

## LEAP MOTION

Andy Miller, the President and COO of LEAP Motion, was both nervous and excited as he sat in his front row seat at SXSW Interactive, in Austin, TX. David Holz, the 24-year old "boy genius" and CTO of LEAP and his co-founder Michael Buckwald were beginning their keynote address where they would demo publicly for the first time, the LEAP Motion Controller, the world's most accurate gesture control system, on the very stage where some of technology's most transformational companies had been introduced to the world. Twitter and Foursquare had both captured the imagination of the industry at SXSW and now the 3,600 participants in Exhibit Hall 5, Austin Convention Center were expecting a launch of equally revolutionary proportions from the young company of just over 50 people. As the bright lights came on, the applause in the audience softened and Buckwald and Holz appeared on stage, Miller took a deep breath. He could not help but think of the long journey that had brought his team to this momentous occasion. If LEAP succeeded, it could change the very way in which humans interacted with their digital environment.

### Making Computing Accessible

The crumbling barrier between man and machine has been a central part of the vision behind the IT revolution. In his 1963 MIT PhD thesis, Ivan Sutherland invented "Sketchpad" pioneering the idea of representing physical objects on a digital screen. This work later inspired Sutherland's student Alan Kay who invented "windowing" at Xerox PARC, paving the way for the "WYSIWYG" format popularized by the Apple Macintosh and Microsoft. In combination with the invention of the mouse, these technologies represent the so-called "Direct Manipulation" paradigm that shapes the bulk of today's routine digital interactions – from selecting and opening text to draggable "icons" on smartphones to modern video game consoles.

Though most consumers treat the "point-and-click" interface as the default technology standard, David Holz and Michael Buckwald, two middle school buddies from Southern

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Florida, believed that existing systems were frustratingly short of the gold standard in Human Computer Interaction. Their vision was to design a system that allows a user to control a digital environment in the same way that one controls real-world objects. If one can simply “pick up” a ball in the physical world, why not be able to virtually pick up a digital ball?

Referring to the particular challenges of 3-D modeling, Holz recalls:

Molding clay is intuitive, but there was a barrier in the information exchange between a person and their computer—namely the limits of the mouse and keyboard—that made 3-D modeling a complex, technical task. We wanted to remove that barrier so people can interact with their computers in a natural, intuitive way.<sup>1</sup>

Holz began working on realizing this vision while in high school in Southern Florida. A gifted mathematician and computer scientist, Holz did his undergraduate work at Florida International University (rather than a more “obvious” place for someone with his skills, such as MIT or Stanford). Holz began his doctoral work in mathematics at the University of North Carolina-Chapel Hill, focusing on problems related to fluid mechanics. During that time, Holz made a number of key algorithmic breakthroughs that dramatically improve the ability of a sensor to accurately detect gesture-based input. It was this work that would form the cornerstone for the LEAP Motion gesture system.

## **Founding LEAP Motion**

By 2010, Holz felt he had developed powerful algorithms, which, combined with simple hardware, could transform the human-machine interface. His belief in the transformative power of this technology led him to drop out the PhD program at UNC and consider how to take advantage of his breakthroughs. He approached Michael Buckwald, his childhood friend, who had already realized some entrepreneurial success building a company that was acquired by the Yellow Pages. The first decision of the two co-founders was to move to Silicon Valley. Speaking about this Buckwald recalls:

I was in DC and David was in Chapel-Hill. There was some discussion about where to move. We talked about Boston, we talked about New York, basically we decided to come out west, partially for access to talent, partially for access to capital. So, it was a difficult step. It became obvious pretty quickly that this was worth dropping everything else for. We were able to raise a little bit of money (ed:

from angel investor Bill Warner) too before we moved on, and that gave us some confidence.<sup>2</sup>

The first challenge was raising funds. Though Holz could demonstrate the power of the new algorithms (relative to existing technology) to investors or other potential partners or hires, it was unclear who the customer was, what exact form the technology would take, and how they fit within a set of emerging human-machine interface technologies. For example, Microsoft was introducing a new gaming system for the Xbox called the Kinect, which allowed users to implement broad physical gestures without a controller. Though many people first hearing about Holz's technology tend to group it with Kinect, Holz and Buckwald emphasized that their breakthrough was based on a different set of principles, and offered a dramatic even transformational improvement in performance. Even though it was not clear what kinds of products the technology made possible or what markets the company would target, Holz and Buckwald were able to attract significant investor interest. Andreessen Horowitz, one of Silicon Valley's most prestigious and successful venture firms, and others provided a bit more than \$1 million of seed funding in 2011<sup>3</sup>.

