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Saama Technologies: Growth Through a Focused Vertical Market Strategy

Case

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Abstract

After a successful transition from a projects-based IT business services company to a platform-driven analytics company, Saama's core leadership team gathered in 2017 to brainstorm the next phase of its growth. The year before, the team had decided to narrow its target market to the life sciences vertical. Saama now had to decide how to execute on this focused strategy by choosing a growth pathway within the life sciences vertical. Saama's leadership team was considering three alternatives: acquiring new customer accounts, developing existing customer accounts, or developing new products by harnessing artificial intelligence (AI) and blockchain technologies. The team had to evaluate these growth pathways in terms of both short-and long-term revenue potential, as well as their potential for sustaining Saama's competitive advantage.

Case

In October 2017, the leaders of Saama Technologies gathered for a meeting at their Silicon Valley headquarters in Campbell, California, to review three years of financial performance. Since its founding twenty years ago, Saama had evolved from a project-based IT services company into a platform-driven analytics company. In 2016, Saama's leadership team had decided to narrow its market focus to one vertical market: the life sciences industry. Based on this focused vertical market strategy, Saama had launched a new cloud-based platform called the Life Science Analytics Cloud (LSAC).

The decision to focus on the life sciences vertical had been successful, and Saama had picked up several Fortune 500 customers from the industry. By narrowing its focus, however, Saama had also reduced its total addressable market (TAM) to less than a third of its earlier TAM, which had included other vertical markets such as insurance, consumer packaged goods (CPG), and health care. Saama's sales team had worked to trim the funnel in the non-targeted vertical markets, but this left the company with the challenge of increasing penetration within its chosen vertical market by securing more life sciences customers and by increasing its share of wallet [1] with existing customers. The company was also evaluating growth through new product development to take advantage of recent advances in artificial intelligence (AI) and blockchain technologies. Although Saama's leaders had confidence in their vertical market strategy, they needed to decide the pathways for growth that would position the company for continued profitable growth.

Company Background
The Early Years (1997–2010)

Saama Technologies was founded in 1997 by Suresh Katta, a technologist with degrees in both electrical and computer engineering. Katta wanted to leverage his lifelong love of mathematics to solve complex, data-intensive problems. While working at computing manufacturer Silicon Graphics, Inc. (SGI), Katta met Sagar Anisingaraju and Rajeev Dadia. At SGI, the trio worked with vast amounts of engineering data, building reporting capabilities for engineering stakeholders to gain insights from their data. Reporting systems at that time typically were separate from business transactional (ERP) systems from companies like SAP. Reports allowed companies to find answers to questions such as why transactions happened and why certain products were not selling well.

Katta realized that the work they were doing on analysis of engineering data could also be applied to the business side of the enterprise. This insight led him to found Saama. The company's name was derived from the Sanskrit word samaveda, meaning "book of knowledge." Recalled Katta in an interview: "It was a risky move. I promised my wife I would find a regular job if Saama wasn't successful within one year. Luckily, things worked out in my favor." [2]

Saama's vision was to allow clients to visualize and analyze what was happening in their business by

connecting data from CRM systems, financial systems, and supply chain systems to get a "single version of the truth" about their business. Saama helped clients convert the vast amounts of raw data stored across enterprises into actionable insights to drive business decisions. Katta's intuition proved accurate, and Saama secured three clients within 15 months. In the first year, the company chalked up $1.5 million in revenue, and Katta brought on board his first employee, Larry Rosenblum, a Berkeley and Stanford graduate who had worked at HP for 20 years. Katta handled sales and Rosenblum managed technical development and customer support. Saama turned cash-flow positive within a year and revenues grew steadily to $3 million in Year 2, $6 million in Year 3, and $10 million in Year 4 of the business.

In 2000, Katta convinced another ex-SGI team member, Rajeev Dadia, to join Saama to run its client care operations. He also wanted his other ex-SGI colleague, Sagar Anisingaraju, to join Saama, but Anisingaraju had left SGI to start his own company in 1998.

Saama's early growth came to a halt in 2001 with the dot-com bust. All of Saama's clients were in Silicon Valley, and the majority were technology companies, which were hard-hit by the dot-com bust and the recession that followed it. Some of Saama's clients even went out of business. Katta had to make the painful decision to let several people go so Saama could stay in business. He managed to steady the ship, and the company returned to profitability, but growth had plateaued.

