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Powell Flutes: Innovating Products and Markets

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Abstract

The purpose of this case study is to provide an understanding of how innovation is possible even when an artistic product has a 180-year history of design stability. Innovation does not come from a lightning bolt out of the sky. Rather, it emerges from an openness to new ideas and deep experience in your industry or product. There are numerous parameters on which a business can innovate, including materials, mechanics, aesthetic design and manufacturing technology. One approach is to eliminate constraints blocking innovation by working backwards from Z to A, rather than working incrementally forward from A to B to C. Market surveys must be conducted cautiously, as consumers may not be able to envision a hypothetical product for which a prototype is not yet available. When innovation breaks new ground, it can also create new markets or market segments. Therefore, it is generally preferable to own 100% of your own market segment than 10% of a highly competitive market.

How can you innovate a musical instrument and create new markets when the product your company makes has a fixed, 180-year-old design? I owned Powell Flutes from 1986 to 2016, and this case study reflects my experience.

The modern Boehm flute originated with Theobald Boehm in 1832. His basic design established the keywork of the flute, enabling performance of different notes reasonably in tune over a range of octaves. Flutes crafted today, more than 180 years later, are regarded as “Boehm flutes” and retain the basic keywork of the Boehm system.

Is innovation feasible in a stable market with a relatively fixed product design? Keep in mind flutists are trained to play based on existing keywork design, and any change requiring an alteration in fingering will likely encounter resistance. In my 30 years as owner of Powell Flutes—the Stradivarius of the flute world—we innovated constantly and created new markets in the process. Our tradition of innovation was not original to us, but went back to the days of “Mr. Powell,” the founder of our company. Verne Q. Powell introduced his own flute model in 1927. His flutes offered an improved scale, which determined how well in tune the instrument played note to note and octave to octave. He also created the “gizmo,” an add-on key nearly universal on today’s flutes.

Materials

Innovation does not require the invention of a “miracle material.” One can take advantage

of the exploding pace of technology to make incremental improvements in a product. The simplest changes implemented at Powell Flutes were accomplished by making improvements in materials. We replaced petroleum-based lubricants with silicone-based lubricants to produce a more slippery surface with extended durability. Cork bumpers, somewhat irregular due to the natural character of cork, were replaced with foam bumpers, which were quieter and more reliable. Flute pads, which are placed in flute keys to cover tone holes and make notes sound, were traditionally made of wool felt, backed by cardboard. Unfortunately, felt and cardboard absorb water, making pads expand and contract which impairs their ability to seal the tone hole. To remedy this problem, we bought patented pads designed by David Straubinger. His design substituted a synthetic fabric for wool felt and placed the material into a machined Delrin backing or retainer.

Powell made flutes and piccolos (“little flutes”) since 1927, the year it was founded. In 2011 we were still coping with the effects of the recession and skyrocketing gold and silver prices. It occurred to me I had very talented people with not enough to do and, additionally, that we were vulnerable to additional increases in the cost of precious metals. I resolved to look for a substitute for sterling silver keys, starting with the piccolo. Nickel silver was well established for student instruments but was characterized by several shortcomings. This composite (which has no silver in it) tarnishes and is relatively soft. Because of its association with student flutes, nickel silver is not considered a material for professional instruments. After considering many metals, I concluded stainless steel could be a viable option. Stainless steel is very strong, readily available and remains clean—or “stainless”—during use. However, to manufacture with it, we had to overcome its primary disadvantages: its hardness makes it much more difficult to fabricate into the desired form and it does not solder nearly as well as precious metals or nickel silver.

The tone holes of flutes and piccolos have traditionally been round, as have the keys which cover them. Because of the hardness of stainless steel, we decided to manufacture square keys instead of round keys since it is easier to machine a straight line than a circle. The design evolved into a modernized art deco style, a radical departure from traditional flute and piccolo keywork.

The normal manufacturing process for soldering flute and piccolo keys is to use a torch in the open air. Since torch soldering is not effective with stainless steel, we learned how to solder stainless steel using our atmosphere furnace. When we finished, we had a unique piccolo that musicians agreed was ergonomically comfortable and played well. In 2012, Powell’s new piccolo was recognized by the National Association of Music Merchants for technical excellence and creativity. However, sales were below expectations because flutists were uncomfortable with the radical design. Since we did not create this new piccolo for financial reasons, we were not disappointed by sluggish sales results and we recognized the piccolo was a success by other standards.

By being innovative with materials, our company learned valuable lessons. The new instrument we developed gave our craftspeople an opportunity to exercise their design creativity during a recession. We developed technology to manufacture using stainless steel which gave us a head start on the competition in the event we ever had to switch

away from precious metals. Last, Powell achieved recognition for innovation, helping support our brand and reputation for innovation.

