User Innovation, Firm Entry and Industry Evolution in the American Guitar Industry

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Abstract. This study explores the role of user knowledge in the U.S. guitar industry's evolution from 1833 to 2023, focusing on the industry's 20th-century transformation into a major cultural and economic force. It contrasts the parallel patterns of innovation, firm entry and user demand for acoustic and electric guitars, and how these changed before and after the establishment of a dominant design. We identify key innovations for each category — particularly those driven by the industry's ongoing efforts to increase instrument volume — identifying the similarities and differences between their respective innovation trajectories and outcomes.

We document the waves of new firm entry and innovation during these two centuries, both for acoustic guitars and the new electric guitar category created by American firms in the mid-20th century. From this longitudinal perspective, we document the shifting nature and returns to innovation for firms in each wave, contrasting the technological ferment of the early electric guitar with improved quality and customer experience in the late 20th century. We also demonstrate the role of user innovation both in helping existing firms and creating new firms. From this, we discuss what the guitar industry demonstrates about shifting opportunities for entrepreneurial entry through the industry's life cycle, as well as the (often overlooked) importance of user innovation in mature industries.

Keywords: User Innovation, Open Innovation, Guitar Industry, Industry Evolution, Market Entry

Introduction

The importance of user knowledge has long been identified as a potential source of new firms, new product categories and new industries. While the original conception was based on small number of novel low-tech products (Baldwin & et al, 2006; Shah & Tripsas, 2007), recent empirical work has been heavily skewed to younger, virtual industries (Haefliger et al, 2010; Autio et al, 2013; Del Bosco et al, 2020).

Here we consider the role of user knowledge over the past 200 years in transforming a centuries-old product — the guitar — during the century when it became the iconic symbol of popular music. We focus on the largest market and source of innovation during this period, that

of American manufacturers.

At the beginning of the 20th century, the design and use of the guitar had remained largely unchanged for centuries, while in popular music it was overshadowed by other instruments such as the mandolin or banjo. However, in the early 1930s, a sudden burst of innovation happened in the guitar industry, not only with the early electrification and amplification of the instrument, but also through the use of new methods of manufacturing, new shapes and new materials. By the early 1950s, the solid body electric guitar was born, becoming a defining staple of rock music.

What could explain such a sudden and pervasive change? For centuries, guitars had been manufactured by artisan luthiers who built guitars alongside other stringed instruments. In the early 20th century, specialized guitar makers and guitarmaker firms emerged that sought to gain visibility and sales based on product innovations. Whereas traditional artisan luthiers were seldom users, this was increasingly common among the entrepreneurs launching innovative guitar manufacturers. Thus, we seek to answer this question: what roles did user innovators and user entrepreneurs play in the mid to late 20th century 'innovation boom' in the guitar industry?

Literature review

Identifying opportunities, creating and commercializing innovations have long been identified as a key strategy for firm success (Freeman, 1982; Shane, 2001; Teece, 2006). At the same time, few innovation activities create differentiation while many are completely wasted (Moore, 2005).Thus, identifying both the right opportunities and solutions often depends on firms getting their own narrow perspective to harness knowledge outside the firm.

Firms thus seek to access knowledge outside the firm to fuel their innovation efforts, such as that held by firms, universities and other organizations (Chesbrough 2006, 2024). They may also access the knowledge of individual users, either to develop new products (Lettl & Herstatt, 2004) or improving existing ones (Franke et al, 2006). These two approaches provide complementary

perspectives on the use of external knowledge, the former emphasizing corporate knowledge and the latter individual knowledge (Piller & West, 2014).

Conversely, the individuals with such valuable knowledge may exercise their own agency to convert that knowledge into widely adopted solutions. This may include freely disseminating the knowledge or solutions, often through online communities such as those for open source software (von Hippel, 2016). Or users may themselves form new firms to commercialize their own knowledge (Shah & Tripsas, 2016; Escobar et al, 2023). While the original conception was based on small number of low-tech products (Baldwin & et al, 2006; Shah & Tripsas, 2007); recent empirical work has been heavily skewed to younger, virtual industries (Haefliger et al, 2010; Autio et al, 2013; Del Bosco et al, 2020).

Consistent with original conception of such user entrepreneurship, much of this research has focused on entrepreneurs satisfying needs similar to those they experience in their personal lives. (Shah & Tripsas, 2007; Haefliger et al, 2010; Fauchart & Gruber, 2011). Perhaps less known is more recent work on user entrepreneurs who start firms based on their commercial use knowledge; the most often studied has been the role of physician entrepreneurs in launching medical devices companies (Smith & Shah, 2013; Katila et al, 2017; Park et al, 2024). This latter industry is also perhaps unique in that user innovation has delivered a series of new technologies and products for more than 100 years.[1]

Here we are interested in the role of user knowledge over the life cycle of an industry. We are particularly interested in how that user knowledge translates into unique products, in an industry where the importance of technological innovation ebbs and flows over time.

[1] Three 19th century examples include the stethoscope (1816), ophthalmoscope (1950) and hypodermic needle (1853), respectively invented by French, German and Scottish physicians. None were involved in commercialization, although a New York physician, George Phillip Cammann, made key improvements to the stethoscope design and partnered with a New York manufacturer to commercialize it (Reinhart, 2023).

Setting: User Requirements and Innovations in the U.S. Guitar Industry

Our study focuses on the US guitar industry from 1833-2023. In its first century, this industry depended heavily on European immigrants for its early growth and key innovations. However, in latter half the 20th century, America's guitar-based popular music compositions and recordings had become major cultural exports to the entire world — as well as the instruments used to record them, which were largely designed if not made in the U.S. (Moulène, 2023) .

