



Aindra Systems democratizes quality healthcare in rural India

Rapid access to cervical cancer testing through edge devices and the AI-enabled cloud platform



Jeremy Cox, Founder CX-Create
Sponsored by Oracle for Startups program

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About this report

Based on interviews with Adarsh Natarajan, Founder, and CEO, this brief report introduces [Aindra Systems](#), one of a growing number of highly innovative companies supported by the [Oracle for Startups](#) program.

The company, founded in 2012, entered the healthcare market in India in early 2020 during the first wave of the Covid-19 pandemic. Against all the odds, Aindra Systems is already making a significant impact addressing the early detection of cervical cancer, a major scourge in India claiming over 72,000 lives each year.

The theme for this month is around startups in healthcare and wellness and how they are innovating, changing the healthcare landscape, and contributing to sustainability.

CX-Create is an independent IT industry analyst and advisory firm, and this report is sponsored by the Oracle for Startups program team.

Highlights:

- Key drivers – high mortality rates of cervical cancer result from barriers to testing leading to otherwise avoidable deaths
- Aindra Systems - collapsing time and removing accessibility barriers to cervical screening in remote and rural communities
- Computational pathology and a cloud platform offers potential for screening of other cancers
- Oracle Cloud Infrastructure and the Oracle for Startups program prove their value to Aindra Systems

The business context for Aindra Systems

Key drivers – high mortality rates of cervical cancer and barriers to testing

Almost all cases of cervical cancer are caused by the human papillomavirus (HPV). HPV is a prevalent virus that can be passed on through any type of sexual contact with a man or a woman.

India suffers one of the highest cervical cancer mortality levels globally, with over 70,000 deaths each year. By contrast, according to the American Cancer Society, in 2020, an estimated 13,800 cases of cervical cancer were diagnosed, and 4,290 women die each year from cervical cancer. The much lower comparative rate in the US is due to regular screening and HPV vaccinations. The disease can be caught early and is very treatable through screening using the Pap smear test at regular intervals (once every three years for women between 21 and 29, and three to five years after that).

So why does India suffer such high mortality rates?

There are several reasons, but the most significant is a lack of local access to screening and a highly centralized healthcare environment where the expertise and medical equipment are concentrated in India's cities. According to the Census India Proportion of Population study, 68.84% live in rural areas. In the Himachal Pradesh region, this is even higher at 89.96%. This contrasts with Delhi, which has 97.5% living in urban areas. *India also has fewer doctors serving the population compared with the US and Europe, averaging only 9.28 per 10,000 vs. 26.04 in the US and 30 – 80 in Europe. (*source: World Health Organization 2018).

As well as fewer doctors per head of population, India's centralized healthcare system is concentrated in the cities and urban areas with heavy reliance on medical equipment from foreign manufacturers. Specialist gynecologists, oncologists, and testing labs are concentrated in the cities, far from rural communities. For women in rural communities, especially the poor, travel to the cities is time-consuming and a high cost.

Foreign device manufacturers also naturally gravitate to the larger city hospitals that can afford their equipment. This creates a long supply chain from the patient to testing and results. Due to the expense, only about a half of women in rural areas go back for further tests. It is estimated that cervical cancer will occur in approximately 1 in 53 Indian women during their lifetime compared with 1 in 100 women in regions with greater access to healthcare and testing – (source: Indian Journal of Medical and Pediatric Oncology.)

Our goal is to democratize quality health care in an accessible and affordable way.

Adarsh Natarajan, CEO and Founder,
Aindra Systems

Aindra Systems overcomes these challenges by bringing testing close to the patient. Aindra Systems has developed an AI-enabled full-stack platform with portable devices that overcome the challenges of distance, inconvenience, lack of specialist resources, and cost. It also

dramatically reduces the lag time between testing and cervical cancer diagnosis. The solution reduces the chances of misdiagnosis through advanced and validated AI algorithms.