Mechanics

Despite the fixed nature of the modern flute's Boehm keywork, innovations in the design of flute mechanics have taken place over the last 40 years. "Scale" refers to the position and size of the flute tube, and to tone holes in the flute tube. The scale affects how well in tune the flute performs note to note, octave to octave. Around 1974, Albert Cooper, a British flute maker, designed a modified scale that played better in tune than the scale most flute makers were using at the time. Cooper offered his scale to Powell and in 1975 Powell was the first established flute maker to produce flutes with the groundbreaking Cooper Scale. This created a surge in orders for Powell flutes. When I became the owner in 1986, we made some improvements to the Cooper scale that resulted in what is today called the Modern Powell Scale.

Another innovation in flutes was the Brögger Mekanik, a design to replace pins with a bridge in the middle of the flute, which was created in 1986 by Danish flute maker Johan Brögger.¹ This design did not change any flute fingerings, but it made flute keys less likely to bind and created more stability over time. It necessitated the addition of some keywork, however. According to some, the new mechanism was somewhat clunky-looking and mechanically complex. Brögger was able to obtain a patent on his design. We offered to license the design with some improvements, but Brögger refused to allow any modifications. Instead of licensing his design we implemented a simple bridge. While our approach was not quite as effective as Brögger's design, it still worked well and looked good. When Brögger's patent expired, we implemented our improved version of the design, which has been very well received.

Breakthrough Instruments

Markets can be segmented into many "pieces of pie." By identifying an underserved segment or understanding unmet needs, a new market can be created, or an existing market can be expanded.

Flutists refer to "The Powell Sound." To the best of my knowledge, there is no other flute maker whose name is used as an adjective to describe the acoustical output of a flute. The Powell Sound has several desirable characteristics. It is colorful, flexible, has strong projection and maintains a consistent timbre from octave to octave. The Powell Sound is the result of decades of a system or "gestalt" comprised of many small decisions made over many years involving materials, scale and manufacturing techniques. Because this complex system creates The Powell Sound, any changes in manufacturing technology or materials must be carefully assessed to determine whether

¹ Flute keys can work independently or in conjunction with another key. There are two ways to accomplish the connection between keys. One way is to drive a pin through the axle of the keys, and an alternative is to connect keys via a wire or bridge.

their impact on The Powell Sound would be positive, negative or neutral. If an innovation detracted from The Powell Sound, we would not proceed—even if it saved us time and money in manufacturing.

In 1997 our marketing director came back from a trip and said we had to produce a wooden flute, as some conductors wanted flutists to perform classical and baroque music on these instruments. We formed a team to assess the possibility of making a wooden flute. This included Powell's maker of wooden piccolos, our operations manager, a flutist from the Boston Symphony and a collaborating wooden flute maker from the western United States. We discussed shortcomings of existing wooden flutes, which were generally regarded as heavy, stuffy, out of tune and lacking projection. We agreed that if we were going to craft a wooden flute it would have to overcome all these deficiencies.

Following this meeting we surveyed our dealers worldwide about their interest in a wooden flute. Interest was tepid and our largest dealer, located in Japan, projected one or two orders a year. I decided to move forward anyway, partly because I thought the project would be stimulating to our craftspeople. A prototype was produced, which I took to Japan. During the trip I saw behavior by Japanese flutists I had not seen before or since. They would try Powell's wooden flute and compare it to their own wooden flute. In most cases they then quietly packed up their flute and placed an order with our Japanese dealer for the new Powell wooden flute. When orders came into our workshop later that year, we had approximately 30 orders rather than the dozen our survey had indicated. Our Japanese dealer alone placed over a dozen orders. So much for market surveys. As we heard in the movie *Field of Dreams*, "If you build it, he will come." New wooden flute orders far exceeded the survey results because it was a revolutionary instrument overcoming the understood limitations of competing wooden instruments. To reiterate, one needs to be cautious in the use of surveys. In my experience consumers may have difficulty assessing a new product for which no working prototype exists.

A "fighting brand" is a secondary brand and product intended to compete in a segment of the market where the primary brand is under attack, or where the company making the primary brand has not participated. In 2003 we recognized we could innovate a flute without changing keywork. Up until that point, student flutes (available for a few hundred dollars and frequently produced in China) came with a student flute headjoint, and professional flutes like Powell's came with a professional quality, handmade headjoint.² We were approached by numerous flute makers at an event in China and carefully considered whether we wanted to be associated with a Chinese instrument. In the flute world, it is universally recognized that the headjoint accounts for at least 50% of the acoustical quality of a flute, yet our calculations indicated the flute headjoint represented only 10% of the cost of producing a flute. Thus, the value equation for the headjoint was extremely high. It occurred to us that placing a professional-quality flute headjoint on a student flute body would deliver much of The Powell Sound at a cost far below that of a professional Powell flute. To create a separation between Powell's brand and a Chinese flute, we established *Sonaré* as our fighting brand and engraved "Sonaré" on the flute body. The headjoint, however, was engraved with the Powell logo just like any other professional Powell headjoint.

² The headjoint is the mouthpiece of the flute— what the flutist blows into.

This hybrid brand was introduced at the New York Flute Fair in summer 2003. One of our longtime customers and a Powell aficionado came up to our booth. With a hand on her hip, she demanded to know “why Powell was offering a flute made in China.” I explained our concept. She picked up the flute and tried it. “I’ll take that one,” she said.