By 2005, Katta realized he needed to diversify Saama's business to avoid another crisis like the dot-com bust. He embarked upon a diversification strategy and identified several new verticals, including the pharmaceutical, CPG, and insurance industries. Genentech and Unilever became clients in 2007. Despite hitting some bumps in the road during that year because of client defaults leading to a cash crunch, Saama continued to grow. In 2010, Anisingaraju decided to merge his venture with Saama and came on board as the chief strategy officer.

Moving From Services to Products (2011–2015)

By 2011, Saama was profitable and had grown to 500 employees, but Katta believed the company could leverage two recent industry developments—innovation in algorithms and mathematics, and the increased adoption of open source software—to pursue even bigger opportunities. The software and services industry was also changing. As Katta noted: "Until this time, if you wanted to build a billion-dollar software company, you could only do it through massive venture funding or you had to be SAP, Oracle, or Microsoft. By 2011, this was no longer true. Entrepreneurs could build and grow a very big business without that kind of funding or legacy." In his role as chief strategy officer, Anisingaraju set out to design Saama's own data and analytics technology stack as its proprietary intellectual property (IP). Saama started with a modest IP footprint. "In the beginning, it was the equivalent of making a button, while SAP was making a shirt," Katta said. "Eventually Saama could make not just the shirt but the most fashionable shirt, at that." Anisingaraju and Katta were betting that competitors like SAP could not move as fast as Saama because they were too big and too beholden to their legacy ERP business.

Katta and Anisingaraju formed a small steering team of engineers to build out solutions for finance, insurance, and healthcare. Initially these solutions were customized, with few repeatable elements, but they brought in revenues and allowed Saama to fund IP development with client dollars. Over a four-year period from 2011 to 2015, clients like Cisco, PayPal, and Synopsis contributed millions of dollars towards the development of Saama's IP.

By 2015, Saama had assembled a powerful board of directors and an influential set of strategic advisors. The board challenged Katta to pivot the business yet again. Revenues from IP-based products had reached a third of total revenues, and the rest of the revenues came from services projects. Katta realized that a project-based business was difficult to scale as it lacked the repeatable elements that would allow Saama to "productize" its services. The move to developing repeatable and scalable products would require significant capital investments, which Saama, as a services company, had never done. The board advised Saama's leadership to raise new capital. A concerted fundraising effort led to commitments of $35 million from a single institutional investor within a few weeks.

The injection of new capital allowed Saama to accelerate its evolution from a project-based services company to an IP-based product company. Saama expanded its engineering team and structured its IP development into a three-layered platform model. The bottom layer consisted of horizontal data infrastructure that could be shared across vertical market applications. The middle layer consisted of industry-specific applications. The top layer consisted of business outcomes for targeted applications. By segregating the horizontal layer from the industry-specific layers, Saama could build products for a variety of industries on a common foundation. Saama also hired professional product managers to manage its IP-based products. Karim Damji, who had headed strategy and product management for other technology companies, came onboard to lead the product management function. Damji also brought the discipline needed to deliver the four Ps of marketing: productizing, pricing, packaging, and positioning.

Saama packaged its analytics offering as the Fluid Analytics Engine (FAE®), which employed advanced analytics models to produce actionable business insights (see Exhibit 1). FAE leveraged new technologies in big data such as the Hadoop Distributed File System (HDFS) and MapReduce to store and process data. The benefits delivered by FAE were speed of implementation, lower cost, and superior insights. FAE delivered speedy solutions because it came with pre-built machine learning models containing advanced visualizations and data management. By pre-building up to 70% of the functionality in the FAE backbone, Saama was able to develop industry-specific solutions within three months. FAE also leveraged the client's existing analytics investments and could be delivered via the cloud, making it cost-effective. Importantly, by offering FAE to different industry verticals, Saama developed a deep understanding of the customer's business and the vertical market. Saama offered FAE-based solutions to the technology, media, insurance, life sciences, healthcare, government, and CPG industries. Its clients included Cisco, Broadcom, GoPro, Astellas, Dignity Health, the FBI, CSAA Insurance Group, Motorists Insurance Group, PayPal, and Unilever.

