zensar

The Digital Proliferation of **the Healthcare Ecosystem**

Focused on patient engagement, diagnostics and personalized care

White Paper

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Market Outlook and Analysis

Zensar's expertise in the medtech space in particular, and the healthcare ecosystem in general has given rise to many deep insights into the way forward in digital enablement. Experience in digitizing wound management technology with a global advanced wound therapeutics company, optimizing clinical pathology and dental healthcare systems with a Fortune 500 diagnostics and life sciences innovator, and other varied, rich experiences has given us an opportunity to study closely, the healthcare space and its way forward.

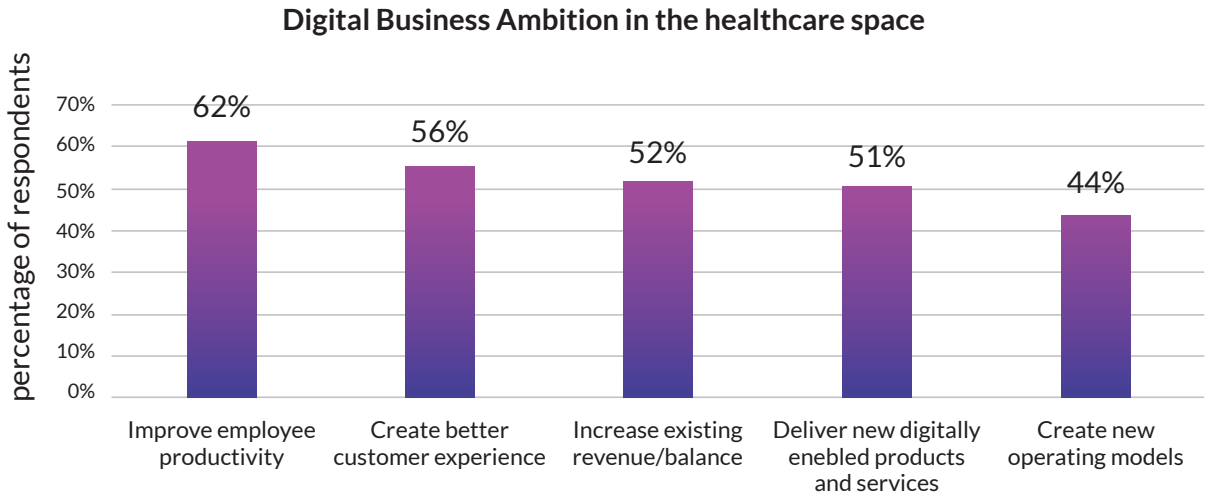
It is this experience and in-depth association with the healthcare industry that has led to believe that proliferation of digital transformation has mostly been focussed on primitive areas such as provision of public medical information, scheduling systems, clinical record keeping and the like. But when it comes to areas like diagnostics, customer engagement and analytics, there has been little to no digital transformation in most mainstream healthcare provider value chains. Both primary and secondary[1] research supports the same hypothesis.

	Manufacturing	Education	Retail	Healthcare providers	Financial services
Information System Platform	55%	58%	65%	63%	66%
Customer Experience Platform	58%	48%	73%	49%	67%
Data Analytics Platform	54%	42%	57%	46%	67%
Ecosystems Platform	43%	37%	60%	56%	60%
Internet of Things Platform	52%	38%	54%	49%	61%

