# Using a Software-as-a-Service (SaaS) model to deliver evidence from Clinical Trials, Studies and other High Quality Sources to Write Equations, Archimedes, Inc. is focused on Revolutionizing the Quality and Efficiency of Healthcare through Mathematics

**Healthcare
IT**

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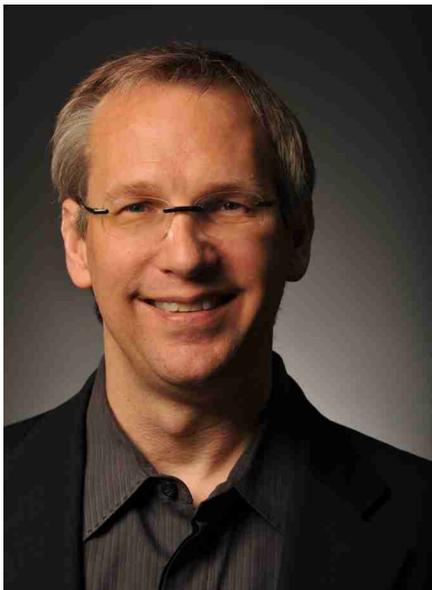
**John F. Beasley
CEO**

BIO:
John F. Beasley serves as the Chief Executive Officer of Archimedes and is responsible for the overall management and strategy of the business. John joined the Archimedes team in May of 2006. Previously, John earned industry-wide recognition for his visionary leadership as CEO of Chem-Connect, a company he founded and grew to become the world's largest exchange for chemicals, plastics, and natural gas liquids. John also has over two decades of experience in the healthcare field where he served as Director of Mergers and Acquisitions at First Physician Care, which he helped build from a start-up to a $100 million company in just three years.

About Archimedes, Inc.:
The mission of Archimedes is to revolutionize the quality and efficiency of healthcare worldwide through mathematics.

While "revolutionize" is a bold word, we believe the opportunity exists. Mathematical modeling is an integral part of decision making in virtually every major industry except healthcare: aerospace, communications, transportation, engineering, energy, and finance, to name a few.

We will bring the power of quantitative analysis to healthcare. We will use the best available evidence from clinical trials, epidemiological studies, and other high quality sources to write equations that represent human pathology and disease, populations, healthcare processes, and delivery systems. The resulting model can be used by physicians, patients, policy makers, administrators, pharmaceutical/medical device developers, and other decision makers to understand how the different options they face affect clinical outcomes and costs.

This type of quantitative information is essential to making the best decisions, which in turn can transform the quality and efficiency of care.

Through our work and partnering with major decision makers we believe we can help bring a much needed revolution to healthcare worldwide.

Interview conducted by:
Lynn Fosse, Senior Editor
CEOCFO Magazine

CEOCFO: Mr. Beasley, according to your website, "Archimedes is quantifying healthcare." Would you please tell us about Archimedes, Inc.?
Mr. Beasley: What we are working to do is inject mathematics into the decision making process in healthcare. For many, many years, the decisions that have been made in healthcare have come out of expert opinion. But the challenge has been a lack of focus on the data that has come out of healthcare; to really look at what is happening at the granular level of which treatments work, which protocols work, which interventions really make a difference. What Archimedes has done is taken the best data that is available from clinical trials, to longitudinal datasets, to electronic medical record data, and developed that data into mathematical models that our customers can use to explore what different treatments could be for their patient populations and sub populations. What we do is predict the risk of adverse outcomes of events in populations and individuals, and then we allow our customers to explore those datasets, understand what they can do to reduce the risk, and make healthcare delivery more efficient.

CEOCFO: Have people not had the tools before to do it or has no one ever thought of this concept?
Mr. Beasley: That is a good question. I would say that mathematical model-

ing in analytics is still relatively new in healthcare. Our founder, David Eddy, MD, PhD, who is both a doctor and mathematician, was one of the leaders in developing modeling way back in the early '70s. So it really started then; the late '60s, early '70s. The modeling approaches then were best in class, but they did not allow for what I will call "integration of human physiology and disease process." This is necessary to understand what is going to happen with the entire human being; to show how diseases interact. I think the thing that sets the Archimedes Model apart, relative to other models that academics and other organizations produce, is that our Model is based on what we call "a full scale simulation model", which was inspired by the big simulation models that were used in war simulation amphitheatres. The thought that David has shared many times is that, "if they can do it for war, we ought to be able to do it for healthcare." He built a very different kind of healthcare model than has ever been built before. It is basically an agent based model that takes simulated human beings and projects what is likely to happen to them over the course of a twenty year time period. This allows us to understand how various interventions will affect the outcomes; both in terms of health and costs for those patients. David along with his cofounder, Len Schlessinger, PhD, developed this Model so that it is integrated across diseases. The Archimedes Model is not simply a model of, for example, cardiovascular disease or diabetes, it actually integrates diseases in a modular way, which allows us to look at things like comorbidities and multiple intervention effects. The best example of this is where you have a patient that has diabetes, is developing cardiovascular disease, and is obese. With the Archimedes Model you can ask which treatments really will make the most difference for that particular individual. That is not available in other models. The last piece is that we have integrated models of healthcare