Aindra Systems - the story so far

Adarsh Natarajan founded Aindra Systems in 2012, but the focus was not on healthcare. Natarajan, an engineer and data scientist by education, started out by addressing the inefficiencies in the distribution of government subsidies to rural and semi-rural communities. The biggest problem was the identification of claimants, where there was typically a lack of documentary proof. He felt that AI and face recognition could verify the claimant's identity. This proved impractical, and Natarajan thought long and hard about where his talents could make the biggest societal impact. He is motivated by a strong desire to make a difference in people's lives, especially those with poor healthcare access.

He turned his attention to the healthcare market, conscious that rural and semi-rural communities had the lowest levels of care due to the centralized nature of India's healthcare system and concentration of resources in cities. He spent considerable time speaking with expert clinicians and oncologists, trying to understand the processes involved in healthcare delivery, identifying inefficiencies, lack of resources, and bottlenecks that could be addressed through computational science and automation.

Bringing data science and automation to healthcare meant overcoming many regulatory hurdles and validation that AI could be used to improve diagnostics and provide additional aid to clinicians and oncologists. He embarked on a lengthy R&D program in 2015 and developed Aindra's current solution, CervAstra – an AI-supported full-stack diagnostic platform focused on cervical cancer but with the potential to expand into other oncological areas in the future.

Solution overview

The solution consists of two relatively lightweight and portable edge devices and two software components that clinicians can use in remote rural settings or local practices for cervical testing and data transmission to the AI-enabled cloud platform for accurate diagnosis.

- Aindra IntelliStain is an automated stainer for staining biological samples (histopathology, cytopathology) mounted on glass slides. It enables the clinician to develop clear and high-quality slides that can be photographed using Aindra VisionX and used for remote diagnosis.
- Aindra VisionX provides crisp images of an entire slide that can then be transmitted to a clinician for analysis. As it is portable, the clinician can examine the image at their place of work or even at home.
- Aindra Astra is the AI algorithm engine for computational pathology, which provides a faster and more accurate diagnosis. Astra's AI algorithms, having been trained on large volumes of data from pathologists, can recognize pre-cancerous and cancerous cells. A pathologist then validates results. CervAstra is the brand name when Astra is used for cervical cancer diagnostics.

- Aindra ClustrPath is the Telepathology platform that enables remote reporting by pathologists. This telepathology program completes the final and important part of reporting of the tests.

Aindra Systems - collapsing time and removing accessibility barriers to cervical screening to remote and rural communities