The young team used this initial capital to develop a proof-of-concept product – a small iPod-sized device that can be plugged into the USB port of a computer and provide motion detection so that the exact movements of individual fingers and rotations of the wrist can be accurately detected and processed with no latency. Even though Holz's technology was unique, choosing what this prototype would look like, and what its capabilities would be was not an easy task. Holz recalls:

My original interest was in a Holodesk, which is like a desk, but the physical objects aren't there. In that design that we made, there were lots of devices, they were all around the room, people were like why are there so many? Do I have a room for this? We slimmed it down, and made it like a one simple experience (but which is also ultimately less powerful).<sup>4</sup>

This phase of their development was conducted under a high level of secrecy – potential investors were subject to a strict NDA, and curious journalists were simply told that the team had developed a motion control technology that was “radically more powerful and affordable than anything currently available.” Holz and Buckwald, however, were eager to debut their technology to the world, grow their organization, and begin working with potential partners to actually realize their vision.

May 2012, was a turning point<sup>5</sup>. The LEAP Motion Controller was introduced through a compelling and link-worthy online video that highlighted the range of potential

applications of the technology, Highland Capital Partners led a Series A round for \$12.8<sup>6</sup> million that gave the firm access to significant resources for commercialization, and the firm successfully recruited Andy Miller from Apple to serve as President and COO. Miller was the CEO and co-founder of Quattro Wireless, a leading mobile advertising company that had been bought by Apple for \$275 million in 2010, after which he served as the VP of iAd at Apple until his move to LEAP. While the decision to bring in an external industry veteran into the company's top management was a critical one, the decision was made easier by the fact that Andy Miller had already been working closely with the founders in his capacity as an investor for Highland Capital Partners.

## **Growing by Leaps and Bounds**

Andy Miller's arrival at Leap was accompanied by an overwhelming successful demo video which reached 7 million views in the space of weeks and was widely covered by outlets like the Wall Street Journal, the Washington Post, Bloomberg and Fortune magazine. In order to meet the growing expectations that this initial publicity had created the company needed to move quickly. To do this the company needed to recruit top engineering talent quickly however scaling and recruiting early technical talent was a significant challenge. Miller recounts: "Passing David's test is difficult. They sit in a room with every applicant, and give them this ridiculous math test. They can do that, the person needs to have that super scientist-oriented brain, most of them can't handle the math. For the position of VP of Engineering we've interviewed over 80 people so far. It's tough."

Despite these challenges however, Miller was confident that their young team could capitalize on their early success and ultimately deliver on their vision of transforming the face of human-computer interaction.

## **Getting Leap to Consumers**

The first challenge Leap faced was to transform their proof-of-concept into the hands of real consumers. The most attractive option for Leap, both to create significant accounts receivable and to engage quickly cutting-edge consumers excited by the technology was to develop a direct-to-consumer model based on pre-orders over the internet. While this option was quite capital-intensive and required the setting up of not only a manufacturing, but also supply-chain and marketing operations, Leap resisted the temptation to work through more traditional distribution channels. Talking about this option, Michael Holz recalls:

In talking to OEMs about the technology, it became clear that they were far behind us. If we went top down, waited till we had some traction, then approached OEMs, it would have been 2015-16 till we got this thing going. So we decided to focus on consumer devices. But at that time, the goal still was not to make our own device. We built a consumer version, small and cheap as possible and shopped around for OEMs, but again, very slow moving, very slow product life cycles, so for that purpose we decided to create our own device. But also, in order to create the kind of brand that we needed and create the developer ecosystem, we needed to have our own device as well. The economics of selling a device, the margins are relatively high, and that was another factor as well. The difference is between selling a \$80 device and selling a license.<sup>7</sup>

Over time Leap has evolved its go-to market strategy to involve a combination of direct selling and partnering with a select established players. First, the company has developed a polished product, contracted with an overseas manufacturer, set-up supply chain and delivery systems to consumers all in time to ship (in July 2013) to the hundreds of thousands of consumers who have pre-ordered the device. In addition, the company has also announced an exclusive retail partnership with Best Buy which will retail the device for \$79.99 and a partnership with Asus, the Taiwanese computer hardware manufacturer, to bundle the LEAP Controller with new high-end notebook and premium All-in-One (AiO) PCs<sup>8</sup>. In addition, the company has also announced plans to integrate Leap technology into HP laptops. Through these channels the company hopes to successfully deliver the LEAP Controller as a mass-market device to retail consumers.

