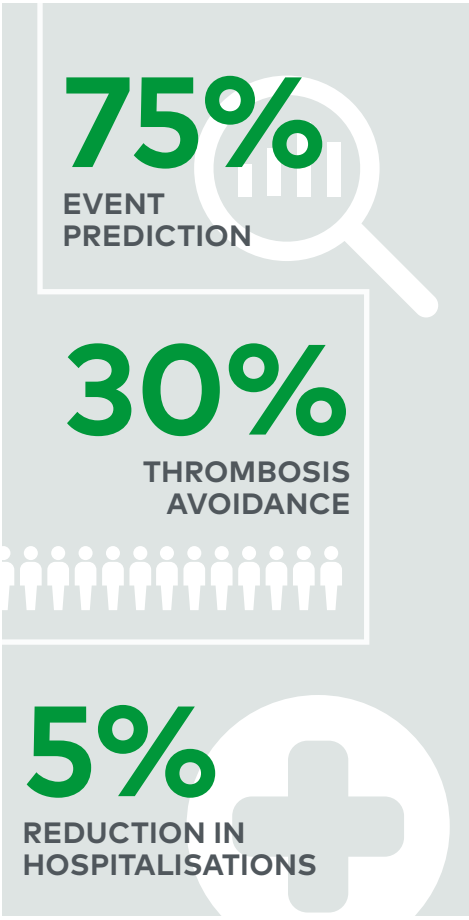


nursing staff in adhering to standardised clinical workflows, and allowing for increased automation and efficiency in patient care and the minimalisation of care variability.

Underpinning the Diaverum approach to renal care is full care delivery datafication. This leads to the construction of a multi-component structured data system, stored in a safe, centralised data warehouse, that can in turn provide novel clinical and operational insights.

The available key clinical information includes constant access to CPM 2.0 parameters, enabling physicians to deliver precision medicine and track quality of care delivery at the patient, clinic and country levels.

Building on this, Diaverum is now developing AI models in relevant areas that can augment clinical capabilities and improve medical outcomes, based on predictive algorithms.



In 2021, Diaverum launched its first AI project, focusing on the prediction of vascular access (VA) thrombotic events, using demographic, laboratory and treatment-related variables. A logistic regression model — trained using data from some 3,500 patients treated in Portuguese clinics and then tested using data from Portugal, Spain and Saudi Arabia — has been able to predict around 75% of thrombotic events one week before they occur.

By 2025, Diaverum estimates that, at full deployment, its AI VA thrombosis prediction model will add at least €500,000 to their EBITDA (calculated at 30% of thrombosis avoidance), based on lower treatment costs from the use of fistulas vs catheters, alongside reduced hospitalisation days and mortality. Moreover, it will improve patients' quality of life, increase longevity and create savings for national health systems from the avoidance of unnecessary thrombosis treatments.

By 2025, Diaverum is forecasting that the collective use of these new digital and AI technologies in dialysis care should result in a 5% reduction in hospitalisations and a 6% reduction on pre-COVID-19 mortality levels.

L.E.K. and Diaverum believe that AI-based tools have the potential to enhance diagnostic decisions, promote predictive analytics and contribute to evidence-based precision medicine interventions. In fact, in the future, it will likely become the standard of care to use AI to support most diagnoses and treatment decisions, as well as to enable patient-risk predictions and support monitoring.

4

Refocus: maintain a relentless customer focus

Driving medical outcomes and empowering patients to live a fulfilling life

CKD patients undergoing haemodialysis are usually older people, with many comorbidities related to the underlying kidney disease and treatment. This complexity adds to mortality and hospitalisation risks among the dialysis population.

Diaverum's digitalised care delivery model ensures consistent medical outcomes at scale, driving improved longevity, reduced hospitalisations and higher quality of life, as shown in Figure 3.