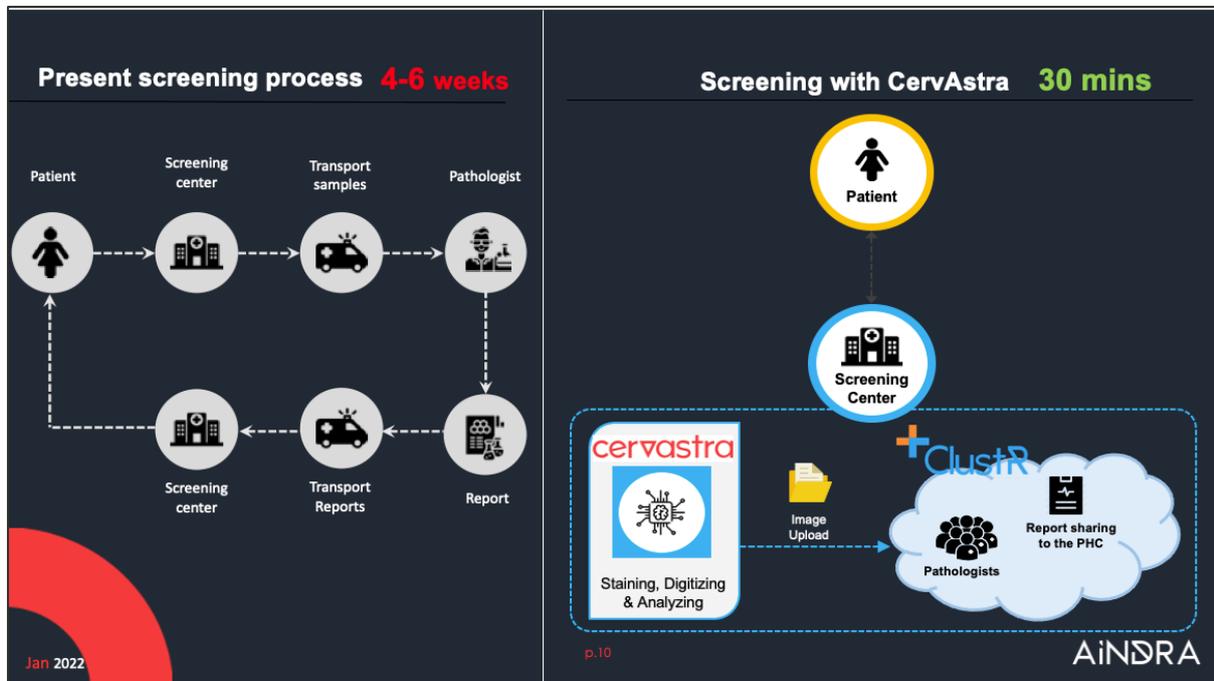


FIGURE 1: COMPARISON OF THE STANDARD CERVICAL SCREENING PROCESS WITH AINDRA'S SOLUTION

Figure 1 outlines the complete value proposition and indicates the difference in time compared with the typical cervical screening process. The first challenge for patients living in rural areas is getting to a screening center. For many on low incomes, the cost of travel and possibly an overnight stay proves prohibitive. Even if they can afford the trip and time and are willing to put up with the massive inconvenience, the process from screening to diagnosis takes a month or more.

Aindra's portfolio not only potentially minimizes the cost and inconvenience to patients who can visit a local clinic using its field-based technology but can provide results in under an hour.

Initially, Aindra used Google Cloud infrastructure but migrated to Oracle Cloud Infrastructure (OCI) in 2021, in part due to the lower costs afforded by the Oracle for Startups program, but also the security and speed in handling vast amounts of data continuous training and refinement of the AI algorithms, offered by OCI. The edge devices that use powerful Nvidia GPUs send data back to the cloud for analysis and receive regular enhancements to keep them up to date, including a copy of the latest AI algorithms.

Current position

The Covid-19 pandemic delays but does not derail the launch of the platform

The initial wave of the Covid-19 pandemic hit India hard in March 2020, just when Natarajan was about to launch the initial trials of Aindra's solution. Undeterred development of the platform continued, and in 2021 the company joined the Oracle for Startups program and migrated the solution to OCI. Aindra's initial trials involved screening around two thousand women supported by non-governmental organizations and validating the test results by trained pathologists. As well as validating the results, both women and clinics in rural locations have benefitted. Local testing has encouraged participation and eliminated the hidden costs, such as travel and overnight hotel, associated with traditional testing methods. Removing this financial barrier will also encourage repeat testing within the recommended 3–5-year period, depending on age.

The local clinics participating in the trial have also benefited financially. The IS and VX devices that can be easily stored in local clinics enable clinicians to get more involved in the complete testing cycle, boosting their incomes. Traditionally after the Pap test, the sample would have been sent to a city-based laboratory for analysis, collecting a fee from the government or insurance company. The edge devices and access to test results from the cloud platform are based on a relatively low-cost subscription. No capital investment is required.

The current go-to-market is direct

Aindra Systems is reliant on three people in direct sales to potential clients. Given the nature of the industry, validations will drive word-of-mouth recommendations as clinicians and participating NGOs share their recommendations to colleagues to use Aindra's solutions. Currently, there are plans to enlist resellers, and Natarajan will consider this to expand the company and as new oncological testing capabilities are added.