Narrowing the Market Focus (2016–2017)

Although FAE drove growth for Saama, Katta felt that the company had spread itself too thin by 2016. He thought Saama was attacking too many verticals. "You always learn from the market, and you always learn from the customer," Katta explained. He came to the conclusion that Saama needed to reverse course by narrowing its market instead of chasing clients in many different verticals. Katta met with Professor Mohan Sawhney at the Kellogg School of Management to get feedback on his vertical market strategy. A comment by Prof. Sawhney resonated with Katta: "No market is too narrow to build a billion-dollar company if you go deep enough." Katta became convinced that Saama had to focus on one vertical in which the company had the most differentiated offering.

Based on an analysis of its clients, its domain expertise, and the attractiveness of the market, Saama chose the life sciences industry as its target vertical market. More specifically, Saama chose to focus on analytics solutions for managing clinical operations in the life sciences industry. Clinical operations represented a big opportunity because life sciences companies could take as long as 10 years to bring a blockbuster drug to market and spend as much as $2 billion in the development process. Further, clinical operations were driven by data and analytics, but this data was difficult to gather and analyze because it was stored in silos within the company and it was collected from a wide range of third-party data sources. If Saama could create an analytics solution that would unify the data sources and derive insights for clinical operations, it could shave months and even years off the launch of new drugs.

Saama decided that it would keep its legacy customers in other verticals, but it would not invest in further product development or actively pursue new clients in the off-target verticals.

The Life Sciences Industry and Clinical Operations

Life sciences is defined as all sciences that have to do with forms of life such as plants, animals, and human beings. Life sciences companies focused on finding cures, eradicating diseases, and lengthening the life span of human beings. The life sciences industry consisted of companies in the biotechnology, pharmaceuticals, biomedical technologies, and biomedical devices sectors, along with companies involved in helping these companies in R&D, as well as in the commercialization of their products.

The life sciences industry was a very research-intensive industry. Worldwide R&D spending by pharmaceutical and biotech companies was estimated to be $154 billion in 2016 and was projected to increase to $182 billion by 2020 (see Exhibit 2). In 2016, the average life sciences company spent 20% of its revenues on R&D.

Clinical Operations and Clinical Data Management

Clinical trials are experiments or observations in clinical research on human participants that seek to answer two key questions:

1. Does a prospective drug or device work? (Efficacy)
2. Is the drug or device safe? (Safety)

In the United States, clinical trials are conducted under the supervision and oversight of regulatory authorities such as the Food and Drug Administration (FDA). These regulatory authorities are responsible for evaluating the risk/benefit ratio of the therapy. Clinical trials typically proceed in three phases:

- Phase I involves testing the drug on 20 to 100 volunteers with the disease or condition. The goal is to determine the optimal dosage to be given to patients and ensure patient safety. This phase costs an average of $170 million and takes an average of 1.5 years.
- Phase II involves testing the drug on up to several hundred volunteers with the disease or condition in order to measure the drug's efficacy and possible side effects. This phase costs an average of $400 million and takes an average of 2.5 years.
- Phase III involves testing the drug on 300 to 3,000 volunteers with the twofold purpose of further testing the drug's efficacy and monitoring for long-term adverse reactions or side effects (surfacing only after one to four years of taking the drug). This phase costs over $500 million and takes an average of 2.5 years.

On average, then, clinical trials across the three phases cost over $1 billion and take 6.5 years. In 2015, almost 7,000 drugs and treatments were in development worldwide. The top three cost drivers of clinical trial expenditures were clinical procedure costs (15–22%), administrative staff costs (11–29%), and site monitoring costs (9–14%). Most important for Saama, 60% of clinical trial activities were data management related and 20% of trial dollars were reserved for clinical data sciences. Life sciences companies struggled to keep clinical trials on schedule and on budget. Fewer than 10% of trials were on budget and on time, whereas about 40% were costly and over budget. Approximately 72% of trials were one month behind schedule, and 14% of trials were abandoned for a variety of reasons: safety concerns, insufficient or low enrollment, lack of efficacy, withdrawal of funding support, withdrawal of the compound, or unavailable subjects. Patient recruitment took 30% of the total time spent; 70% of studies experienced delays in patient enrollment, while 20% failed to recruit a single subject.

Based on discussions with customers, Saama identified a pain point—life sciences companies found it difficult to procure data from the diverse data sources they needed to access, and they found it difficult to get actionable data. For instance, the site ClinicalTrials.gov provided useful macro data on clinical trials, but the data was not granular enough to predict the enrollment rate of a given site or investigator.