delivery systems on top of the physiology models; so not only can we very accurately predict the health outcomes of patients, we can also look at the economic outcomes. We can compare different treatments, understand what is truly cost effective and what is not. This is critical in today's environment where healthcare cost is approaching 20% of gross domestic product (GDP), which is at an unaffordable level for our nation. We have got to find ways to both provide better care and reduce the cost. By integrating both the healthcare system and the physiology together, this gives us the ability to carefully look through a quantitative lens and make better and more informed decisions.

CEOCFO: What types of companies are using your services today?

> **"It is not just Archimedes; there is a fundamental change that is happening within the industry. People are recognizing that the quality of care that America's health system provides is not as good as we would like it to be. In nine months we were able to take a clinic within Kaiser Permanente and reduce the risk of cardiovascular disease by 13% simply through an informational intervention. We were able to reduce the risk and reduce the cost. With analytics, we have the ability to bend the healthcare cost curve."**
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> **- John F. Beasley**

Mr. Beasley: We started with policy organizations. That was really the inspiration behind starting Archimedes, because our founder David Eddy was on the boards of large payer organizations making important decisions in healthcare; like the decisions on whether or not to disapprove silicone breast implants. That was one example that he was involved with. He found that expert opinion about whether or not silicone breast implants were okay or not okay ranged from they were 100% acceptable to they should not be allowed in the practice of medicine. He really pursued modeling from a policy perspective, because that was what he was involved with. Our first customers were organizations like the Centers for Disease Control and Prevention (CDC), the American Cancer Society,

the American Diabetes Association and the American Heart Association. The company then evolved to the next major target market, which was the life sciences space, which includes the largest drug developers in the world. They really understood what we were doing early on because they had been involved in pharmacodynamic and pharmacokinetic modeling for a long time. Understanding how our Models worked and how they could be incorporated into their decision making process, and understanding how their clinical trials may play out was something that they valued. They became our first major commercial target market. The last target market is health systems. These are primarily the big integrated health systems like Kaiser Permanente or Intermountain Healthcare that are both risk takers, so they are the payers in healthcare, but they also manage the healthcare delivery system. They are responsible for the financial piece and for the delivery of care. What they are looking to do is improve the quality of care for their members, but also improve the efficiency of care. They use our clinical decision support tools, such as IndiGO, and our population management tools, such as ARCHeS, to really understand at a granular level - meaning at the individual level of patients - what the risk is for adverse outcomes like heart attacks and strokes and the instance of diabetes, and then how best to reduce that risk over time. Those are the three major target markets that we have. There will be more in time, but that is a lot for our organization at this point, because there is a great deal of need in those groups.

CEOCFO: Are you licensing software to them and then they are running their studies or are you running the analytics for the various entities? What is the model?
Mr. Beasley: We started as a consulting organization wrapped around a very sophisticated mathematical model that basically only highly trained mathematicians could oper-

ate. Our mission is to revolutionize healthcare worldwide through mathematics. We understood pretty early on that we were not going to revolutionize healthcare consulting project by consulting project. They are good projects, and we like this kind of work because we can really make a difference, but we needed something that could scale. Shortly after the company was started, we evolved our business model to include software as a service. We have products for our life sciences customers, our policy customers, and our heath system customers that are delivered to their desks or even in the exam room in the health systems target market. We are integrated within the electronic medical record, and again, all of this is delivered as software as a service—so the technology we use will allow the business to scale very rapidly and spread it across many customers, allowing us to scale our reach and revolutionize healthcare.

CEOCFO: Do the majority of companies in the areas you service know about you?

Mr. Beasley: Yes they do. For a couple of reasons: Number one, David Eddy is quite well known in healthcare. He is considered the father of evidence-based guidelines. The movement that started in the '80s to ensure that good evidence was used to determine the guidelines for patient care—that entire movement really started single handedly with David. He is well known for that. He was also on the Clinton's health reform committee. People know us through that lens, but we are also a subsidiary, our parent company is Kaiser Permanente. Kaiser Permanente has been a great parent for us, and an active user of our products. Through their discussions with other health plans, even internationally, they have shared their experiences in using analytics. Finally, I believe that we are the organization that has the longest track record in this space. Archimedes' work started back in '93, so we almost have two decades of experience in both building and validating models, and deploying those within our target customer markets. You really need that experience, because this is very chal-

lenging work, and we believe there is no substitute for experience. You really have to know what you are doing, because we are dealing with real patient outcomes, and individualized guidelines for patient care. We need to make sure our solutions are reliable. We have been around for quite a long time, and the industry professionals we work with understand who we are.

CEOCFO: The value of your offering seems almost a no brainer. What have been the impediments to adoption?