The guitar traces its lineages to ancient musical instruments with a neck and strings are variously dated to 3000 or 2000 B.C., based on artifacts and records from Mesopotamia, Egypt and the Hebrew scriptures. The first fretted instruments date to before 1000 B.C.

What we now call the guitar can be traced to four-note instruments of the early 16th century Spain; in some cases, the gut strings were doubled to increase the volume. Experiments were made to add additional strings, leading to the first six-string guitar with modern tuning in Spain and Italy in the late 18th century (Sparks, 1997).

The familiar guitar hourglass body shape was visible in Spanish guitars by 1780, and imitated by other European guitarmakers early in the 19th century (Wheeldon, 2017). The classical (gut-stringed) guitar design was refined by Antonio de Torres Jurado (1817-1892) of Spain, who producing guitars from 1852-1893 that permanently transforming the design of classical guitars in Spain and then throughout the world (Bergeron, 2017).

However, in terms of both performance and sales, the classical guitar was already being eclipsed by the steel-stringed acoustic guitar, invented in America by an immigrant entrepreneur in the 1840s. In mid-20th century, a series of America entrepreneurs (and later more established firms) invented and then refined a radically different design, the solid body electric guitar.

Increasing Performance Volume

The economics of the American music industry changed in the 19th century, as performers

sought to perform in ever-larger venues. These requirements drove a series of major innovations.

The first was the invention of the steel-string guitar by Christian Frederick Martin, a German-born entrepreneur who in 1843 invented a novel bracing system that enough strength for a guitar to handle the higher tension of steel strings. This breakthrough proved crucial not only to the future of the instrument, but also to the industry: the birth of the American guitar industry is usually dated to Martin's launch of his eponymous firm in 1833 (e.g., Bacon, 2012).

Other approaches to greater volume experimented with different shapes and sizes. Orville Gibson developed the archtop approach, adapting the arched top (and dual f-holes) of a violin's front plate for the sound board — first in 1895 for a mandolin[2], then for a guitar — offering many of the volume and resonance advantages as with a violin. While the archtop was popular in mid-20th century jazz musicians, it otherwise remained a more expensive niche solution that today is available in midpriced, premium and boutique price points.

Of more enduring impact was the Dreadnought invented by Martin in 1916: with its larger and richer sound, it became a preferred size for many guitarists; unlike the archtop, it was never patented. Today, most guitarmakers offer products in this size, although now major acoustic vendors (such as Martin and Taylor) now offer at least one size larger than dreadnought.

The final improvement in volume came with the creation of a series of ampliphonic (or "resonator") guitars, providing additional volume through use of a metal body and metal resonator. Invented and produced by guitarmaker John Dopyera, a Slovakian immigrant and later entrepreneur, this niche technology marked the last major effort to increase acoustic volume.

Instead, the ultimate solution to performance volume came with the creation of an entirely

[2] In Gibson's May 1895 patent application, the embodiment of the invention is disclosed using sketches of a mandolin with an arched front and back. However, the description for the patent issued in February 1898 (US patent 598,245) broadens the scope of the invention to include "that class of stringed instruments known as 'mandolins,' 'guitars,' 'mandolas,' and 'lutes'."

new subcategory of guitar, the electric guitar. A key pioneer was Adolph Rickenbacker, an early employee of Dopyera who left to form his own firm. There he invented both magnetic induction pickups and one of the earliest electric guitars, the Rickenbacker A-22 "frying pan," (Wheeler, 1990: 335). In the 1940s and 1950s, this was followed by a series of experimental designs that sought to make a practical instrument both suitable for high-volume mass production and durable enough for daily use by professional musicians. The next two decades — from 1950 to 1970 — capped off the most intense and sustained period of product innovation in the American guitar industry. With the maturation of the product category, the high-volume electric guitar makers faced a stalemate, with technological or other product innovations no longer driving new product sales or market share (Rayna & Striukova, 2011).

Broadcast and Recording Influences

Beginning in the 1930s, the radio broadcast of blues and folk guitar performances began to standardize performance styles and the performances of specific pieces. After World War II, the explosion of musical recordings and radio broadcasts brought increasing popularity and visibility to other forms of popular music: jazz, country and what was later termed rock & roll.

The success of "Top 40" and other popular music had three effects on both guitar use and design. First, unlike acoustic or hollow body electric guitars, solid body guitars were less vulnerable to audio feedback for the amplified music performed at ever-larger venues such as amphitheaters, arenas and eventually sporting stadiums. Second, the popularity of their respective chart-topping songs created pressures for top touring artists to exactly replicate their studio sound on tour — despite very different acoustic, amplification and instrumental configurations used for each.

Finally, the increasing popularity of guitar-based trios, quartets and quintets — most notably the Beatles who toured from 1960 through 1969 — encouraged teenagers (largely boys) to buy

inexpensive guitars and spend hours every week seeking to replicate the sound they heard on their record player. Such performance imitations might include melody ("lead guitar") played on an electric guitar, or harmony ("rhythm guitar") played on an electric or acoustic guitar. U.S. guitar sales exploded in the early 1960s, rising 275% in four years to reach 1.5 million units in 1965 (Waller, 1968: 5).

By the 1960s, three distinct categories of guitars were both widely sold: the original classical guitar, the steel-string modern acoustic guitar, and the solid body electric guitar, with the latter two accounting for the overwhelming majority of sales in subsequent decades. Each had their own recognizable design, but by sharing key dimensions and other characteristics, playing skills for one were directly transferable to the others (Table 1). While other variants were created — such as hollow-body electric guitars and acoustic electric guitars[3] — these three designs largely dominated the American guitar industry through the end of the 20th century.