Q) Capabilities of organisation's digital platforms
A) Percentage of respondents

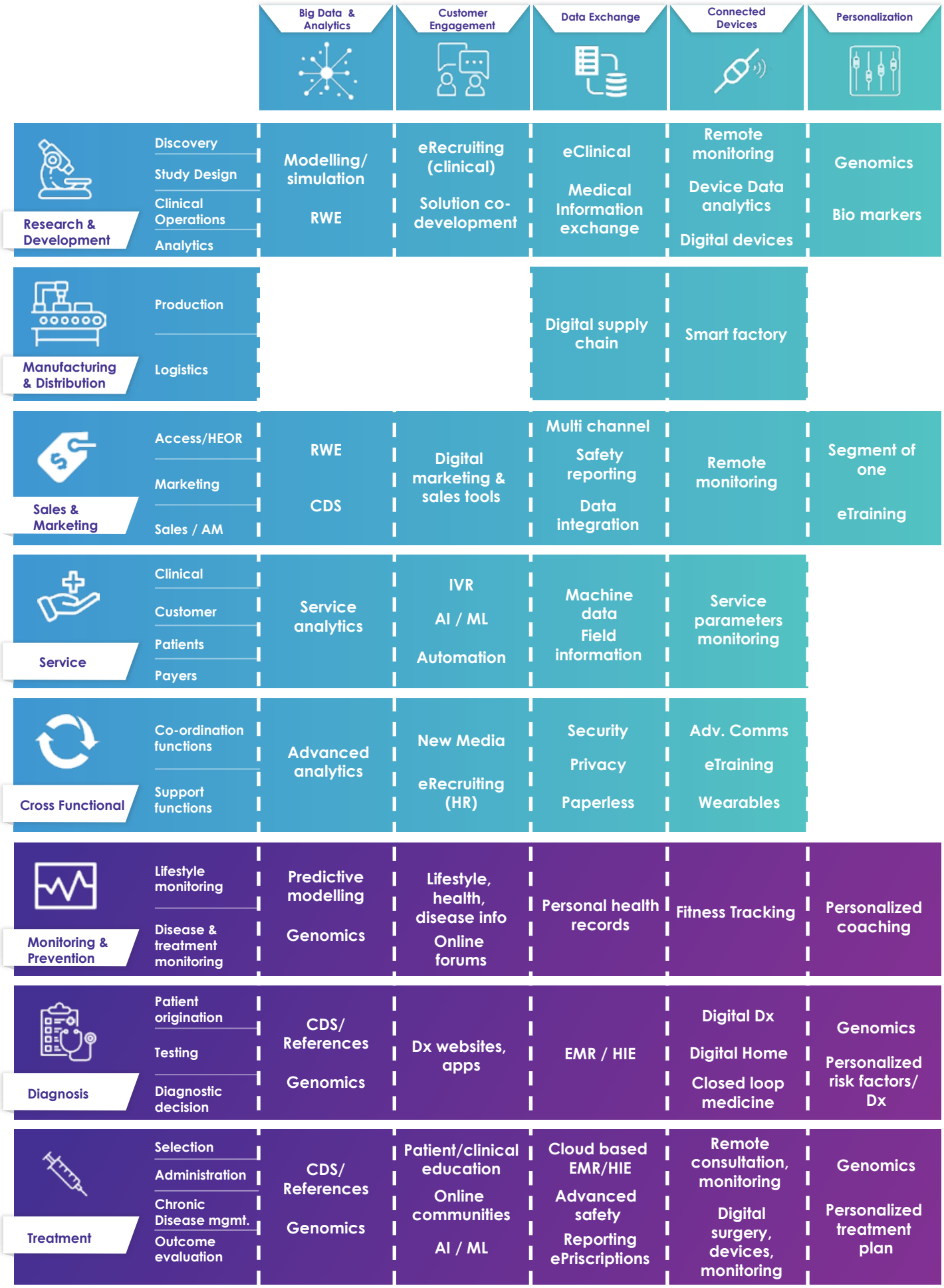
Weak Proficiency — Strong Proficiency

Research reveals that the proliferation of digital is more focussed on information systems platforms but major areas like customer experience, diagnostic data analytics or even IoT enablement of on ground devices are still lagging, especially when compared with other industries. Hence, an in-depth survey of our clients and technology partners was performed in order to assess the MedTech and healthcare landscape and proliferation of digital transformation initiatives across the value chain. What is holding us back? Is it the desire to go digital? The survey coupled with secondary research[1] revealed that healthcare providers have high levels of ambition for digital optimization and transformation of their businesses



Therefore, with ambitions in place, the question now comes to where the efforts must be focussed to ensure the maximum impact and returns for healthcare providers and consumers a like.

Owing to the extensive experience in the MedTech and digital healthcare field , we strongly believe that IT Transformation's role in Digital Health going forward would revolve around adopting initiatives focussing on predictive and analytics based diagnostics, patient engagement and personalized experiences with an end goal of transforming business model aligning with value-based care model across the global region. To that end, we have identified a number of potential opportunities for Digital Health Acceleration in the digital health value chain through our proprietary digital Health Opportunity & Relevance Matrix:



The matrix details several initiatives across the combined medtech and healthcare value chain including the following components:

- Research and development of new and alternative drugs and medical procedural/ techniques
- Medical device/ pharma-based manufacturing
- Market research and sales training for medical device/ medical care product/service line-up
- Support services for after sales care and monitoring