Clinical data consisted of R&D (clinical operations data) and commercialization (real-world data). In a clinical trial, the amount of data gradually increased as a drug moved from phase to phase. The biggest data problems arose in the more advanced phases, as a drug progressed toward market authorization and access and into pragmatic trials and registries.

Saama's discussions with customers revealed three key desired outcomes for clinical operations: operational efficiencies, clinical trial effectiveness, and a streamlined submission process. These outcomes called for clean longitudinal data, patient centricity, leveraging artificial intelligence, and bringing a Silicon Valley innovation mindset to the arena of data solutions. The customer pain points suggested that the clinical development process was ripe for disruption.

Sizing the Clinical Operations Analytics Market

To identify its TAM, Saama mapped all the places big data and analytics were used in the life sciences industry. Big data and analytics spend could be found in R&D, as well as in sales and marketing (commercialization). A closer look at the R&D process indicated that roughly 20% of the R&D budget was spent on initial research or pre-clinical activities and the remaining 80% on a combination of clinical trials (Phase I–Phase III), regulatory approval, manufacturing, and post-market surveillance activities (see Exhibit 3).

The clinical trials component of the R&D process could be further divided into business processes that started with the development of the protocol and continued with study startup, site activation, patient enrollment, study conduct, and finally study closeout (see Exhibit 4). These business processes constituted the segments of Saama's addressable market. The other area in which big data and analytics spend occurred was for marketing and sales activities during the commercialization phase for the treatment or drug.

Combining the analytics spend in R&D with the analytics spend in marketing and sales, Saama estimated its TAM to be $14.8 billion in 2017 (see Exhibit 5). A more meaningful measure was Saama's total serviceable market (TSM), the portion of the TAM that Saama could reach with its current channels and products. Saama's TSM was limited to the clinical trials (Phase I–Phase III), post-approval safety trials (Phase IV), and the sales and marketing component of commercialization. Saama estimated its TSM to be $7.23 billion in 2017. Within this market, Saama limited its target market to two segments: pharma and biotechnology companies, as well as contract research organizations (CROs) and contract manufacturing organizations (CMOs). This resulted in a target market size of $2.83 billion for Saama, 70% of which were pharma and biotechnology companies and 30% of which were CROs and CMOs.

The total number of life sciences companies was between 500 and 600. About 20 large companies had more than $10 billion in annual revenues, and 30 midsized companies had revenues between $1 billion and $10 billion. The rest were smaller companies of revenues between $100 million and $1 billion. In 2018, the large companies accounted for almost 30% of the analytics spend in terms of the TAM and almost 50% of the analytics spend in Saama's target market.

Building the Life Science Analytics Cloud (LSAC) Solution

In September 2017, Saama announced the launch of its Life Science Analytics Cloud (LSAC), which was designed to optimize clinical development processes and deliver business outcomes by streamlining the steps of the entire clinical data journey. Saama's research had shown that process improvements and the use of data standards could save the life sciences industry up to $6 billion annually. The LSAC offering used data frameworks, smart data pipelines, therapeutic area-specific templates, and analytical assets to reduce time-to-value and improve ROI for clinical development.

The LSAC offered a complete range of cloud-based clinical data analytics solutions and incorporated the latest techniques in machine learning and deep learning to deliver results for the life sciences industry. With LSAC, Saama was able to create a holistic view of the patient's journey through a clinical trial, which was crucial to identifying cohorts for clinical trial and tracking the treatments they received. The LSAC featured a centralized "clinical data lake" consisting of three information buckets: evidence generation around innovation, data management and quality through automation, and insights and cost based on operational information. Based on this data foundation, Saama created a suite of cognitive analytics products.

Saama's LSAC solution included the following offerings (see Exhibit 6 and Exhibit 7):

- Clinical Development Optimizer (CDO), for monitoring and managing performance and risk of the clinical trial portfolio
- Trial Planning Optimizer (TPO), for designing and optimizing clinical trials
- Cohort Builder, for identifying eligible patient populations for clinical trials
- Market Analyzer, for analyzing the market performance of pharmaceutical products
- Patient Pathways, for tracking the end-to-end patient journey through disease and treatment

The overarching benefit of the LSAC solution was to drive faster trials and better patient outcomes. This in turn led to faster drug commercialization and reduction in total cost of ownership. LSAC allowed clients to design better trials, evaluate trial performance, derive valuable business insights, and proactively manage risks. LSAC also leveraged existing infrastructure, which helped save money through shorter implementation and deployment time frames.