## **Developing a Platform**

In order to deliver real value to the hundreds-of-thousands of consumers waiting in the wings, Leap however had to provide value through applications designed specifically for Leap technology. While Leap can interface with existing software, its real value lies in applications designed specifically to leverage its unique capabilities. Building a vast array of such quality applications in-house would require investing in specific capabilities around software development and support. Rather than build these capabilities themselves, the company has decided to open up the basic features of the LEAP Controller through an SDK (Software Development Kit) that selected developers can then use to develop applications. Excited by the diverse possibilities of the LEAP hardware, over 50,000 applications have been submitted to LEAP's developer program and the company has given out more than 10,000 devices for free to prospective developers.

In order to showcase these developer applications, the company is developing an application store called AirSpace that will allow users to install applications that have been quality-tested and deemed “safe” by Leap’s internal team. While the application store is a major undertaking and requires setting up international payment platforms, analytics, review and rating systems the company believes it to be a key component of its strategy going forward. How much control the company wants to exercise through its application store? What pieces of the LEAP technology it provides to developers and how revenues are shared between developers and firm are all key hurdles for successfully implementing LEAP’s platform strategy.

Speaking about this issue, Miller explains:

Our platform model is a little bit more free than Apple. We are going to be more open. You can take our developer kit and fork it. Everything is open, but we will also host an app store that will follow certain rules. We are in the process of figuring out the rules for the app store. While openness is important, we also realize the importance of having an curated appstore [...] You’ve got to own the community. It’s the most important part of the whole gig. We need to get the app store right immediately. Because if it doesn’t work, it’s hard to change tires at 100 miles an hour. The app store is the center of the wheel.<sup>9</sup>

The company has seen some early signs that developers can develop compelling applications for the LEAP that can significantly enhance its value to customers. Popular applications developed by developers include a quad-helicopter controller by hand gestures, applications by Google Earth, the Weather Channel, Corel, Autodesk, Fruit Ninja and a Jenga-style game (Block 54). However, attracting marquee software brands and finding the “killer application” that can do for Leap what Lotus 1-2-3- did for the IBM PC remains a challenge for the team going forward.

In addition to the AirSpace application store, the company is also working on deep integration with browsers and operating systems. This would allow users to perform routine tasks like browsing a webpage or opening a new application using Leap-enabled motion sensing<sup>10</sup>. This would make the system valuable to users even if they do not install custom applications designed specifically for the Leap controller.

## **Licensing, Partnerships and Beyond**

While managing existing relationships, platform strategy and retail strategy remains the focus, the management is keenly aware of the technology’s potential in other segments

like consumer electronic products (TVs, watches, smart-glasses, kitchen appliances, gaming consoles etc.) and industrial applications (supply chain management, outdoor advertising displays, automobile and aviation interfaces). The management team could adopt a number of different approaches to benefit from these diverse opportunities. LEAP could either set up an entire new division to develop custom technology for a number of different industries, or it could work with a few exclusive partners in certain industries by licensing its technology or alternatively it could adopt an unrestricted non-exclusive licensing strategy where partners could use the underlying technology as they desired.

Miller explains the possibilities:

The response to this (LEAP) has been unbelievable. 90% of the Fortune 500 have contacted us and think that this will be useful to them in some way. A few think they can revolutionize surgery, others are interested in robotic, laser eye treatments, some see it in fighter jets and aviation and still others in improving workflow in places like Jack-in-the-Box. Fedex wants to put this in warehouses, bio-engineers want this in MRIs, theme parks and Hard Rock Cafe want it so that customers can have engaging in-house experiences while consuming information.<sup>11</sup>

How Leap pursues these opportunities while still maintaining a focus on its newly established consumer business remains a key question for the company going forward.

### **Lights, Camera, Leap!**

Back at SXSW, David Holz had just finished an amazing “Clay Molding” demonstration where he used Leap to construct a three-dimensional model of Bart Simpson in under a minute<sup>12</sup>. As many audience members gasp, eyes glistening in amazement, Miller sits in his chair, soaking in the applause as the lights come back on and the attendees begin to murmur. He thinks about the journey back to the “LEAP Bunker” in San Francisco’s newly redeveloped South Beach area where important decisions await him at his desk. How should the application store be run? What can LEAP do to bring the best developers on board and give consumers the best possible experience while still maintaining an open platform? And what should be done about the boundless possibilities of the core technology in other industries? Miller and his team’s choices would determine how far Leap’s vision of transforming that way we interact with machines translates into reality.

## References

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