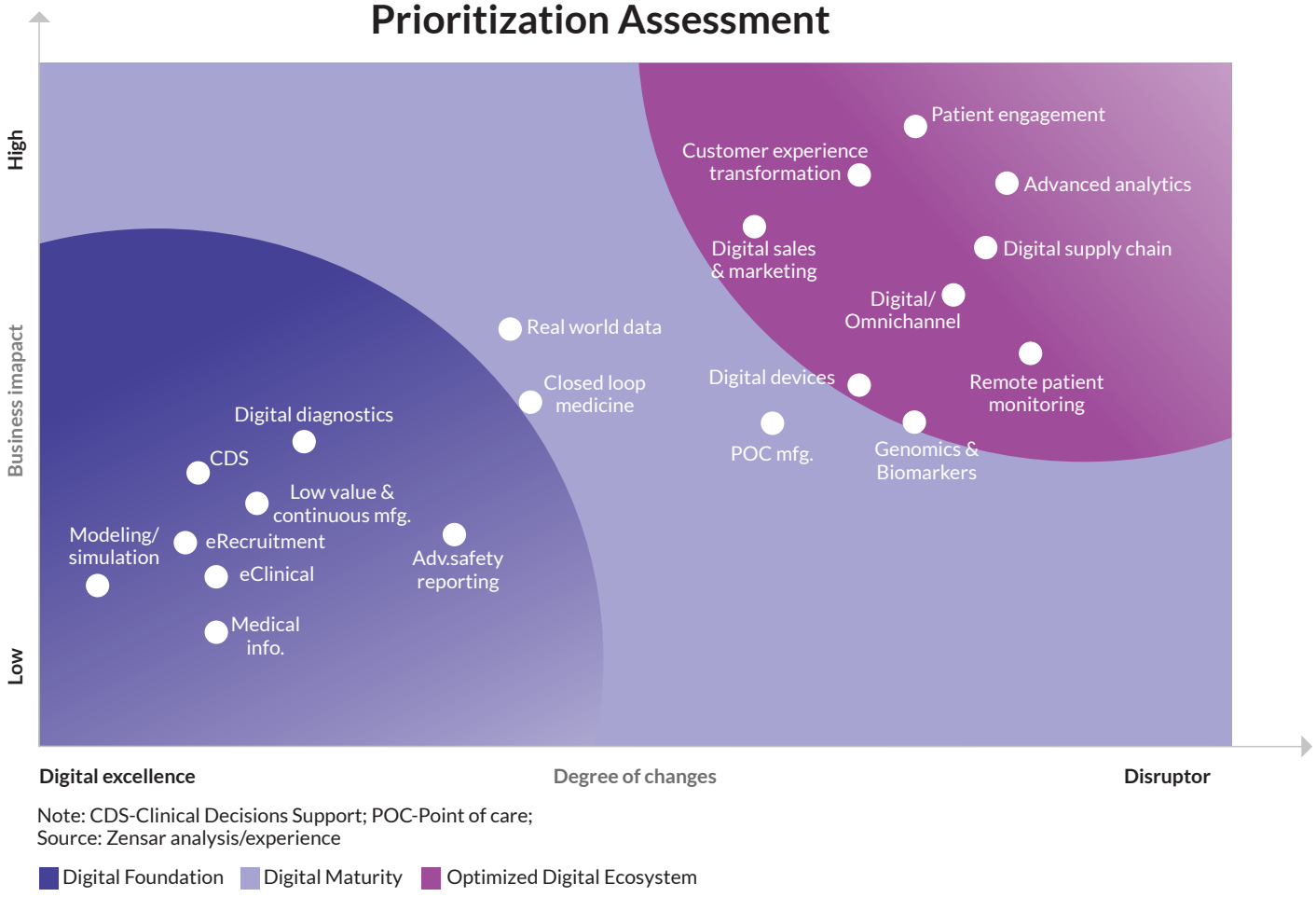
What areas should be prioritized?

While the initiatives in the traditional health care value chain are top contenders for digital transformation going forward, Zensar research has shown that initiatives in the field of predictive analytics and monitoring, advanced and personalized data based diagnostics and improved treatment methods and remote access abilities are key upcoming disruptors in the healthcare space.

Prioritization of these initiatives is key, especially when dealing with niche markets and different treatment ecosystems. Hence the most granular level of prioritization will vary from firm to firm. However, there are certain factors that are agnostic and can help one decide on which step to take first on the development and implementation journey.

Zensar recommends prioritization on the basis of two factors:

- Digital transformation prowess required for the initiative
- The business impact created by the initiative



Note: CDS-Clinical Decisions Support; POC-Point of care;
Source: Zensar analysis/experience

Digital Foundation | Digital Maturity | Optimized Digital Ecosystem

Zensar believes that, depending on their respective parameter values on both the axes, a handful of the digital initiatives in the healthcare space have been grouped into the following:

Digital Foundation

These initiatives are mostly transactional in nature aiming to ease the process of basic healthcare functionalities. Their implementation and active use require relatively primary digital prowess and adoption and are generally low on business impact across the healthcare value chain.

Digital Maturity

These initiatives have more substantial business impact and require significant digital transformation within company operations and approach to pull off successfully. There is also a large dependency on customer adoption of digital methods and the maturity of base of medical technology expertise that may not necessarily be one's bread and butter

Optimized Digital Ecosystem

These initiatives can only be accomplished with disruptors in the digital transformation space within the healthcare ecosystem that have broken away from the traditional industrial benchmark for the same and are the pioneers for digital enablement of healthcare services. These initiatives also have the biggest business impact over the long term and provide meaningful and ground-breaking changes to the way the average consumers engage with the healthcare ecosystem.

Depending on investment priorities and the particular area of operation for the healthcare provider, indicatives can be prioritized, and low hanging fruits can be taken forward to maximize returns for the company.

Zensar research has shown that certain solutions can have a much larger long-term impact tan others and would play a critical role in digital development of those looking to become pioneers in the healthcare space:

Patient inclusive ecosystem

A patient inclusive ecosystem leads to greater and exponentially growing business benefits to healthcare providers. Digitally enabled systems can transform a patient into a crucial node of information in the healthcare value chain. Patients can interact to create product awareness, guide other patients about their experiences to create best practices as consumers, give them dos and don'ts and create a community around patient experiences through chats, information videos and the like.

Businesses benefit as the patient becomes more informed reducing the need and instances of caregiver visits, turning the system from "always on management" to "management by exceptions" as patients become self-governing gradually. Moreover, the quality of the queries change as patients

become more informed, improving customer satisfaction, reducing call times and by extension the need for more helpline call center staffing.

Predictive Health Alerts

The utilization of data for clinical care and diagnostics is not a new idea, however the sheer volume, velocity, veracity and variety of these data is unprecedented. Coupled with disruptive digital innovations, such as machine learning and artificial intelligence, we are now witnessing the digital revolution of the diagnostics world.

For health care, predictive analytics will enable the best decisions to be made, allowing for care to be personalized to each individual. And based on personal data, pattern recognition and related alerts to future illnesses can be crucial in many cases to pre-empt the damage. Cold Spring Harbor Laboratory, a research firm uses the same to make it easier and quicker for providers to detect acute kidney injury in hospitalized patients[2].