Choosing a Growth Pathway

As Saama's leaders gathered to chart the path ahead in October 2017, they were beginning to see their focused vertical market bet pay off. Saama's life sciences business had shown explosive growth in excess of 50% year over year for three years in a row. Saama's account and functional leaders were projecting similar 50% CAGR growth rates for the next three years. Key customers were starting to adopt Saama's LSAC offerings. Industry accolades were arriving and Saama's experts were presenting at pharmaceutical industry conferences and being recognized as thought leaders. Saama's AI research team distinguished itself through groundbreaking work that was published in peer-reviewed technical journals. To build on the momentum, Saama's leadership had identified three possible growth pathways.

Customer Acquisition Pathway

The first growth pathway was a "hunting" strategy that would involve acquiring new customer accounts for the LSAC business. These could be entirely new accounts ("new logos"), or they could be Saama's legacy life sciences services customers who were new to the LSAC solution. Saama would target pharma and biotech and CROs that represented a total target spend of $2.83 billion. This pathway seemed attractive, as Saama had less than 5% market share and the market for analytics solutions was still in its infancy, with many customers still to be acquired.

To estimate the revenue potential from new customer acquisition, Saama's team divided the target market into 20 large accounts (e.g., Pfizer), 30 midsized accounts (e.g., Actelion), and about 550 smaller accounts (e.g., Ironwood Pharmaceuticals) based on annual revenues of the companies. For each segment, the team estimated the annual analytics spend, the annual revenues Saama could expect from a typical account, the length of the sales cycle, and the probability of closing a deal with prospective accounts. High-probability accounts would close 50% of the time, while medium-probability and low-probability accounts would close 25% and 10% of the time, respectively. Saama's sales team estimated that it could close no large accounts, one midsized account, and two small accounts in Year 1. In Year 2, it could close two large accounts, four midsized accounts, and six small accounts (see Exhibit 8).

Acquiring new accounts was no easy task, however. Saama would have to compete with large system integrators, such as Accenture and Deloitte, as well as with the in-house development teams at life sciences companies. Although system integrators tended to be deeply entrenched in most large accounts, they had often over-promised and under-delivered on analytics solutions. Saama would need to find beachheads in new accounts by identifying specific pain points, such as patient enrollment or clinical trial portfolio management, that mapped to a specific LSAC module like the Cohort Builder or Trial Portfolio Optimizer.

Success in new account acquisition would depend on the strength of Saama's value proposition, the clarity of the company's story, and its ability to reach the right decision makers within the organization. Saama would need to lean heavily on two or three of the senior executive team members to close strategic deals. To shorten the sales cycle, Saama could employ a pilot program in which it could offer one specific LSAC module for a 30-to 60-day trial at a relatively low price to help customers gain confidence with Saama's solutions and capabilities.

Customer Development Pathway

In contrast to the customer acquisition ("hunting") strategy, the customer development ("farming") strategy relied on increasing the share of wallet among current LSAC customers by broadening Saama's footprint within an account with adjacent products, as well as by deepening its penetration within the account by selling to other business units or clinical groups within the account. Saama estimated that the typical analytics spend

for a large life sciences client was around $100 million per year. Saama's current deployments brought in around $2 million, representing a mere 2% share of wallet for a large account. This suggested that large and midsized accounts had significant potential for increasing share of wallet. Small accounts would be excluded from the customer development pathway, as the opportunities to broaden and deepen Saama's footprint were limited in that type of account.

In broadening the scope of its offerings within a client account, Saama would have to position itself as a "best of suite" provider with a superior end-to-end analytics solution, as opposed to point solutions or more narrowly focused solution providers. Saama would need to compete against a wide variety of focused competitors who might have capable point solutions that did not necessarily work well with Saama's offering. Saama would need to convince clients to "rip and replace" these point solutions or it would need to co-exist and integrate its solution with the point solution providers chosen by the clients.