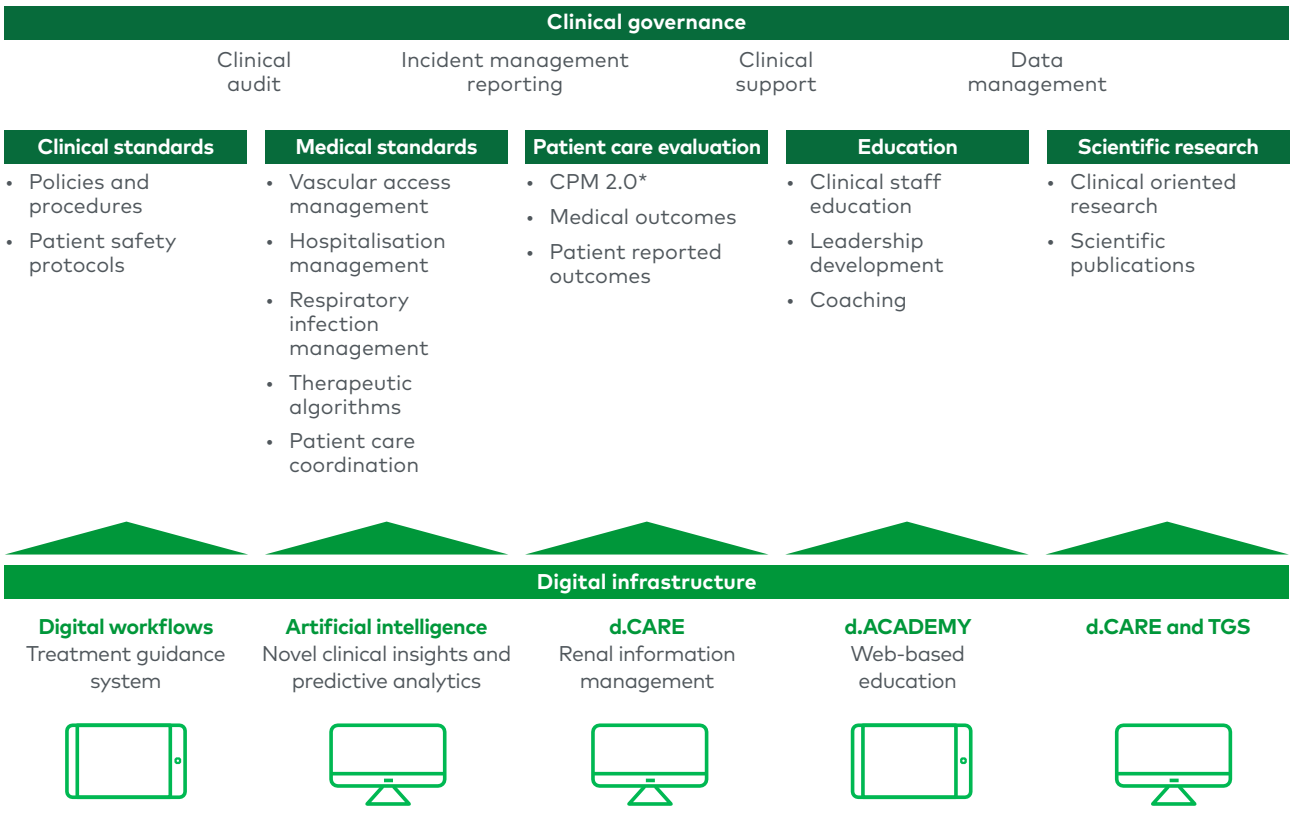
The individualised CPM 2.0 score creates a standard index to track care delivered to each individual patient, while the different measured parameters facilitate physician reviews and clinical audits.

The d.CARE app empowers patients to engage with their healthcare team on their ongoing renal care via smartphone or tablet; to input information on their health, diet and exercise habits; and to provide insights on their quality of life and feedback on their treatment experience. The app also provides patients with guidance and medication reminders.

Finally, the d.HOLIDAY online portal enables patients to book treatments seamlessly outside of their home clinic. This empowers them to enjoy world-class treatment while travelling for business or leisure or to meet family and friends.

Figure 3
Care delivery model and digital infrastructure

Diaverum's care delivery model consists of five pillars of excellence, governed by a robust clinical governance framework and enabled by a proprietary digital infrastructure



*Clinical Performance Measurement (CPM 2.0) is a proprietary metric established by Diaverum to evaluate clinical performance within its own clinics. CPM scores are based on a combination of 31 weighted parameters in eight areas of care in haemodialysis.