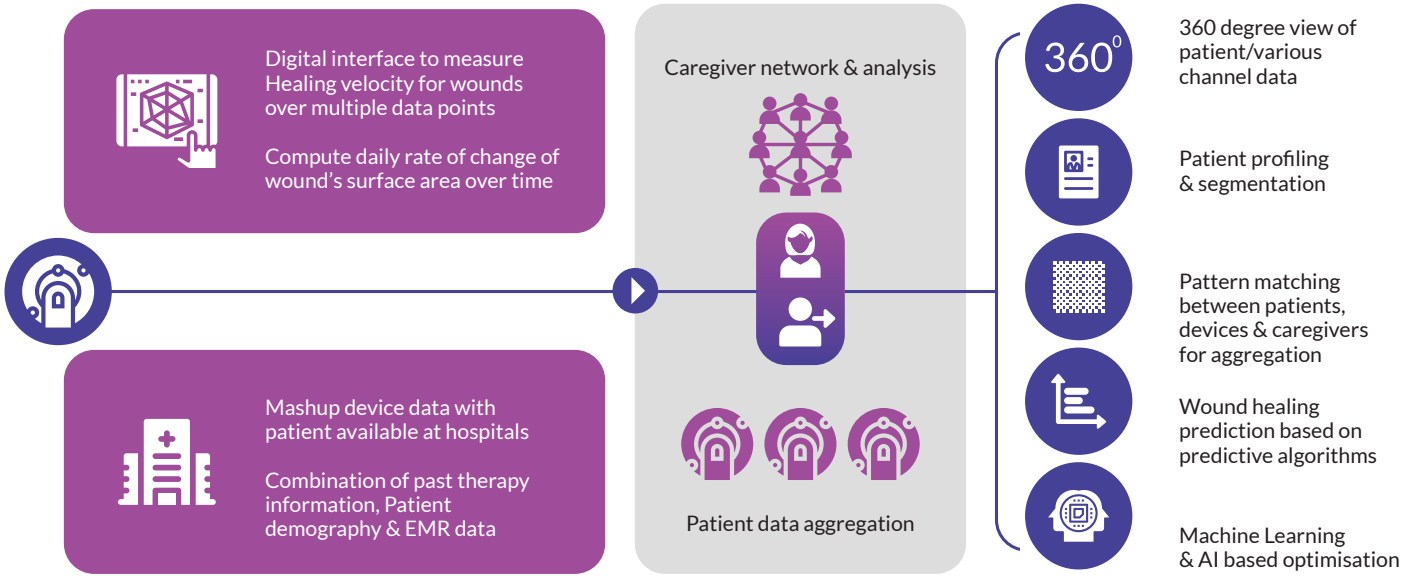
Digitisation will enable care providers to collect data on a large scale, identify certain attributes as predictors, and develop algorithms. These algorithms can then be applied from training data to the patient specific attributes and then suggest recommendations or create alerts to warn of potential upcoming illnesses/symptoms. The algorithm can then record results relative to the recommendation and learn from itself to improve algorithm. Over a large dataset, gradually this algorithm will become an accurate predictor for medical illnesses potentially saving lives due to timely action and will help in management of chronic illnesses as well.

Data Driven Clinical Care, Diagnostics and Analysis

Internal analysis and market experience has shown that most medical devices are primitive in nature in their data collection or data analysis capabilities. Multiple data points were often ignored leaving a lot of potential value on the table unutilised or at best, underutilised.

As more and more data points are collected and auto analysed, it eliminates half the job for human engagement stages with clinical analysts or doctors from the healthcare provider's side, reducing engagement costs and improving customer experience for end users. Zensar's own experience with digitizing wound management is a good example of how data driven clinical care can work ideally

Zensar's experience has shown that most wound management devices leave a lot of data on the table, which could have otherwise been used to speed up the analysis. Furthermore, due to the high inaccuracy of wound evaluation techniques, specifically ruler measurements, it is extremely difficult to quantify changes in a wound's progress. In addition to the lack of an accurate and objective quality metric for evaluating wounds, modern electronic health records are simply not built to handle analysis of data.



A modern digitally enabled wound management system not only collects data over multiple points but also uses databases to provide better qualified recommendations and analysis. Such a solution has been detailed below:

Digital transformation in data collection, analysis and aggregations can enable many features such as

- Automated Wound heal rate analysis
- Multi point heal velocity measurement
- Retroactive comparison of captured data for creation of predictive models and alerts
- Pattern recognition and subsequent aggregation of similar patients to provide a reference database for customers
- 360-degree view of patient data across different channels to centralise information for service providers and caregivers
- Visual imaging to analyse and create real time 3D renders of wounds and healing progress

Digital enablement, therefore, can make possible many advanced wound management techniques and is helping patients today. Tissue Analytics3, a Baltimor3e based medical technology company develops software solutions that use artificial intelligence to automatically and objectively extract high quality data from clinical images. The solution has the added benefit of increasing productivity and reducing the costs associated with clinical trials.

What kind of architecture is needed to make it all possible from the ground up?

