BOSCH
Invented for life

Moving from digitization to intelligence:
The quantum leap in diagnostics

Mr. Guruprasad S,
Vice President & Director,
Business area healthcare

Ms. Madhumitha S,
Strategy lead, Business
area connected products

TABLE OF CONTENTS

INTRODUCTION 03

CHALLENGES FACING THE LABORATORY TESTING SECTOR 04

1. Pricing Pressures and Increased Competition 04
2. Volume vs Value Debate 05
3. Relationships with Buyers 05
4. Attrition and Retention 05
5. Need for investment on Technology 05

NEW-AGE SOLUTIONS IN DIAGNOSTICS 06

1. From Eyesight to AI Sight 07
2. Edge Technology as a differentiator 07
3. Smart Pathology Enablers to reduce workload 08
4. Cloud Connectivity 08

IMPACT OF NEW-AGE SOLUTIONS ON STAKEHOLDERS 09

1. Impact on Pathologists 09
2. Impact on Patients 10
3. Impact on laboratories 10
4. Impact on Health Systems 10

THE FUTURE OF DIAGNOSTICS 11

1. Workflow change for the better 11
2. Disrupt or be disrupted 11

A DEFINITIVE STEP TOWARDS CERTAINTY 12

CONTACT DETAILS 13

INTRODUCTION

Diagnostics has always been a 'silent champion' of the healthcare industry. With a rich history of over 3000 years, the field of diagnostics has undergone several transformations which have shaped the entire industry. Hippocrates, the great Greek physician, introduced the idea that the mind and body together must be observed to holistically understand any illness. The entire evolution of diagnosis has since then depended on how we could make these observations sharper and more accurate. Early diagnosis is one of the most crucial elements for successful treatment of any ailment, leading to its healing.

The advent of the internet in the late twentieth century saw an opportunity to integrate technology with clinical information to scale diagnostics better. The diagnostic providers were happier because they saw a sustained increase in volume at their laboratories while the customers were satisfied about the enhanced efficiencies.

The twenty-first century has seen vast improvements in technology with digitization touching every aspect of healthcare. The next big breakthrough is forecasted to come from Artificial Intelligence (AI) and Internet of Things (IoT), which will be the underlying propellers of change. AI in particular is disrupting the diagnostics industry, thanks to a wealth of information derived from the Human Genome Project.[1] Clubbed with remote analysis thanks to affordable cloud storage, the applications of AI in diagnostics are innumerable. AI solutions are taking diagnostics to the next level by reducing human error, reducing turnaround time and increasing productivity and efficiency. With the unprecedented scale of the Covid-19 pandemic, diagnostic testing has emerged as a saviour and as a ray of hope, for billions of people worldwide. Pathologists across the world are under tremendous pressure to deliver accurate results within a short time frame. Advanced diagnostic solutions, now more than ever, are the need of the hour.

1. https://assets.kpmg/content/dam/kpmg/in/pdf/2020/02/healthcare-reimagine-healthcare-in-the-next-decade.pdf

CHALLENGES FACING THE LABORATORY TESTING SECTOR

As the world population explodes and access to affordable healthcare increases, the complexity for diagnostics providers is bound to only further increase. A study by KPMG[2] has revealed that the following are some of the challenges faced by the diagnostics sector:

Pricing Pressures and Increased Competition

According to a study,[3] an average citizen in the UK takes 14 diagnostic tests per year. Another survey[4] shows that the number of laboratory tests per year in the US surpasses a mind boggling billion! During Covid-19 the pressure on labs was even more real. India alone tested upto 600,000-700,000 cases daily.[5]

With the demand only getting higher every year, every keen investor in the healthcare sector sees potential in funding diagnostic test centres. As a result, there are multiple newcomers to the industry, which is true for both emerging and developed markets.