Domestic Distribution

Although the domestic market was the largest market for the U.S. guitarmakers in the 20th century, the market and industry were not insulated from global trade. In the 19th century, guitar design was imported from Europe, and key craftsmen emigrated from there. In the 20th century, America exported not only popular music compositions and recordings, but also the instruments used to produce them (Moulène, 2023).

The explosion of U.S. guitar sales in the 1960s attracted lower priced foreign imports, particularly from Japan. By the late 1960s, about half of all guitars sold in the U.S. were imports — about 80% of those from Japan (Waller, 1968: 104-5, 193-4). Long term, the most successful have been Yamaha and Ibanez, both produced by large diversified Japanese instrument makers

[3] In terms of product lines and industry structure, by 1980 the hollowbody and semi-hollowbody guitars became niche products within the broader electric guitar market. Meanwhile, the acoustic electric was later established as an additional feature offered with acoustic guitars rather than a distinct category of instrument.

that are more than 100 years old, as well as Takamine, a younger firm that makes acoustic guitars. The largest American makers — particularly Fender and Gibson's Epiphone subsidiary —followed by moving offshore the production of lower-priced models. While imports were originally from Japan, in recent decades American and foreign firms have shifted production of their lower price models to Korea, Mexico, China and Indonesia.

Guitar distribution also changed during the late 20th century. The original model was the independent specialty shop selling instruments and often sheet music — larger in major cities, smaller in towns and later suburbs. For example, in 1864 George Washburn Lyon and Patrick Joseph Healy opened their Chicago sheet music store, but 20 years later it produced a variety of banjos, mandolins and guitars under its Washburn brand.

The second distribution model was the national general retailer — notably Sears Roebuck, the catalog and later chain store retailer that was America's largest retailer for the first eight decades of the 20th century. This category emphasized high-volume, low cost products. Such efforts to control availability and costs was typified by Sears's purchase of Harmony in 1916, and then in the 1950s and 1960s using its Silvertone house brand for guitars produced by Harmony and select suppliers (Wheeler, 1990: 347). Manufacturers either sold guitars directly to retailers or through distributors (wholesalers) (Waller, 1968).

The third category was the chain retailer of musical instruments. While Sam Ash was the first major chain — expanding from its initial (1924) New York store to other East Coast locations in the 1960s — it peaked at 47 stores in 2019, before declaring bankruptcy in 2024. Instead, the largest chain was Guitar Center, which grew from one Hollywood store in 1964 to 21 at the time of its 1996 IPO and 564 stores in 2023 (*Musical Merchandise Review,* 2023).

The final distribution category was online retailer. Facing shareholder revolt due to its own delayed e-commerce roll-out, in 1999 Guitar Center acquired Musician's Friend, the leading

online instrument retailer — transforming it to become its primary internet sales site, while merging seven of its stores with its own 61 physical stores (Scally, 1999). At the same time Sweetwater Sound, a local Indiana musical equipment retail store established in 1979, began to a successful multi-decade effort to establish a differentiated online presence, with the founder-CEO selling control to a private equity firm in 2021. In 2023, Guitar Center (with Musician's Friend) led the retail industry with $2.1 billion in revenues, followed by Sweetwater ($725 million) and Sam Ash ($400 million).

Segmenting Firm Entry in the U.S. Guitar Industry

The U.S. guitar industry is both an economically and cultural important industry with a wide base of customers and interested readers. This has resulted in thousands of books, magazine issues and websites on the topic; for example, the Library of Congress lists more than 4,000 books among its publications the word "Guitar" in the title. Utilizing a wide range of printed and electronic sources, we compiled a database of 143 guitarmaking startups launched between 1833 through 2023. Particularly helpful were histories of the entire industry (particularly Wheeler, 1990) as well as histories of key firms (e.g., White, 1994; Carter, 1996; Johnston & Boak, 2008). The database includes many significant firms that survived for 20 years or less, but likely underrepresents small local makers from the pre-Internet era that failed to produce lasting innovations or win adoption by famous musicians.

From this database, we could see that the structure of the modern guitar industry became evident in the early postwar era, with the creation of the electric guitar and the boom in guitar sales due to rock & roll. Waller (1968) classified U.S. manufacturers into discount, broad line and high priced segments, but (as discussed below) the entrepreneurial entry beginning in the 1970s created an even higher-priced niche. Therefore, we classified the guitarmakers into four distinct segments:

- *Economy*: typically selling guitars under $300 (in 2025 dollars);
- *Midpriced*: typically offer range of prices, but with a reputation established by higher volume, mid-priced guitars (under $1,000); some of these become mass-market firms, while others produce smaller volumes of midpriced guitars.
- *Premium:* no economy products, lower overall volume, and guitars from $1,000-3,000;
- *Niche*: Either extreme quality — typically custom-built (priced at $5,000-$50,000) — or highly specialized features (such as resonators).

For both acoustic and electric guitars, guitarmakers assume a natural buyer progression through the first three categories, where guitarists start with a student guitar, and as a teenager or young adult trading up to a higher-quality midpriced guitar. The premium category appealed not only to professional musicians, but also to a much greater number of affluent hobbyists who aspire to utilize professional equipment — much as the "prosumer" market transformed SLR camera sales in the late 20th century. The final category subsumes those product categories that — due to price or features — most guitarists will not consider during their lifetime.