Future direction

What to expect

The Aindra Astra Platform has the potential for use in other oncological areas. Natarajan hopes this is the first of many diseases that can be better managed at the point of care. His goal is to deploy his AI-powered platform to tackle multiple health challenges to underserved populations, not just in India but worldwide. "Our goal is to democratize quality health care in an accessible and affordable way." Taking a platform approach also provides opportunities for partnerships with other healthcare solution developers that could be added to the platform. Other edge devices may be required to support such solutions, but these can be added relatively easily using APIs.

Oracle Cloud Infrastructure and the Oracle for Startups program prove their value to Aindra Systems

Oracle Cloud Infrastructure is optimized to handle large volumes of data associated with diagnostic testing. The Oracle for Startups program provided favorable terms, allowing Aindra to offer low subscription prices. Natarajan commented that the support received from the Oracle for

Startups team had been timely and helpful. Given the healthcare regulatory environment and the time it takes to validate and prove the efficacy and safety of testing solutions and devices, he hopes Oracle's favorable terms can be extended beyond the initial two-year period.

As Natarajan looks to the future, Oracle's Market Access program, providing introductions to enterprise account teams in other countries, will be welcomed.

CX-Create's viewpoint

Aindra Systems lives up to its billing

There is no doubt that the Aindra Systems solution will significantly improve India's cervical cancer testing regime, especially in rural communities that otherwise have significant hurdles to overcome. It is also a boost for rural clinics, providing an additional source of income for those willing to participate. The PaaS approach offers tremendous potential to extend the healthcare applications to other cancers and connect to any medical device as part of the testing process.

Once established in India and subject to local regulatory approvals, there are significant growth opportunities in other countries and regions of the world, with hard-to-reach rural communities, for example, Africa, Brazil, and Indonesia. Oracle has a substantial global footprint and is active in healthcare. We can expect Aindra Systems to take full advantage of its relationship with the Oracle for Startups team to open doors to relevant account teams wherever it decides to compete.

Summary details

Table 1: Fact sheet

Solution name	Aindra Astra, IS, VX, and ClustrPath	Solution category	Healthcare PaaS and edge devices for cancer testing
Key industries	Healthcare	Geographies	India
Deployment model	SaaS	Licensing basis	Subscription
Size of organizations served	Any size	Go-to-market model	Direct and Channel Partners
Number of employees	13	Key partnerships	Oracle for Startups AIIMS Bhatinda, AIIMS Jodhpur, CMC Vellore, Kidwai Memorial Institute of Oncology, RV Metropolis, Rajarajeshwari Medical College and Hospital, KMC Manipal

URL	https://www.aindra.in/	HQ	JP Nagar Phase 5, Bengaluru, Karnataka 560078
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Appendix

Further reading

- [HEARTio. – smarter cardiac triage](#)
- [PRORADIS - shortens distance and time improving patient care in Latin America through innovation](#)
- [Skin Analytics - helping moore people survive skin cancer](#)
- [Sensei Aq - .improving human nutrition](#)
- [Sensei Retreats – takes a science-led approach to health and wellbeing.](#)

To explore more startups supported by the Oracle for Startups program, follow this [link](#), and under categories select Startups and Scaleups for innovation, sub-category: Oracle for Startups.

About CX-Create

Jeremy Cox founded CX-Create Limited in January 2021, a former principal analyst at Omdia (formerly Ovum) focused on customer engagement strategies and platforms.

He is recognized by major CX vendors, clients, and former colleagues as a leading thinker in customer experience and engagement. Formative experiences in the 1990s at IBM convinced him of the critical importance of understanding the business world from the outside in. These insights were put to practical use in his former roles as a principal CRM consultant at KPMG Consulting and as an independent consultant supporting public and private sector organizations.

Our mission

CX-Create's mission is to help enterprises and the vendors and startups that serve them remain relevant. The company's primary focus is to track and understand the constantly evolving customer experience world and share those insights with clients. Continuous innovation is also an essential component of persistent customer relevance, directly and indirectly, which is why we are enthusiastic about startups and the Oracle for Startups program.

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