2. https://assets.kpmg/content/dam/kpmg/xx/pdf/2018/07/the-healthcare-diagnostics-value-game.pdf
3. https://thepathologist.com/issues/1015/the-true-value-of-laboratory-medicine/
4. https://www.gpo.gov/fdsys/pkg/FR-2014-02-26/pdf/2014-04229.pdf
5. https://www.hindustantimes.com/india-news/daily-tests-up-to-700k-1-million-target-in-sight/story-ZQNld4oWxtxTMX1zy2cueP.html

With more competition added to the fold everyday, the firms are pushed to using pricing as one of the differentiators to increase their customer base. If the costs for testing don't go down, labs have to take a major hit in their margins, questioning their operational viability.

Innovation is the need of the hour to keep the productivity up and the cost down, especially in developing countries. And investing in technology innovations is the best bet for diagnostic firms in emerging economies to beat the odds and remain profitable. It is high time laboratories realize technology has become an operational expense.

Volume vs. Value Debate

With pricing pressures, value delivered will eventually come under pressure. The impact: a laboratory test has become a commodity as opposed to a high value service. This commoditization has started a race to the bottom, which diagnostics companies feel is a difficult issue to address. More over, 2/3rd of the clinical diagnosis is still done manually using a microscope. The extensive use of microscopy for disease diagnosis tends to be laborious and can hamper both the time taken for reporting as well as the accuracy levels. On an average, there is 1/3rd variation noted in the test results between the laboratories.

Relationships with Buyers

Customer loyalty is a rare commodity in diagnostics. Proximity, convenience and pricing have been major parameters when it comes to customer decisions and customer relationships in the healthcare sector is difficult to forge. Hence, customer experience and service become pivotal aspects that define whether diagnostics center can establish long term relations with doctors, clinicians, patients and payers.

Attrition and Retention

The pathologist vs people ratio is terribly askew. This means that no diagnostic firm can afford to lose good expertise. This gap is even more intense in the rural areas with 1/3rd of the healthcare diagnostic labs having no access to the trained pathologists.

However, with more tests than ever before, pathologists face burn-out issues as they continually work at odd hours to meet demands. The talent gap is real considering the growing need for accurate and speedy results.

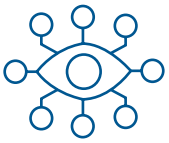
Need for investment on Technology

This is more of an inevitability than a challenge for the laboratories. There are two key differentiators when it comes to tests: the precision and the time taken to establish the results. If you fail to achieve even one, your firm is out of contention.

NEW-AGE SOLUTIONS IN DIAGNOSTICS

The healthcare & diagnostics industry has already realized that digital adoption is no longer just a ‘good-to-have’. However, it is yet to explore the full-potential of intelligent technologies. Advanced technologies combining AI, IoT and data analytics are proving to be game changers in the field of diagnostics and can help counter many of the challenges that most providers are currently struggling with.

1 From Eyesight to AI Sight



Connected instruments, now available with inbuilt AI based algorithms can analyze human cell morphology consistently in a short time. The AI algorithms can analyze the form, shape and structure of a human cell and record the minutest of deviations. The algorithms are trained with tens of thousands of images and millions of discrete points of cells pushing it to recognize hundreds of cell features.

Say hello to morphology solutions using Computer Vision Technologies. In-built with computational abilities, these smart devices harness the power of AI and Machine learning (ML) - better to qualify as this is the first usage and are easily integratable in any lab setup.

Marrying this in-built algorithm with advanced analytics ensures pin point accuracy and better turnaround times. Lesser turnaround time means reduced working hours for the pathologists which in turn implies reduced overheads and in summation, lesser cost of testing. This reduction in cost will give a huge leg up in pricing beating competition.

2 Edge Technology as a differentiator

To ensure buyer loyalty, diagnostic companies have to be proactive to customer demands. This may vary across different markets and across different tests. For some markets, pricing may be the differentiator while for others, customer experience might be the differentiator.