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At the same time, firms created to target a premium (or midpriced) price point often sought to broaden their lines to lower priced guitars, to build brand loyalty with future trade-up buyers. Some were very successful — as with Fender and Gibson selling cheap imported guitars and Martin and Taylor selling midpriced guitars — and in other cases the product line diversification doomed the company (or failed to save it from already-impending doom).

The industry faced numerous boom and bust cycles over these two centuries, some tied to the general economy such as the Depression of the 1930 and major recessions in the early 1980s, 2007-2009. It also had its own specific cycles, the boom of the 1950s and 1960s due to economic growth, rock & roll and the new electric guitar. This was followed by various episodes of stagnation and decline, including in the first two centuries of the 21st century.

Finally, the importance of innovation ebbed and flowed over the decades. Such opportunities were limited for acoustic guitarmakers. The ferment of the early electric guitar industry offered unique opportunities for innovation, followed by decades with few if any such opportunities.

Early Evolution of the Acoustic Guitar

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19th century

As in other aspects of 19th century industrialization, key elements of American craftsmanship came to American from established European craftsman. Many of the technical innovations of the 19th century and early 20th century American guitarmakers were made by European immigrants, who founded guitar firms in the new world and pioneered new guitar designs.

The earliest and most enduring impact came from Christian Frederick Martin (1796-1873), a second generation guitarmaker who immigrated from Germany to New York. Martin established C.F. Martin & Co. in New York in 1833, relocating seven years later to rural Pennsylvania. In the 1840s, Martin invented a novel internal bracing system, one that in the allowed him to create the first steel-string guitar (Johnston & Boak, 2008). The tension of the steel strings also required a stronger neck,[4] reinforced with an internal metal truss rod beginning in the early 20th century.

Both steel strings — and the use of all six strings for harmony (rather than single-string melodies of the classical guitar) — increased volume, the first of a series of innovations to improve acoustic guitar performance (Table 2). Today the oldest American guitar maker, Martin remains both family-owned and solely producing acoustic instruments.[5] In recent decades, it has been among the top five among U.S. guitarmakers by revenues, and often the top acoustic maker.

Other German immigrants included Frederich Gretch (1856-1895) and Wilhelm J.F. Schultz (1857-1946). Born in Mannheim, after arriving in America 1872, Gretsch apprenticed to a Brooklyn drum and banjo maker. In 1883, he opened his eponymous instrument firm in Brooklyn to make drums, banjos and tambourines. After his death in 1895, his son Fred

[4] Steel string acoustics almost always have mahogany necks, while classical guitars (with lower tension) often use cedar. Electric guitars have thinner metal strings, and since the Telecaster have mostly used a maple neck.

[5] In addition to steel-string acoustic guitars, today Martin also manufactures and sells children's guitars, acoustic-electric guitars, ukuleles and four-string acoustic bass guitars. It previously experimented with hollowbody and solidbody electric guitars, which it abandoned to focus on acoustic models (Blue Book, 2025).

broadened the product line to include mandolins and guitars.

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(Gretsch, 2021a, 2021b)

Meanwhile, the Hamburg-born Schultz was a cabinetmaker before emigrating in 1882. In Chicago, he apprenticed at the Knapp Drum Company, and then became shop foreman when it was acquired by Lyon & Healy. He remained there until starting Harmony in 1892. The company sold a range of musical instruments throughout North and South America, emphasizing affordable value rather than maximal quality. Harmony capitalized on the booming demand for mandolins and then ukuleles, prompting a 1916 acquisition by Sears Roebuck and Schultz's retirement in 1917 (Wyeth 2010).

Massachusetts-born George Washburn Lyon (1826-1894) combined with Irish-born Patrick Joseph Healy (1839-1905) to start their Lyon & Healy sheet music store in Chicago in 1864, soon expanding to make and sell musical instruments. Although their early records were destroyed in the city's 1871 great fire, by the end of the century they were making and selling a wide range of stringed instruments, including the Washburn fretted instruments (mainly guitars and mandolins) as well as pianos, harps and violins. Lyon retired in 1889 while Healy died in 1894. Washburn remained a premier brand of high-volume, low-cost guitars under various owners until the 1940s, when it went bankrupt for the last time.[6]

Early 20th century

Among American-born entrepreneurs, the most lasting impact from any early 20th century entrepreneurs came from Orville Gibson (1856-1918). A self-taught instrument maker, he experimented with novel mandolin and guitar designs, creating a new archtop guitar shape which offered a louder tone than earlier designs. In 1902, he cofounded what became the Gibson Guitar

[6] A new Washburn was founded in 1972, completely unrelated to the original founders of operations. This appears to be the first of several examples of new firms seeking to capture favorable associations with historic guitarmakers, a process of reusing abandoned trademarks that has been termed "zombie brands" (Gilson & LaLonde, 2008).

Company, where he worked as a designer until his death (Carter, 1996).

Meanwhile, early 20th century immigrant entrepreneurs learned the craft on the job, many who fell into guitarmaking as part of the family trade. One of the first was Epaminondas Stathopoulos (1893-1943), who immigrated with his Greek family in 1903. Before emigrating, his father Anastasios had made violins and lutes in Smyrna, and added the (now popular) mandolin when he began producing in Queens. His son Epaminondas ("Epi") apprenticed with Anastasios and took over the company at age 25 after his death. Epi changed the company name to Epiphone and diversified into banjos and archtop guitars, but with Epi's death in 1943 the company declined until it was acquired by Gibson in 1957 (Wheeler, 1990).