Mr. Beasley: It is one of those things that revolves around healthcare – the industry is, relatively speaking, slow to change and slow to adopt new technologies; especially technologies that are difficult to understand. A mathematical model that is as sophisticated as the Archimedes Model is tough to understand. You really do need to have a PhD in math to dig down into it. For many years, we got the comment back from our target customers that, "This is a black box. We do not understand it. If we do not understand it, then we are not going to use it." So, we started a campaign of writing papers that are published in peer review journals, sharing more and more about the Model and how it's validated. I believe we have published over one hundred and thirty papers in peer review journals, including how our Model works, and just as importantly the validations of the Model. Because it is one thing to build a mathematical model and have very talented people doing that; it is another thing to validate the accuracy of that model against datasets that were not used to build the model. That is really the test that one uses to get confidence that the Model is sufficiently accurate to use in real world situations. We have built a suite of validation capabilities where we take twenty-six of the landmark clinical trials in the diseases that we work with, and we regression test our Model against those sets of landmark clinical trials every time we make revisions. We then publish that information for our customers. We believe this transparency provides our customers with much more confidence in

the Model. Our usage is growing quite nicely. We have been very fortunate to get the early support of the American Diabetes Association, American Cancer Society, American Heart Association, and also the Robert Wood Johnson Foundation in our work. Kaiser Permanente is also our parent, which gave us a lot of credibility that a typical early stage startup company would not get. With that, we have had many other high-profile customers. The best example and most recent is Intermountain Healthcare in Salt Lake City. They have just signed a contract with us to deploy our IndiGO application throughout their healthcare system. IndiGO is an individual clinical decision support application which provides information to individual patients about their health risks in the exam room setting, as well as other settings, which helps the patient and the doctor have a conversation about the patient's risk and the alternatives for reducing that risk. We quantify the individual's risk. Those are the kinds of applications that some of the leading organizations are very excited about. Not everyone is using us today, but our expectation is that analytics will be an enormous part of healthcare in the future and Archimedes will be one of the leading players in the space.

CEOCFO: What is ahead for Archimedes?

Mr. Beasley: Before I answer that, I just want to mention that every other major industry in the world has been revolutionized by mathematics. From the retail industry to the banking industry, and certainly all of the work that is done on the Internet - the web retailers, everyone is using analytics; even to the degree that there is a movie —"Moneyball" —which is about the Oakland A's using analytics to improve their performance. Every other industry has changed with analytics except for healthcare. Healthcare is the last industry to adopt it. There are lots of reasons for that, but we see an enormous opportunity for that change to happen now. That is another big piece that is happening. It is not just Archimedes; there is a fundamental change that is happening within the industry. People are recog-

nizing that the quality of care that America's health system provides is not as good as we would like it to be. I believe we are now ranked 47th in the world in terms of the quality of care, but we spend twice as much as our nearest first world country, so we need to do something, and we believe that something is to deploy analytics in the market. Back to the other question, we are actually at a very interesting transition period, which we are quite excited about. Over the years, we have developed our models and used the best data that we had available to create simulated populations that then emulate the populations of our customers. Among others, we have used a dataset that is produced by the U.S. government called NHANES. It is basically a dataset that represents the health of the United States. That works quite well, but what our customers have asked is whether they can integrate their own data into our models and into our analytic methods. We have developed approaches to allow them to do just that. At the same time this is intersecting with a major change happening in healthcare, and that is the investment in the electronic medical record which has really been going on for probably five plus years, but now it is in full swing. The U.S. government has really done a fabulous job in providing incentives for healthcare organizations, and primary care providers, to implement electronic medical records. With that, huge datasets are being built, and big data is really beginning to blossom in the healthcare space. We provide tools to allow our customers to take their own data and essentially run them through the Archimedes Model; understand what the likely outcomes are for their patients, and how they can improve those outcomes in their own populations. Our customers are very excited about this added feature being made available. This is probably the one major change that is happening with us today.

CEOCFO: What makes Archimedes stand out for investors and people in the business and healthcare communities?
Mr. Beasley: There are many things. As I mentioned earlier, I will call it our "legacy", a combination of our founder David Eddy and his staff. I would say that he is the physician that has changed healthcare more than any single physician in the world in the last thirty years. This combined with the backing of Kaiser Permanente and the opportunity to participate, explore and pilot our products there, and the proven value of the Archimedes Model to both improve the quality of care and reduce cost. The example that I would give you is a pilot in Hawaii that we did with our IndiGO clinical decision support tool, where in nine months we were able to take a clinic within Kaiser Permanente and reduce the risk of cardiovascular disease by 13% simply through an informational intervention. We were able to reduce the risk and reduce the cost. With analytics, we have the ability to bend the healthcare cost curve. Frankly, we are very excited about this. We really want to make a difference in healthcare in the U.S. and worldwide, and we think we have the tools and the ability to do that.

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