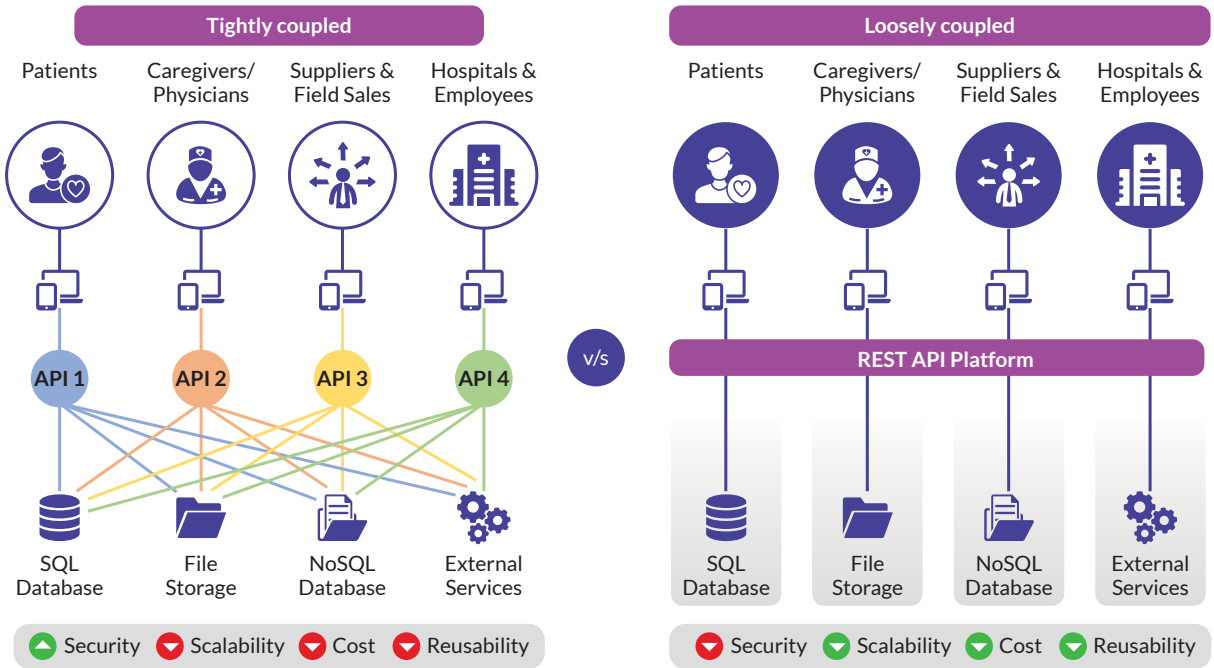
System architectures are a key component of the healthcare ecosystem. It is the design of the system architecture that will determine the way it is able to interact with data which increases in its complexity and sensitivity as it matures. In a healthcare ecosystem that is trying to curate, analyse and communicate large and mostly confidential data in an effort to digitize the customer experience, there are two factors that are critical.

Security

Similar to financial records, the importance of confidentiality and the high risk posed to both the end user and the service provider in case of a lapse of the same make security one of the top concerns. In fact, a recent study4 shows that nearly 90% of healthcare organizations suffered data breaches in the past two years, bringing the total cost of data breaches in the healthcare industry to as much as $6.2 billion. The sensitive nature of information such as customer health parameters, prescription data, medical procedure records, insurance and personal details have to be kept confidential.

Scale

Technology & demographic change requires digital health and social care solutions to deploy on an increasingly large scale to keep the costs of care sustainable without reducing its quality. What we have seen in the industry is that, many attempts to develop innovative solutions have shown success at pilot level, but face difficulties in the actual deployment stage. The same holds true for the transferability of solutions from one region to another: what works well in one place, might not work well in another.