Perhaps the most innovative was John Dopyera (1893-1988), who made violins as a child before immigrating to the US from Slovakia in 1908. He invented the category of ampliphonic (or "resonator") guitars, and co-founded National Instruments and Dobro to commercialize these inventions. The technologies offered unique advantages in tone and volume, but after merger in 1932, the company was poorly run and (after acquisition) discontinued sales of the resonator guitars, while Dopyera continued to make ampliphonic guitars until his death (Wheeler, 1990).

At National, their best hire was Swiss-born production engineer Adolph Rickenbacker[7] (1887-1976). In 1931, he left National and (with guitarist George Beauchamp) co-founded a company to build and sell Rickenbacker-brand guitars. The company invented its own magnetic induction transducers (pickups) to convert string vibrations to electrical signals, and in 1932 sold its first electric guitar, the Rickenbacker A-22 "frying pan".

Finally, direct electric amplification for acoustic guitars became practical in the 1970s. In response to the request of touring artist Glen Campbell to play his Ovation guitar without having

[7] Born Adolf Rickenbacher, he later anglicized his own name and that of his guitars to match his second cousin, American World War I ace Eddie Rickenbacker.

to stand in front of a microphone, in 1971 Ovation released an acoustic guitar with piezo-electric bridge pickups[8] that set the eventual pattern for the entire industry. In 1979, Japanese maker Takamine released its first US guitar with its own Palathetic piezo-electric pickups that were particularly resistant to feedback and proved popular with prominent touring artists, a pickup design that it sold largely unchanged for the next 40 years.

User Innovation Enables Birth and Growth of Electric Guitar

The birth of the electric guitar is notable for two reasons. First, it failed in its original intent to reproduce the sound of acoustic guitars, but louder. Instead, it created a new instrument with a new sound, the electric guitar. As such, both kind of instruments have co-existed and developed in parallel, with many successful guitarists (such as John Lennon) playing both.

However, its key innovations came in three distinct waves: small companies experiments, maturation though larger firms, and then (after incumbent innovation stalled), waves of new firms entered starting in the 1970s. User innovation played an important role in all three waves.

The origins of the modern electric guitar began with early experiments in the 1920s and 1930s, first by small companies and later by major brands such as Gibson. Their goal was to make it possible to electronically amplify guitars — more than what was physically possible just with acoustic means — so this instrument could be heard in larger venues, and also be heard in larger ensembles such as the increasingly popular "big band" sound. Such an electric guitar also had advantages for recording guitars for vinyl records and for radio broadcasting, but the greatest need was performance where it was particularly difficult to use microphones to capture guitar sounds in a noisy performing environment (O'Connor, 2015).

In the 1920s and early 1930s, there were numerous experiments by engineers attempting

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[8] Ovation's December 1971 application for a patent on piezo-electric bridge pickups was granted in January 1973 (US patent 3,712,951).

electrify the guitar. This included both developing electromagnetic transducers (informally "pickups") convert the magnetic field of vibrating metal strings into a weak electrical signal, as well as different guitar body designs. With multiple experiments, assessing the "first" is difficult, but two early experiments include the Stromberg Electro (1928) whose pickups never worked, and the Rickenbacker A-22 "frying pan" (1932), which attached handmade pickups by cofounder (and guitarist) George Beauchamp to a solid aluminum body played on the guitarist's lap.

The first commercially successful electric guitar came from the largest incumbent firm — Gibson — which commissioned both external and the internal engineers to develop its own pickups and shipped its first ES-150 acoustic electric guitar in 1936. Within two years, the firm was shipping a range of electrified models to its own dealers and national retailers Spiegel and Montgomery Wards (Duchossoir, 2011).

Consistent with the dominant design literature, the development of the modern electric guitar required considerable additional experimentation. One area was the nature of mounting the pickups — either above the soundboard or attached to it. Another was the design of the pickups — including both single and dual coil designs — which would not be resolved for another two decades, in part due to the wartime interruption of the industry's sales and innovation during the 1940s (O'Connor, 2015).

But the most basic problem was that instrument makers had to unlearn everything of the previous century about making a loud guitar. Amplifying the vibrations of an acoustic guitar soundboard meant that with a loud enough amplified speaker, the speaker would create guitar vibrations and potentially severe feedback loops.

The solidbody guitar was developed as the result of a series of experiments from 1939 to 1958 (Table 3). The major innovations of this period were initiated and fueled by user innovation. In particular, the key features that became part of the dominant design of electric

guitars were all put forward by user innovators, although in most cases these innovators were not entrepreneurs themselves.

The first prototype came from Les Paul, already known for radio broadcasts as a country and jazz guitarist. In 1939, he created one of the first prototypes for solidbody electric guitar: later termed "the Log," it was a 4x4 wooden post to which he attached a traditional guitar neck and (for appearance's sake) two halves of a hollowbody guitar. While he shared his user innovation with two leading guitarmakers (Epiphone and Gibson), both declined and continued to develop hollowbody guitars. Elements of this design would later be found in the semi-hollowbody guitar, as epitomized by Gibson's most successful model, the ES-335 in 1958.

Instead, the development of the modern solidbody guitar was the result of a series of experiments from 1498-1958 (Table 3). The first such model was made by Paul Bigsby, who founded the Bigsby Electric Guitar company in 1946. While Bigsby designed pickups used by guitarists and guitarmakers on their own guitars — and in 1951 invented a vibrato tailpiece design that's still in use today — his great impact came with a custom guitar he made in 1948 for country star Merle Travis. Travis sought a guitar with a longer sustain period, something that could not be achieved on a hollowbody because the vibrating soundboard damps the string's energy. Travis' Bigsby guitar[9] is believed to be the 3rd of a run of 23 solidbody guitars. However, Bigsby's commercial impact was limited by a total career output of less than 60 guitars (Babiuk, 2009).