Source: L.E.K. research and analysis

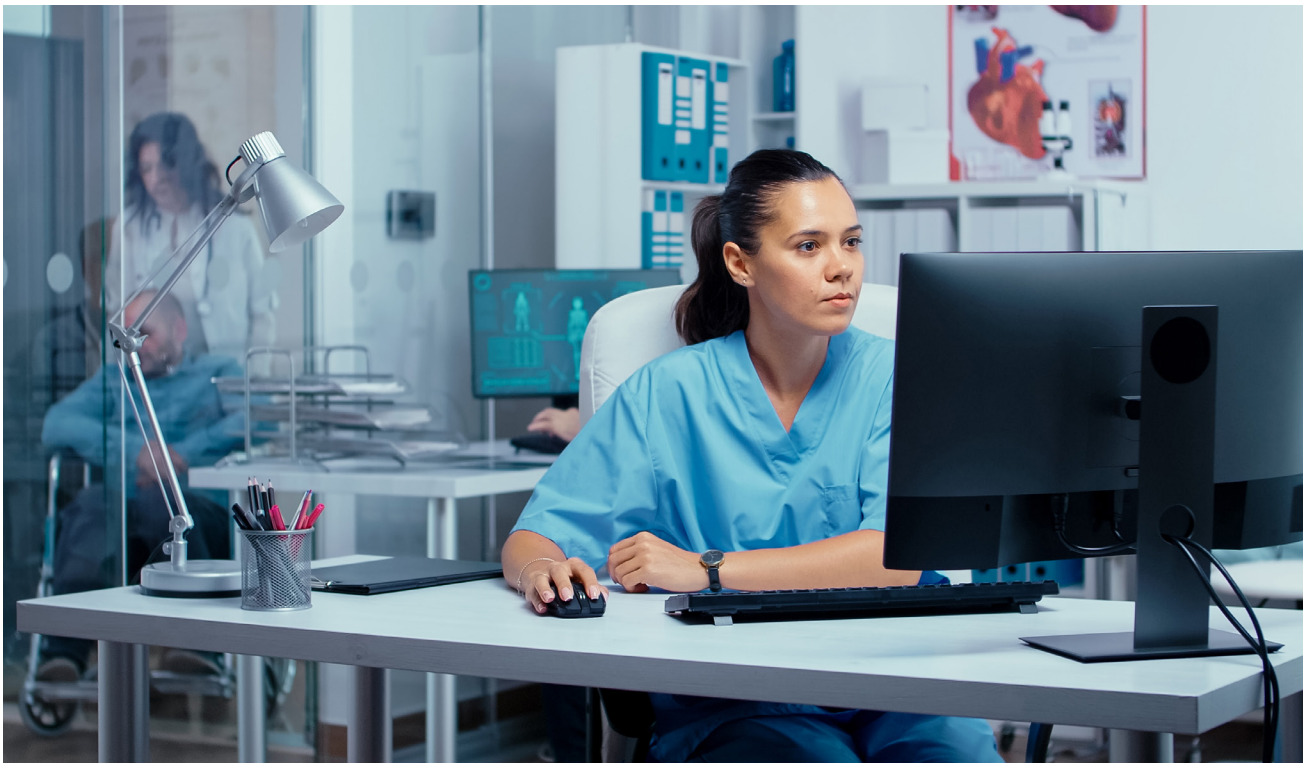
5

Reinvent: continually renew business models to move from a global dialysis organisation to a digital company

L.E.K. believes that Diaverum's digital twin platform will have a real impact on patient outcomes, saving lives and reducing cost of care, while at the same driving economic performance and success for the business.

However, the overall potential of the digital twin model is much greater. It will allow Diaverum to reinvent its business model by providing its core intellectual property as software as a service (Saas) to dialysis ecosystem partners globally, creating value for third-party providers by enabling premium medical outcomes, reduced mortality rates and operational efficiencies.

"We envisage adding value to the global nephrology community by making our platform commercially available in a SaaS concept, combining it with clinical governance, training and support services from our global teams" - Dimitris Moulavasilis, CEO, Diaverum.



"Diaverum's digital twin strategy is the most ambitious yet that we have seen in the dialysis sector, and it shows how strategic vision, organisational change and step-by-step implementation can lead to tangible and impactful outcomes for patients, payors, healthcare companies and investors all along the digital transformation journey!"

Klaus Boehncke, Partner,
Digital Health Lead,
L.E.K.

Lessons for the global healthcare industry

L.E.K. Consulting believes that global healthcare, life sciences and medtech companies need to develop their digital capabilities as soon as possible. As the Diaverum case study shows, it takes vision, energy and time to build the required infrastructure and new capabilities, alongside embedding an organisational change programme. Start-ups and other recent entrants to the industry are developing new, innovative and disruptive digital healthcare solutions on a daily basis.

The Diaverum case study demonstrates how global leaders are emerging to offer a clear path for other healthcare companies to follow. The most important element is a visionary CEO and an engaged leadership team, with the ability to push through digital transformation and ensure full organisational ownership.