If pricing is the concern, Edge technology can chime in by processing large amounts of data near the source, eliminating the need for transfer of huge chunks of information to a data center, integrating Internet of things (IoT) and mobile computing. Besides, not all data can be put into the cloud. Edge technology adds a layer of security to sensitive data. With edge technology, the myth of ‘small labs being unable to process volumes of data’ can be busted.

If customer experience is the concern, edge technology can help patients go through their testing process quickly. Edge computing is emerging as a primary enabler of activities, thus enabling pathologists to process data near-real time, decreasing the turn-around time significantly.

3 Smart Pathology Enablers to reduce workload

Excessive workload has often been severely detrimental to retention in the diagnostics industry. One major reason for this is the lack of remote access to samples. If pathologists are able to access high resolution images remotely, disease diagnostics and treatment can span across geographies, and at much lesser time and cost.

With AI-driven digital pathology solutions, pathologists can observe intricate morphological structures of bio-samples even if they are working remotely. Moreover, advanced algorithms can often help decode patterns more effectively than manual methods. With more flexibility and accessibility, excessive workload is bound to become a thing of the past.

4 Cloud Connectivity

If the patient cannot come to the laboratory, the laboratory should be able to come to the patient. Solutions to all the challenges faced by the diagnostics sector have multiple commonalities driven by AI and Machine Learning (ML). But connectivity is the key to ensuring that interpretation of data happens quickly and can be relayed to the customer in time. Every sector wants to deal less with uncertainty.

Cloud solutions when clubbed with a connected user interface, helps provide a unified customer experience across interactions. Secure cloud platforms are the need of the hour to facilitate easy sharing and collaboration among peers, thus enabling concurrent case analysis, and when required an independent second opinion.

IMPACT OF NEW-AGE SOLUTIONS ON STAKEHOLDERS

Embracing intelligent solutions for diagnostics has a resounding impact on multiple stakeholders in the diagnostics industry.

Benefits

Pathologists

- Objective analysis
- Reduced errors
- Better specimen views

Patients

- Accurate diagnosis
- Faster test results
- Access to second opinion

Diagnostic Labs

- Increased throughput
- Increased business outcomes

Health Systems

- Population health management
- Standardization
- Affordable care

Impact on Pathologists

Every lab analysis has to be objective, with less errors and better specimen views. Clearly, all of these goals can be attained by digital intervention in diagnosis. Good pathologists would appreciate the flexibility provided by the digital solutions. With most of the data on cloud and with easily transferable pictures of high resolution, clinicians would no longer be bound by geographical constraints. Besides, the increasing volume of demand warrants the intervention of technology in laboratories.

Impact on Patients

Diagnostic players are looking for tools that will remove wedges between the patient and the pathologist. They are ready to pay a premium subscription for tools that serve both stand alone and chains of labs. Labs are moving towards tools that contribute to hassle free patient experience. Pathologists don't want their patients filling multiple forms, repeating processes or waiting for their results beyond a reasonable time limit.

With objectivity in specimen analysis, information sharing and reporting, customers can get a second opinion very easily and can decide what the test results indicate. What's more, customers won't have to physically be present at the labs to obtain these results and reports. People have begun realizing the advantage of convenient and reliable pathology solutions with a direct impact on the credibility of diagnostic centres.

Impact on laboratories

There is a good amount of paperwork that burdens the pathologist besides the study and analysis of the said biological specimen. Errors in diagnosis and documentation pose one of the most common problems for pathologists who are liable to comply with various medico legal aspects of diagnosis.

The only alternative is to go digital and to make all files available online and on the cloud. The transfer of data would not only save a good deal of time for analysis of more specimens but will also help build transparency and credibility, freeing the pathologists of any undesirable legal burden. Not only do the reports become easier to generate but also they become more accessible for auditing in case of discrepancies. And there's more: easy storage without the need for bulky infrastructure makes the archival process more efficient.