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Travis was a friend of Leo Fender, and the influence of Bigsby and his guitar upon Fender is debated until this day. What is not disputed is Fender's role in popularizing the electric guitar, assisted until 1946 by Clayton Orr "Doc" Kauffman (a lap steel guitar player and keen user innovator) and then George Fullerton (a part-time professional guitar player).

[9] Travis' guitar was donated to the Country Music Hall of Fame in 1974, where it remains on display.

Fender designed the first ever mass-manufactured solid body electric guitar – the Telecaster,[10] first sold in 1950. Unlike Bigsby, the Telecaster was clearly intended to be a mass market guitar. It was designed to be manufactured in volume by unskilled workers, without all the features that would have required advanced lutherie skills. Unlike other guitars, it was without any glued parts; instead, two pieces of straight wood were attached with screw; the electronics were fitted onto a special plate also secured with screws — rather hidden inside the low body using a labor-intensive process. Unlike guitars at the time, the body of the Telecaster was painted in plain yellow, rather than the normal "sunburst" color gradient.

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The first Telecaster sold for $170, while Gibson guitars of the era sold for $97.50 to $375 (respectively $2200, $1280 and $4900 in today's dollars).

While mocked for its crudeness, the Telecaster's unique sound soon became associated with a nascent genre of music – rock and roll – and sales grew sharply. The Telecaster introduced key tuning innovations that continue to this day such as inline tuners, a straight pull headstock and adjustable bridge saddles. It also included a maple fretboard (rather than the rosewood still used in acoustic guitars), as well as a neck secured by screws (rather than glue), both design elements hat today remain common among electric guitars.

The Telecaster quickly became the most popular electric guitar design, and has remained one of the most popular designs to this day. This early commercial success did not go unnoticed by Fender's competitors. While most continued to focus on hollow body electric guitars, market leader Gibson released its own solidbody in 1952. It was named the Les Paul — following an endorsement contract with the now famed guitar player — but Paul had only minimal input in this design. Those inputs included the shape of the cutaway, a color on the top, and his own

[10] The guitar was introduced as the Broadcaster, but renamed in 1951 to the Telecaster due to a trademark dispute with the Gretsch Broadkaster.

bridge and tailpiece. The first two were kept, but the latter was discontinued by 1954.

Because guitarists were not involved in the design, the model was merely a showcase for Gibson's manufacturing capability, in contrast with Fender's rudimentary design. While aesthetically pleasing, the archtop served no purpose on a solidbody electric guitar. With this mix of elements, the Les Paul is a comparatively heavy guitar, it is unbalanced when played either sat or standing, its neck it highly prone to breaking, and overall it is known to be "user unfriendly."

The Gibson Les Paul and the Fender Telecaster reflect a notable contrast: the former is fancy and upscale while the latter is plain and crude. For its first electric solidbody guitar, Gibson adopted a clear premium strategy, as the guitar adopted all the most aesthetical features its competitor did not have. While the Les Paul first sold at $210 — only 24% more than the Telecaster — its premium aspirations were clear.

After it was discontinued in 1961, it gained visibility and popularity because (despite its difficulties) it was used by famous rock stars such as Eric Clapton, Jimmy Page, Jeff Beck, and Keith Richards. The value of the original production run later soared among collectors, due to this visibility and its scarcity . However, very few of its features were ever carried forward in other guitar models. Even the famed 'humbucker' pickup that gives its distinctive sound the most sought after Les Paul models were featured at the same time in other Gibson guitar models.

While the Telecaster was a commercial success, Fender started to work on a new model that would set the solidbody dominant design: the Fender Stratocaster. In addition to involving in-house guitarists including George Fullerton and Freddie Tavares, Fender used local musicians to gather feedback on the early prototypes of the Stratocaster. Such feedback gave it its distinctive (and later widely copied) double cut-away design, allowing it both to attach the guitar strap and

allow easy access to the upper frets.[11] It also included innovations in its vibrato unit. The Stratocaster was available in a range of DuPont automotive paint finishes, such as Candy Apple Red and Sonic Blue (Gross, 2015).

While the Stratocaster was a clear improvement over the Telecaster — both in features and appearance — it still reflected a mass-market strategy. The more advanced design could still be carried out by unskilled workers, as no gluing operations were required. The modular design of the electronics (located behind a pickguard secured with screws), meant that necks, bodies and electronics could be manufactured separately and assembled at the end. Priced at $249.50 at its 1954 release (47% more than the Telecaster), it was both an immediate market success and became that design that was widely copied by other guitarmakers.

Facing the commercial success of the Stratocaster and slow sales of the Les Paul, in 1958 Gibson released a range of models, some more successful than others. The most successful was the ES series of semi-hollowbody guitars, which later spawned its own copycats. However, aside from using Les Paul's idea of a solid center block, they did not include any significant innovation. They were nonetheless clearly inspired by a user innovation. By the 1960s, the two major electric guitarmakers faced an innovation stalemate, as will be discussed below.

Demand-Driven Changes in Acoustic Market

While the last half of the 20th century was most remarkable for the creation of the electric guitar market, the acoustic guitar industry also saw major changes. With the major innovations in the past, this industry was transformed first by musical tastes, and then firm segmentation strategies.

The 1960s and 1970s brought hit guitar songs by folk, folk rock and country stars. This

Commented [TR10]: The footnote is so good and gives a modern touch. I love it! It really shows the Strat is the dominant design! I would not have thought of looking into emojis! The geek that I am feels ashamed!