Saama's typical LSAC client signed up for only one LSAC module. Saama could broaden its footprint within an account by cross-selling additional LSAC modules to the client. For instance, Saama could focus on a CDO client and sell it related modules, such as TPO. Saama estimated that the average large account could buy three additional modules at an average of $500,000 per module per year and that midsized accounts had the potential to buy two additional modules at $250,000 each per year. The company estimated that in Year 1, it would close no large accounts and only one midsized account for cross-selling deals. It estimated that in Year 2, it would close one large account and four midsized accounts.

Saama could also deepen its penetration within an account by selling into other therapeutic teams within a client account. For instance, if Saama were working with the oncology therapeutic team at a large pharma client, other therapeutic areas at the client could also benefit from Saama's solutions. To be successful at cross-selling to other clinical trial teams, Saama would need to secure glowing references from existing stakeholders. Saama would need account managers to work with operational directors and managers in the client's organization, showing them improved business value from Saama's solutions and thereby spearheading growth through proven results. On average, an account expansion deal would lead to an additional $1 million from a large account (two additional therapeutic areas at $500,000 each) and $250,000 from a midsized account (one additional therapeutic area at $250,000 each). The company estimated that in Year 1, it would close one large account and two midsized accounts for account expansion deals. It estimated that in Year 2, it would close three large accounts and four midsized accounts.

Saama could also address adjacencies such as compliance, patient sentiment, and managed care solutions. These adjacencies represented expanded feature capabilities within the established focus area and would require Saama to manage a broader set of subject matter expertise and client delivery capabilities, along with salespeople who were multifunctional and skilled at cross-selling multiple products and the whole LSAC platform.

Product Development Pathway

The third growth pathway for Saama was investing in transforming its products and solutions to take advantage of recent developments in technology. In recent years, the technology industry had witnessed dramatic advances in two areas: artificial intelligence and blockchain technologies. These were nascent areas, so the analytics spend on these technologies was not yet well known. However, Saama's leadership team was convinced that these two technologies had the potential to disrupt the analytics marketplace by creating new paradigms for developing analytics models, as well as for managing clinical trial workflows. Saama's current analytics solutions could be enhanced with these technologies but could also be commoditized by the same technologies. The likely outcomes were not yet clear.

Artificial Intelligence and Deep Learning

Artificial intelligence was a field that had existed for several decades in academic institutions and large technology companies. In recent years, however, AI had hit an inflection point due to the creation of open source tools from companies such as Google, Microsoft, IBM, and Amazon, as well as advances in computational engines (GPUs) and cloud computing. Open source tools and wide availability of powerful

computing engines had leveled the playing field in the analytics industry. Smaller and nimbler startups now had access to some of the same algorithmic work that propelled technology giants such as Facebook, Google, Amazon, and Microsoft. Every major technology company, including system integrators, system of record providers, and analytics solution providers, was investing heavily in AI and deep learning [3] technologies. Saama realized that it needed to embrace AI and deep learning as a competitive necessity. It created an internal AI research team with a charter to develop, test, and iterate new AI-enabled analytics solutions.

Saama's AI research team identified several areas where AI could enhance clinical analytics, including patient selection for clinical trials, predictive feasibility models, natural language–based prediction of adverse events, intelligent virtual assistants, and clinical trial cost predictions.

Exhibit 9 shows an example of how Saama had augmented its LSAC platform with just one AI application: natural language understanding (NLU). Saama's AI team realized that close collaboration with leading-edge clients would be crucial to identify promising use cases for AI. To drive co-development with customers, the team created a program called Innovation.AI. In this program, Saama would work with a selected set of clients to design experiments for AI applications in clinical operations. Saama would bring technology expertise, and the client would contribute data and the business problem to be solved with AI.

Saama created an initial list of candidate use cases for AI in clinical operations. These included intelligent virtual assistants for clinical trials, predicting insurance claims for fast-track submissions, and adverse events to drug mapping using NLU. The Innovation.AI projects were one-time pilots and were valued at $100,000 for midsized customers and $250,000 for large customers. Saama estimated that 50% of pilot engagements would convert into scaled-up AI projects, with a value of $500,000 annually for midsized accounts and $1 million annually for large accounts. In Year 1, Saama expected to secure one pilot project with large customers and two projects with midsized customers. In Year 2, it expected to double the number of pilot projects and would begin to realize revenues from scaled-up engagements that began as pilots in Year 1. In Year 1, revenues from the AI engagements would be limited to revenues from one-time pilot projects. In Year 2, revenues would include one-time pilot projects as well as recurring revenues from scaled-up engagements.