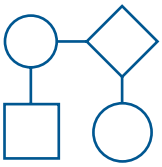
Impact on Health Systems

Any technological disruption eventually leads to reduced cost of service. This addresses two challenges discussed earlier: pricing issues due to increased competition and maintaining consistency in the face of an increasing volume of tests. The accuracy of results, thanks to digital pathology solutions ensures consistency.

Laboratories are rooting for digital pathology solutions that can meticulously track daily usage, manage hierarchy, provide data security and have a friendly user interface. Additionally, less paperwork, less manual intervention, less effort and lesser attrition of pathologists ensures reduced cost and affordability of healthcare for people even at the grass roots of the economy.

THE FUTURE OF DIAGNOSTICS

While we may feel that we are standing at the cusp of a revolution in the health-tech space, most experts would agree that this is just the beginning. There is so much more that lies ahead of us which will completely change diagnostics as we know it today. Advances in lab technologies will directly lead to increased efficiency, improved accuracy and therefore, much better patient care leading to an overall improvement in public health.



Workflow change for the better

It has been established without much doubt that paperwork is the nemesis of efficiency. Add manual errors to the mix and you have yourself a recipe for a process laden with cracks for errors to creep into. Digital transformation does a great job working around this disadvantage. Yes, digital pathology solutions help in better precision of tests, better turnaround time, accessibility but more importantly, the transformation as a whole streamlines workflow, identifying and removing bottlenecks. As a result, there is increased efficiency in every process thanks to sustained automation. AI takes the digitization journey a step further by simplifying data interpretation, making processing of large amounts of data faster and enabling labs to scale at speed.

Disrupt or be disrupted

In the near future, expect to see a whole new window of opportunities opening up as a result of ground-breaking research in areas such as cancer immunotherapy, stem cell technology, gene editing and regenerative medicine. These technologies have the potential to change the entire paradigm and open up new markets for clinical laboratories. A strong push to ensure quality standards along with safety requirements and data privacy regulations will drive the growth of new services. The bottom line is, laboratories will have to change and change fast because the game has become global. The day is not far when people in one continent send the images of a bio sample to a lab in another continent because the pathologists there are the most sought-after in a particular specialization. On top of that.

A DEFINITIVE STEP TOWARDS CERTAINTY

For over a century, scientists, doctors and pathologists have been examining blood cells the same way. Blood is smeared on a slide and examined with a microscope. Morphology experts, painstakingly, categorize each blood cell based on their shapes & sizes into distinct classification buckets. Studies show that artificial intelligence gives better information about blood cell[6] morphology, much faster than human experts. This is just one of the areas where AI can make a huge difference. Several body fluids, when analyzed using AI, could yield, faster and more accurate results, helping in timely detection of several disease.

The job of AI is not to replace humans but to assist them. A lot of laboratories still have skilled professionals often performing monotonous, repetitive tasks, leading to wastage of time, money and resources. Once these tasks are automated with AI-driven technologies, clinicians can focus on finer aspects of analysis.

We need to acknowledge that diagnostics is no more a side-kick to therapeutic healthcare. Rather, it is the superhero which can help nip the disease in the bud. More than simply being a way to identify health parameters, diagnostics are now being used to support clinical development of drugs, predict disease before symptoms begin, forecast the progress of a disorder, and identify patients who are most likely to respond or not respond to specific treatments.

A smart, modern pathologist can now choose from multiple tools to ensure minimal observer error, 100% reproducibility of tests at a turnaround time never seen before.

Digitization had already made its way in the healthcare sector and the transformation is quite evident. The next big quantum leap is only possible through new-age, AI-powered solutions. As more and more diagnostics centers embrace cutting-edge technologies, we will move towards a healthcare ecosystem that is proactive, transparent, integrated and simpler than ever before.

6. https://www.blood.ca/en/stories/breakthrough-study-uses-ai-analyze-red-blood-cells

BOSCH
Invented for life

Get In Touch

Robert Bosch Engineering and Business Solutions PVT. LTD.

India | USA | Europe | UK | Japan | Middle East | China

For more information, send your enquires to
connect@in.bosch.com