Commented [JW11]: We need a coherent discussion of all the vibrato innovation from 1948-1960, but no time this week.

[11] Its influences as the standard electric guitar shape can be seen in the Unicode 6.0 standard emoji (🎸), which notably resembles the Stratocaster.

included solo artists — Bob Dylan, Joni Mitchell, Joan Baez, Judy Collins in the 1960s and John Denver, James Taylor, Jackson Browne in the 1970s — as well as guitar groups such as The Kingston Trio, Peter, Paul and Mary, Simon and Garfunkel, Crosby, Stills and Nash and America. This provided aspiring guitarists both artists to emulate and songs to cover.

The folk era brought a boom in acoustic guitar sales, for both new firms and even America's oldest guitarmaker. As recalled by its sixth (and current) CEO, C.F. "Chris" Martin IV:

> "There wasn't a tremendous amount of 'innovation' during the folk boom," says Chris Martin. "It was more, 'Let's just see what these musicians want."' What they wanted was a connection to the past, a return to roots. During Fred and Frank Herbert Martin's time [1945-1986], Martin introduced guitars that harkened back to that earlier era. (Walsh, 2020: 18)

Some rock bands would use both acoustic and electric guitars for rhythm guitar, such as the Beatles, Grateful Dead, Eagles, while the rising popularity of country music highlighted new bands that were slower to adopt electric guitars than their rock & roll counterparts.

Such acoustic interest prompted strong demand for low-cost student starter guitars. Fender offered low-end imported guitars, as did discounts vendors such as Silvertone. But with the rise of rock and disco, the acoustic market crashed in the 1980s, causing Gibson to (temporarily) exit and Martin to cutback tenfold (Roche, 2024).

In 1974, Martin attracted what its most improbable and successful premium competitor, when teenager Bob Taylor and two other employees of a San Diego-area guitar shop bought the shop and began to make their own guitars. Later named Taylor Guitars, the firm was led by two amateur guitarists — CEO Kevin Listug and Taylor as chief designer. Its artists eventually included established artists and groups such as America, Dave Matthews Band, David Crosby, Jim Messina, Kenny Loggins, and Lyndsey Buckingham, as well as newer artists such as Taylor

Swift, Jason Mraz, Bilie Eilish and Babyface.[12]

Taylor improved its processes in time for the recovery of the acoustic market in the late 20th century and early 21st. It increased volume and cost costs (without reducing quality) by using computer-controlled machining to make the fretboards (Taylor, 2011). While tone was a matter of preference, in 2014 Taylor surpassed the market share of the decades-older C.F. Martin due to ease of playing (Graham, 2014); today it sells a range of midpriced, premium and niche products, and employs more than 1000 people.

At the same time, the industry witnessed a proliferation of boutique acoustic makers offering custom guitars at a luxury price. These offered an antidote to the cost-cutting, high-volume production of Fender and Gibson, now under corporate ownership and increasingly offshoring production. And unlike electric guitars where sound quality was largely determined by electronic pickups, the quality of sound for an acoustic was determined by a complex interdependence of design and manufacturing factors understood only by the most skilled craftsmen.

The possibility of hand-crafting a steel-string guitar had been pioneered in 1960s by Americans Richard Schneider, Michael Gurian and Steve Klein, followed in the early 1970s by James Goodall and Canadian Grit Laskin (interview, October 29, 2023). Most were amateur guitarists, and these early handmade pioneers set the pattern for dozens of new boutique firms over the next 50 years. Typically defined as shops led by a single luthier, these boutique firms produced several dozen to several hundreds of guitars each year — handcrafted and often custom — often priced at more than $10,000 each. Such guitarist-guitarmakers sought to offer the ultimate in playability, sound quality and craftsmanship — both for serious players and affluent professionals seeking a luxury good.

[12] Swift was known from her earliest tours for her Taylor acoustics, but in 2024 switched to an endorsement deal with Gibson. Most musical stars use multiple guitars on tour, often from multiple vendors.

One example of the solitary luthier was Ervin Somogyi, who in 1970 began making high-end versions of both nylon and steel-string guitars, one each month for more than 40 years; he also taught a new generation of niche guitarmakers, both through master classes and two 2010 books on "responsive" acoustic guitars. Our database identifies 25 premium or luxury acoustic U.S. guitarmakers formed between 1970 to 2015, versus two mid-market firms.

Commented [JW12]: Probably obsolete with latest DB

User Entrepreneurs Revitalize Electric Guitars

Thanks to user input, Fender recorded early success with the Telecaster and Stratocaster, as evidenced by their many features that were copied by later models and helped define the electric guitar's dominant design. Rather than continue with user innovation, Fender's subsequent "improvements" were driven by the vision of Leo Fender, who was not himself a guitar player.

The 1958 Jazzmaster targeted a large premium segment: jazz guitarists who were at the time essentially playing expensive hollowbody archtop guitars fitted with pickups. Because Fender had neither the skills nor the skilled workforce required to manufacture such guitars, Fender introduced numerous innovations in the hope to convince professionals to adopt its instruments.[13] However, when Fender abandoned its user-driven innovation approach, the result was ill-fated innovations that failed to influence other guitarmakers.[14] One example was the offset body, an asymmetrical body shape claimed to make seated playing more comfortable, but at the cost of added weight and bulkiness; however, in rock and roll guitarists played standing up. It also had a complex tone switching system that allowed users to predefine tone settings at the cost of simplicity and convenience.[15] It also included a new two-part vibrato system (consisting of a bridge and a tailpiece) – which sacrificed playability for appearance, and new

[13] Many professionals had already adopted Fender Telecaster or Stratocaster instruments, alongside (rather than replacing) their existing hollowbody guitar. They would switch guitars based on the music style.