Besides the revenue outcomes from Innovation.AI experiments and AI engagements, Saama would also benefit from being perceived as a trusted advisor and thought leader for its life sciences customers. In addition, embedding AI models into its LSAC modules would increase competitiveness of the core LSAC offering and serve as a defense mechanism to prevent commoditization of the LSAC platform. However, the revenue potential from AI-related products and solutions was quite uncertain.

Blockchain

The blockchain is an incorruptible digital ledger of economic transactions that can be programmed to record not just financial transactions but virtually everything of value. [4] By creating a distributed ledger of transactions, blockchain creates an indelible record that cannot be changed; furthermore, the record's authenticity can be verified by the entire community using the blockchain instead of a single, centralized authority. Although blockchain technology initially was applied to financial transactions in cryptocurrencies like Bitcoin, the technology could be used to record, verify, and manage any transaction or contract among multiple parties.

Blockchain had the potential to be a significant disruptor to the entire life sciences ecosystem. From a vendor/competitive perspective, it democratized data and made it more accurate. This meant that the competitive advantage currently enjoyed by Saama in ingesting and harmonizing of data could be eliminated. Access to troves of data also did not present a barrier to entry for analytics vendors accessing the blockchain. Pharma companies and CROs could get rid of many processes for cleaning and verifying data as the blockchain made these issues moot. Blockchain represented a serious threat for system-of-record vendors as their system workflows would get severely altered or even eliminated. Pharma companies and CROs would also have access to benchmarking data across companies if everyone agreed to put their data in a blockchain ledger. Patients could also have more control over their data and could even be in a position to monetize their data.

Saama needed to identify the most promising use cases for blockchain in clinical operations, and it needed to figure out how to create a viable business model for blockchain-based offerings for these use cases. Saama's R&D team zeroed in on three big challenges in contemporary clinical research: patient enrollment in clinical trials, personal data privacy concerns, and data sharing. Clinical studies were often compromised by errors or fraud, resulting in a lack of inviolability or reproducibility. Blockchain could address this problem by providing a transparent, decentralized technology wherein the data was secured and hardcoded by a complex, cryptographic algorithm. In addition, the decentralized ledger would give users a great deal of control and autonomy over the data and could lead to improved trust in the efficacy of the clinical trial process.

To illustrate the power of blockchain in clinical trials, consider a specific use case of informed patient consent. One of the key problem areas in the conduct of a successful clinical trial was to capture and manage patient consent for all applicable protocol amendments. As clinical operations are digitized, patient consent forms could be captured digitally. However, issues such as proper time stamping, omissions, and fraud had created major bottlenecks for the timely verification for approvals. Blockchain's Smart Contracts would solve this problem. See Exhibit 10 for more details on clinical trial data workflows enabled by blockchain technologies.

Although Saama had started experimentation with blockchain, much uncertainty remained regarding the blockchain ecosystem, as well as business models for monetizing blockchain offerings. Saama's R&D leaders were actively engaging with industry forums and participating in pilot programs to vet blockchain technologies. Through these activities, Saama's team hoped it would gain insights into use cases and business models for blockchain in clinical operations.

Conclusion

Saama's leadership team had distilled its growth opportunities and challenges into three key questions:

1. What growth pathways would best enable Saama to fulfill its vision of becoming the market leader in the life sciences clinical analytics space?
2. Which growth pathways best fit with Saama's capabilities?
3. What are the risks and implementation challenges for each growth pathway and how can they be mitigated?

By identifying the best growth pathways and being cognizant of the risks and challenges of its chosen pathways, Katta and his team hoped that Saama would be able to maintain its fast-growth trajectory.

Notes

1. Share of wallet is the percentage of a customer's total spending that a business captures with its products and services.

2. All quotations from Suresh Katta are from an interview with the author, October 30, 2017.

3. Deep learning is a subset of a broader family of machine learning methods based on learning data representations as opposed to task-specific algorithms. Deep learning models feature multiple layers of nonlinear processing units that correspond to different levels of abstraction; the levels form a hierarchy of concepts that progress from specific to more abstract concepts. Deep learning models are inspired by information processing and communication patterns in a biological nervous system, such as neural networks in the human brain.

4. Don Tapscott and Alex Tapscott, Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World (New York: Portfolio/Penguin, 2016).

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