The Sonaré flute substantially enlarged a relatively small, existing market. It was priced above student flutes but was still affordable enough to penetrate the intermediate or “step-up” market with a price around \$1,500. At the time, a professional Powell flute cost about \$8,000, and a student flute could be had for \$500 or less. By virtue of the Sonaré flute we expanded the step-up market. We achieved a large share of this expanded market with sales of about 3,000 units a year, compared to less than 1,000 units for our professional Powell flutes.

Manufacturing Technology

It is not necessary to be an engineer to innovate technology; simply identify the need and focus on the objective to innovate. Yes, make incremental or fundamental improvements, but avoid an incremental process while doing so. With a step-by-step process you are likely to bump into obstacles as you move incrementally. Instead, jump to the objective and work backwards, dealing with obstacles as necessary.

In the view of Powell team members, The Powell Sound came primarily from the headjoint, and secondarily from the scale of the flute body. To control these proprietary elements for our line of Sonaré flutes—Powell’s fighting brand—we chose to manufacture the headjoint and extrude the tone holes of the flute body ourselves. Key assembly and padding would take place in China, and we would finish the instrument at our Boston-area workshop. This process allowed us to maintain The Powell Sound and to claim “assembled in USA,” as a little more than 50% of the cost of materials and manufacturing was of U.S. origin and the finishing process took place in the USA.

We recognized that, for Sonaré to be price competitive, we had to become more efficient in production of both headjoints and extruded flute bodies. Thus, we focused research and development on bringing down costs for these two processes while maintaining or even improving quality. The traditional approach to tone hole extrusion involves making egg-shaped holes in a raw flute tube, placing a solid pulling ball inside the tube, and connecting the ball to a shaft. The ball is then pulled up through the tube and a die to form the tone hole. It is a job I had done numerous times, as I understood that the flute body is the foundation of the flute and downstream innovations depended on having accurate bodies. The traditional process took about 45 minutes. Our goal was to perform this work on a computerized machine in less than five minutes without adversely affecting quality.

The biggest obstacle to automating tone hole extrusion was the requirement to deliver pulling balls from the outside of the flute tube rather than preloading the pulling balls on the inside. This meant being able to put a big ball through a small hole. I developed an idea that came from my practical experience. Rather than fixating on the idea of a solid or nearly solid ball, my idea was to replace the singular pulling ball with a circular arrangement of tiny ball bearings which, together, could simulate or replace the action of the solid pulling ball. The ball bearings would be on a shaft which had a

groove. When the ball bearings were in the groove the “ball” would be in its contracted position, and when the ball bearings were forced out of the groove they would expand. This concept became U.S. Patent #7,420,109, dated September 2, 2008, “Musical instrument tone hole forming tool and method.”

The idea came quickly. Execution took about 18 months, but the result was outstanding. We took a job that had taken at least three setups and 45 minutes of operator time and reduced it to two minutes of operator time and 17 minutes of machining time. Aside from the reduction in labor, we also discovered we had improved the quality of extruded tone holes. The traditional approach used both brute force pulling along with some gentler spinning. When we switched to the automated process, the balance between extrusion and spinning shifted and the majority of the extrusion came from spinning. The result was an absence of ripples along the sides of the tone holes. Since we also had a single setup, no accuracy was lost changing setups and the tone holes were located exactly where we wanted them to be. Acoustically, we had a body which was so good we also used this technology for our line of professional flutes with extruded tone holes.

The most critical aspect in innovating this operation was keeping the goal foremost in mind and, at least initially, ignoring potential obstacles (such as, how could we possibly put a big ball through a small hole?). To create a breakthrough, start with Z and work backwards, rather than starting with A and working incrementally forwards. The numerous obstacles encountered as one goes from A to B to C are likely to result in the conclusion that the goal is not achievable. By working backwards from the goal and assuming all obstacles can be overcome, one has a much better chance of accomplishing the goal.

Lessons

There are multiple takeaways from the experiences narrated above:

- Know who you are and what makes your business or organization special. In our case, The Powell Sound was unique to Powell, and it was the filter through which every innovation—materials, mechanics, manufacturing technology, etc.—was run.
- There are opportunities to innovate a product or its manufacturing technology even when an aspect of its design is fixed. Keep an open mind and assume away constraints rather than allowing constraints to block innovation. Everything is possible, even putting a large ball through a small hole.
- There is a role for market research, but its value can be limited when you are surveying consumers about a product that does not exist and for which there is no prototype. Sometimes “the seat of your pants” —based on deep knowledge of your product and industry—works.
- It is better to create a market than to fight for a piece of an existing market. I would rather get 100% of a new market segment than fight for a 10% share of

an existing market. Of course, the new segment must be meaningful either because it is large or it stimulates craftspeople's creativity.

- When introducing a fighting brand, be careful not to compromise your existing brand, and ideally establish a qualitative connection between your existing and fighting brand.
- Innovation generally does not come from a lightning bolt or market research. In my experience, it comes from having an open mind, assuming away constraints and from deep experience in your product or industry.