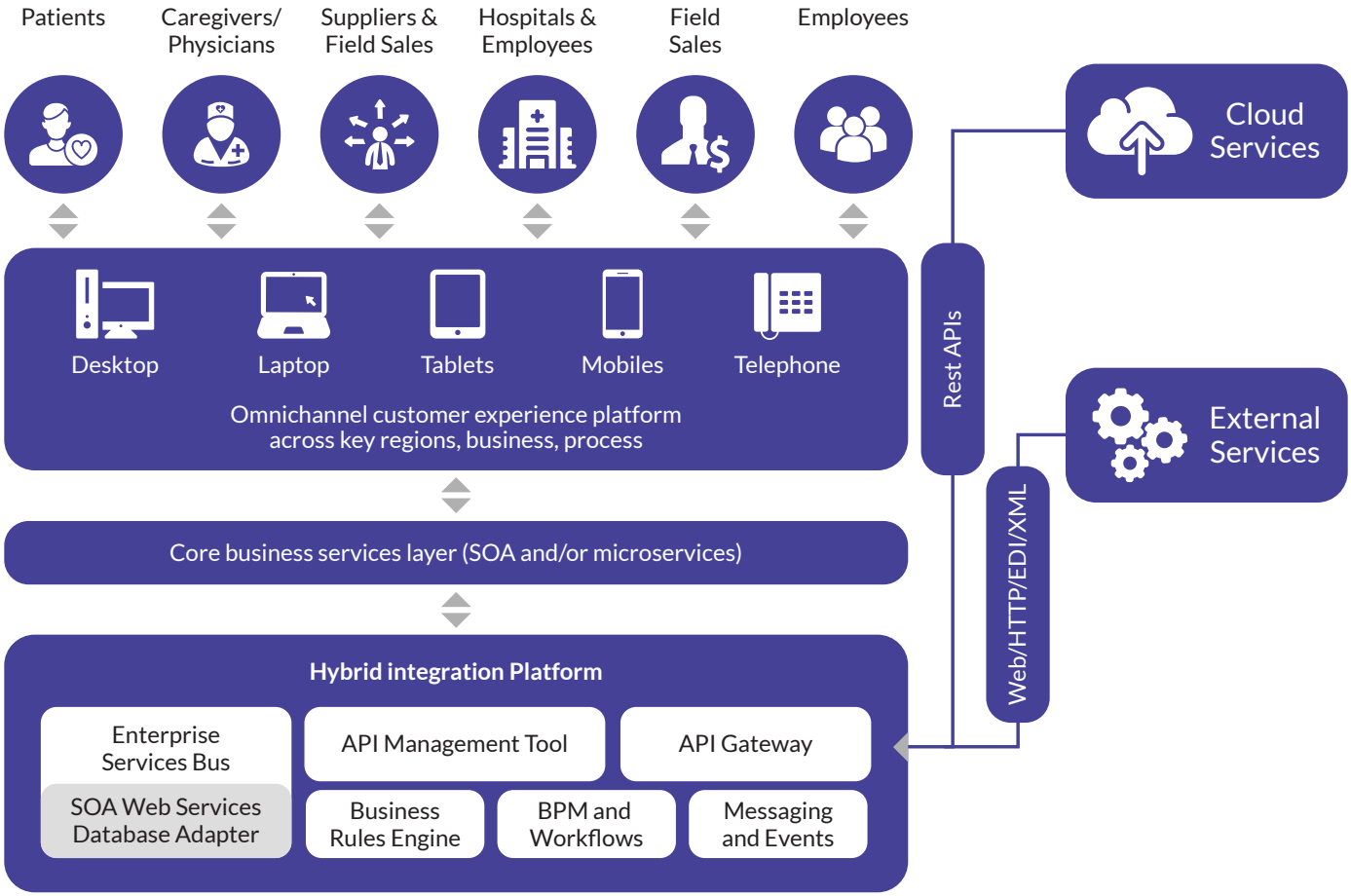
Optimizing for these two factors starts at the system architecture level where you have the option of a tightly coupled or loosely coupled architecture. Both have its pros and cons as described below: A tightly coupled system is secure in nature as the interdependence of the different components and subsequent processes prevent exploitation of a single point of access, potentially exposing confidential and sensitive data. Hence, the secure nature for a tightly coupled system is ideal for handling data of a sensitive nature which is the mainstay of the healthcare ecosystem.

On the other hand, the very interconnected and interdependent nature of a tightly coupled system reduces its ability to scale effectively with larger and more complex datasets. It also reduces the reusability of system components as any redesign of a single system component would limit/stop the functionality of other components due to interdependence.

A loosely coupled system runs on the principle of fully functional independent systems which are interconnected in nature and have minimal interaction between them. Hence a malfunction in one component does not lead to system stoppage. This independent nature leads to high scalability and is ideal for non-essential data that needs to be transacted in large volumes. The reusable nature of the components also leads to low cost.

Hence, a hybrid system of tightly coupled components dealing in sensitive customer data and loosely coupled components dealing with non-critical transactional data would ideally be able to scale and protect consumer records while providing customers with the digital health ecosystems that providers aspire to. Additionally, the architecture can be modified in accordance with the kind of devices that their ecosystem involves. For instance, in case it deals with a large number of Class I medical devices (an aggregate of 47% of devices fall under this category), the architecture can be more focused on loosely coupled elements, as the devices pose a lower risk to the patient and/or user. However, if the system deals with Class II and Class III medical devices (43% and 10% respectively) the system deals with more risk for the patient and hence should be tilted towards tightly coupled elements.