Diaverum's digital transformation journey has also paved the way for them to become a healthcare software company, enabling third parties to provide local staffing and infrastructure while Diaverum provides the technology platform. This approach would be similar to that taken by Uber, where the ridesharing company provides the consistent digital quality and user experience globally through software, while the physical assets (cars) and human resources (drivers) are locally sourced.

Impact on the bottom line

The digitalisation of care delivery also comes with a positive financial impact, both for the organisation and for healthcare payors.

Digitalised clinical workflows and automations improve the efficiency of the labour force required to deliver the service. Diaverum suggests that TGS alone can achieve a 10% efficiency improvement, while also allowing technicians and assistant nurses to play a prominent role in treatment, guided by Diaverum's digital tools.

Reduced average hospitalisation days per patient has a direct positive impact for the health payors, leading to savings from avoidable and unnecessary treatments. Another area of direct health system savings comes from the rationalisation of pharma consumption, enabled by intelligent prescription algorithms.

Overall, improved patient care becomes a driver of patient organic growth — beyond the disease's prevalence in the clinic's area of operations — due to increased patient longevity, enhanced clinic reputation and greater patient loyalty.

Is your healthcare organisation digital-ready?

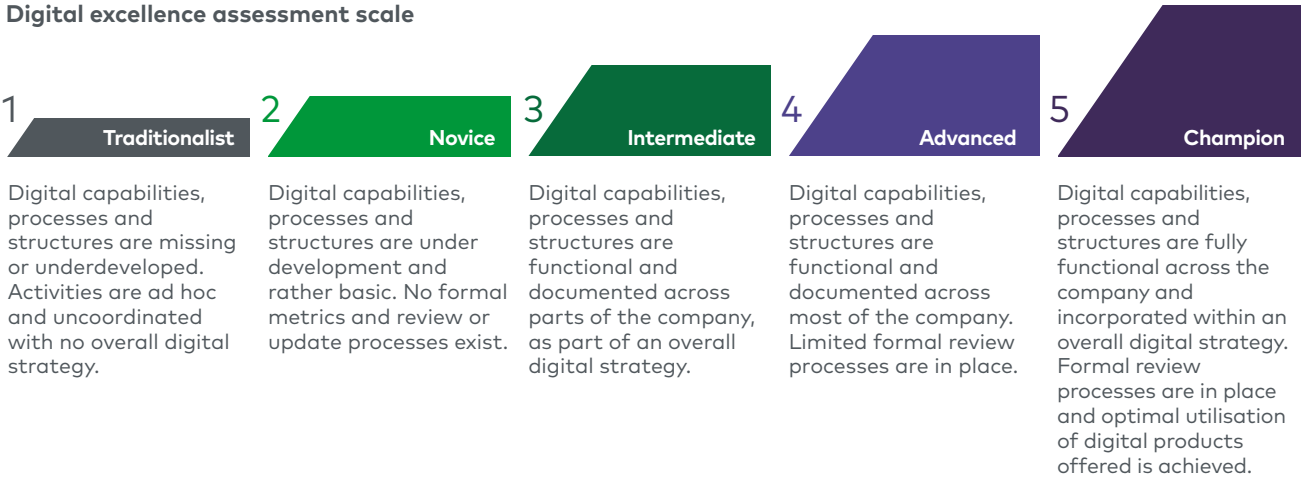
Faced with the growing challenge from start-ups and tech companies, boards and CEOs of legacy health sector participants are increasingly asking questions such as "Are we moving to digital fast enough?" and "How can we establish a digital mindset amongst our employees?" Even once the decision is taken to begin a digital transformation, there are the two fundamental questions of "How digitally mature are we already?" and "What should we do next?"

L.E.K. Consulting has developed a digital excellence assessment scale, as shown in Figure 4.

After surveying our clients on a range of success factors, such as digital strategy, ecosystem development and organisation, we then assign them to one of the five categories shown.

We believe that Diaverum is well within the advanced level, with most of the components of its digital strategy already in place. Moreover, a great deal of its digital twin functionality is already available or currently being rolled out across the organisation, indicating that Diaverum's progression to the champion level is within its reach.

Figure 4
We measure the digital excellence of an organisation on a five-point scale



Source: L.E.K. research and analysis

To find out how your healthcare business can benefit from a digital excellence assessment and to learn more about L.E.K. Consulting's Digital Excellence (DEX) Framework, contact **Klaus Boehncke**, Partner and Digital Health Lead. Discover more about L.E.K.'s Healthcare Practice **here**.

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