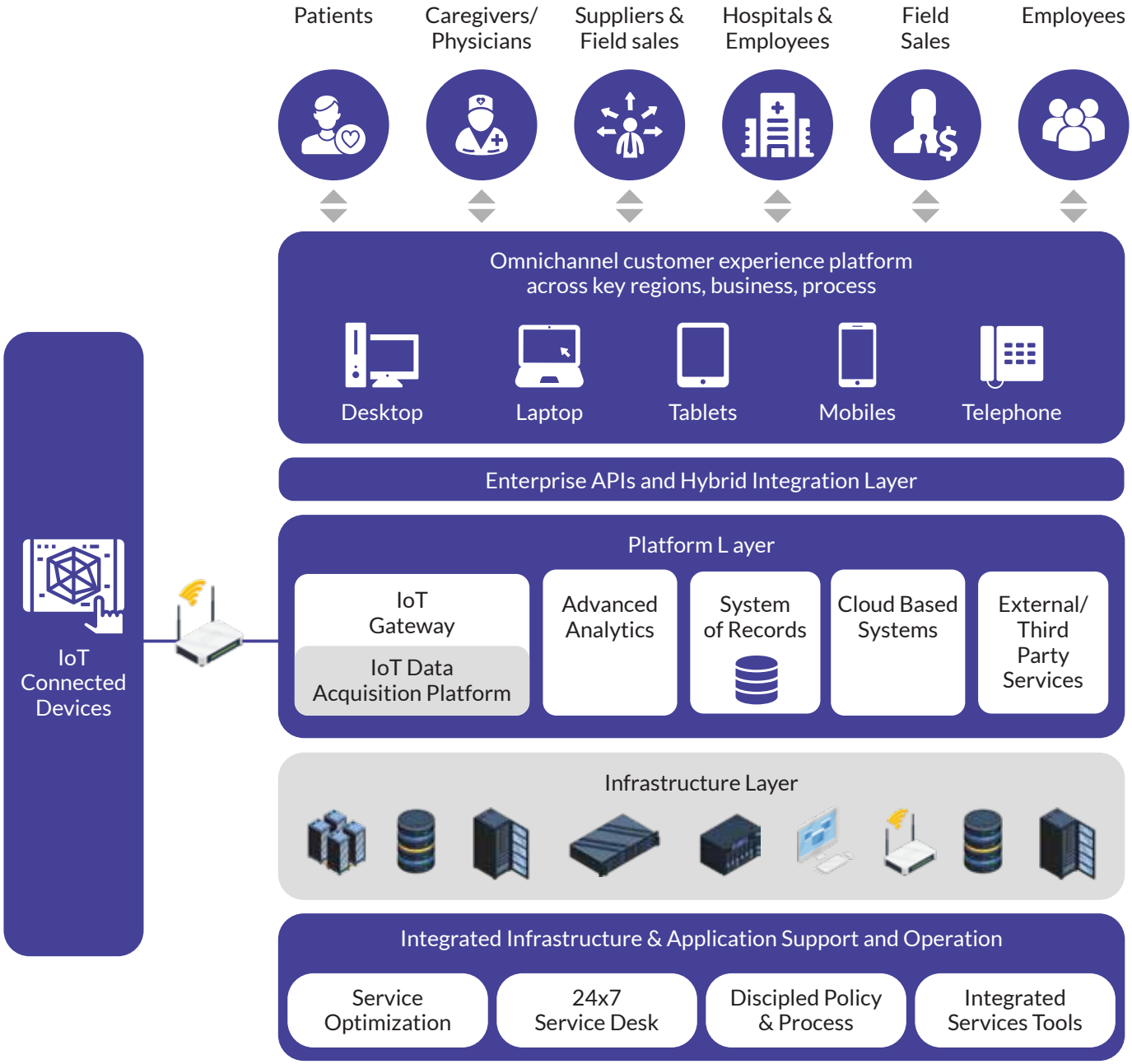
Below is an example of a flexible, hybrid end state architecture.



The integration architecture has the following value:

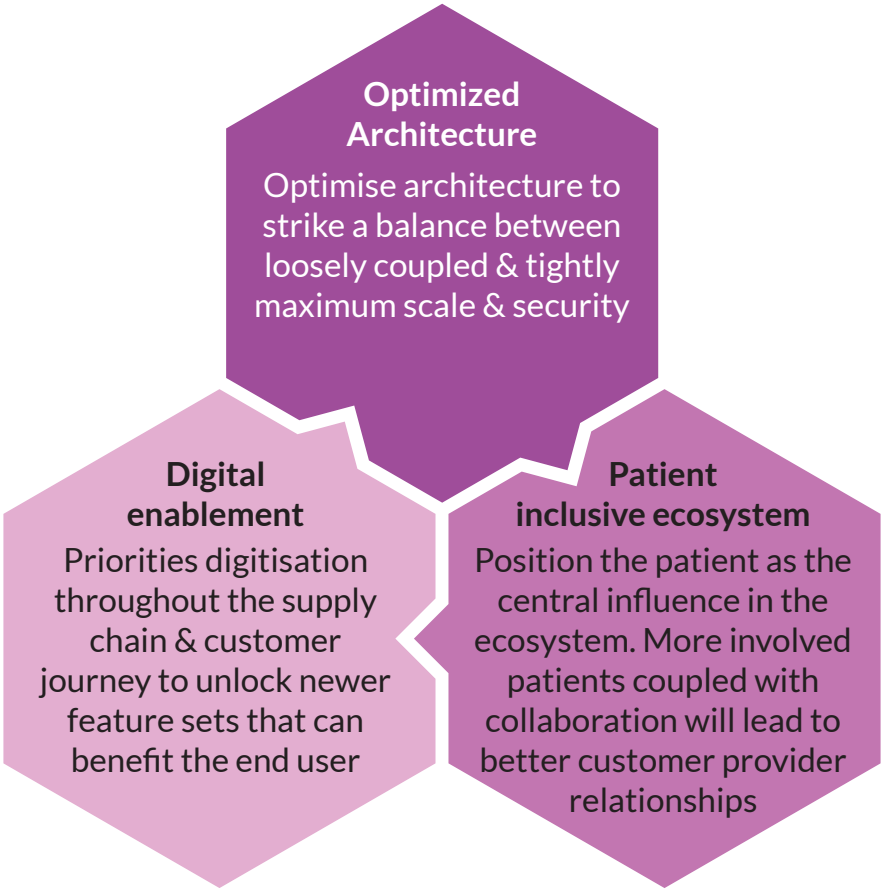
- Aligned more to Digital reference architecture with enterprise level API capabilities
- All risks mitigated, eliminated technical debt and employs modern SOA and Microservices techniques
- Leverages service-oriented architecture which is more loosely coupled and eliminates dependencies on legacy systems
- Optimizes redundant batch processing and reduces maintenance, support overheads
- Adopts modern architecture approaches such as Microservices
- REST APIs consumed and exposed via API gateways
- Promotes more automation and reuse via BPM
- Uses business rule engine to abstract/separate logic from applications

Zensar understands the need of revamping the existing architecture with a holistic point of view considering the potential changes in near future. We have come up with a representative Future End State of Modern Architecture encompassing the complete Health Ecosystem. Below is a detailed overview of the potential architecture model.

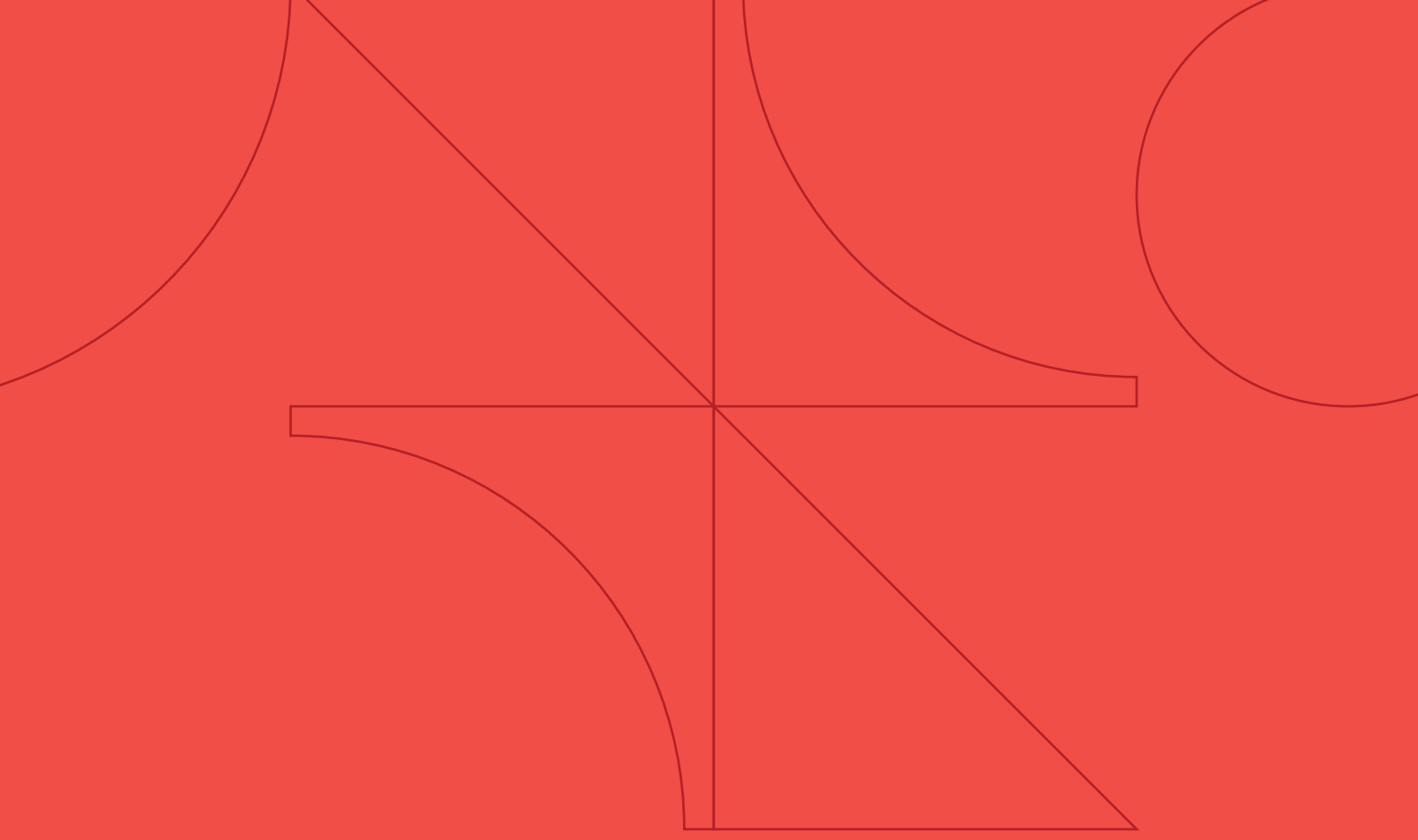


What kind of expertise and partnerships are needed for digital transformation?

The healthcare ecosystem is a fragile and complex one, with multiple stakeholders and interlinked systems which often work on independent system and are subject to varied regulations that differ by geography and economy. Firms which wish to continue advancement into this space have to uphold the three pillars that will help them create and sustain value for patients and payers.



The right digital partner is critical of any transformation aimed at creating impact. Zensar's proven methodology helps it assess the digital maturity of the medtech and healthcare ecosystem after proper due diligence and fact finding. The maturity assessment and future roadmap planning helps pioneering industries take decisions and investments on the right future initiatives. Coupled with deep domain expertise and a robust technology practice, Zensar can provide a holistic point of view aiding immensely in taking the correct steps going forward.



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An RPG Company

We conceptualize, build, and manage digital products through experience design, data engineering, and advanced analytics for over 200 leading companies. Our solutions leverage industry-leading platforms, and help clients be competitive, agile, and disruptive as they navigate transformational changes with velocity.

With headquarters in Pune, India, our 10,000+ associates work across 33 locations, including San Jose, Seattle, Princeton, Cape Town, London, Singapore, and Mexico City.

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