[14] The features were imitated only by copies and reissues of those original instruments after the vintage craze.

[15] In Fender's various reiusses of the Jazzamaster, only a few include the original complex tone preset system, but instead most include the simpler volume, tone and pickup switch of the Stratocaster.

pickups that replicated the Gibson 'P90' pickup sound but were more prone to interference. Priced at $329.50 (32% more than the Stratocaster), the Jazzmaster was a commercial failure, and would have been forgotten if not for its revival in the later vintage craze (Appendix 1).

Fender continued introducing new models in the following years. In 1962, it introduced the Jaguar at $379.50, further widening the gap between Fender's vision of the ideal guitar and what users actually wanted. It included both a complex (and largely unused) muting system, and making the complex Jazzmaster pickup system even more complex.[16] Overall, between 1958 and 1965, Fender ignored its earlier user-driven approach and thus repeatedly failed in its efforts to drive industry innovation; after 1965, these features were dropped in subsequent Fender models.

Gibson's track record of innovating without users was even worse. In the 1950s, it recorded its only one moderate success — the ES-300 series (335, 345, 355) of hollowbody guitars, a practical version of Les Paul's earlier "Log" vision. Otherwise, its major electric products of 19450-1965 were initially commercial failures — not proving profitable until the Les Paul and other models gained iconic status during the vintage craze, as discussed in Appendix 1.

Commented [TR13]: Looking at sales figures at the time (and even nowadays) I would not be sure this qualifies as a major success. ES-3X5 are rather niche. Should we say "relative" success?

Without Fender's user input, Gibson was unable to understand or replicate Fender's success. Facing the growing success of the Fender Stratocaster and the slumping sales of its initial Les Paul solidbody, Gibson responded by introducing a series of guitar models between 1958 and 1965 that all had in common to target the same mass segment as Fender. Rather than the premium attributes of the Les Paul, its guitars looked more like the simpler look of the Fender guitars.[17] With the exception of Gibson SG (a moderately successful competitor to the Stratocaster), all these models were initial commercial failures. It drew the wrong lessons from Fender's success, copying the "weird" shape of the successful Stratocaster, rather than

[16] Fender reissues of the Jaguar drop the former feature and usually drop the latter.

[17] i.e. lack of body or neck binding, one single type of wood used for the body, typically mahogany or a close wood species, a flat top, as opposed to the Les Paul's archtop carving.

understanding its practical, user-requested benefits.

Its two most adventurous designs — the Explorer and Flying V of 1958 — were impractical to play and discontinued within a year after building only 38 and 98 guitars respectively. In 1963, noting Fender's (user-requested) Stratocaster automotive color choices, Gibson commissioned automotive designer Ray Dietrich to design the Firebird. The guitar was similar to the discontinued Explorer, but with a neck-though-body construction. It was also heavy and inconvenient to play, and was discontinued (despite a 1965 redesign) in 1969.

Thus, without user input to understand user needs, Gibson ceded this new market to Fender: none of Gibson's attempt at a solidbody guitar were successful until its older models were revived during the vintage craze of the late 1960s. In contrast, in its initial products Fender recorded commercial successes that helped shaped the industry's dominant design. It was only when it switched to innovating without user input met the same fate as Gibson's.

The end of the golden age of electric guitar innovation ended around 1965, and Fender was acquired by CBS (1965) and Gibson by Norlin (1969). The two firms instead innovated each other — Gibson copying Fender-style guitars and Fender emulating Gibson's ES-300 series— with little success. Both faced criticism for declining instrument quality, further fueling the vintage craze. Evolving musical tastes and techniques were unmet by the market leaders, leading to two key trends: the rise of cheaper, higher-quality copycat imported instruments (largely from Japan), and the entry of innovative new brands, often led by user entrepreneurs.

We identified two new electric guitar makers in the 1950s, two founded by user entrepreneurs (Guild and Mosrite), the others by a luthier (D'Aquisto) and construction industry entrepreneurs (Stratosphere). Guild and D'Aquisto focused on traditional acoustic and hollowbody electric guitars, while Mosrite and Stratosphere targeted the solidbody market with multiple-neck guitars. While Mosrite, founded by a guitarist, gained moderate success and

endorsements, Stratosphere, founded by outsiders, failed.

In the 1960s, we identified five new electric guitar manufacturers. Four were founded by guitarists: Alembic targeted the premium electric guitar market, while Thomas Custom Guitars, Melobar, and Hallmark focused on niche markets with innovative solidbody designs, such as double-neck and sweep-wing guitars. In these cases, the user entrepreneurs sought to fill gaps left by incumbents, either through greater sophistication or bold, unconventional designs enabled by solidbody construction.

The 1970s saw a sharp rise in guitar manufacturers, with 21 new builders emerging. Of these, 16 were founded by guitarists, who pursued diverse market entry strategies. Two offered economy alternatives to Gibson and Fender, using imports (SD Curlee) or leveraging CNC manufacturing (Peavey). Two—Music Man and G&L—offered improved mass-market guitars, both co-founded by Leo Fender after he left CBS-owned Fender in 1970.

The remaining 12 targeted either premium quality (4) or niche markets (8). The premium brands—Collings, Hamer, James Tyler, and Valley Arts—refined classic Gibson and Fender models, addressing quality declines with minor improvements, continuing to this day (although most under new ownership). The niche players innovated with new materials , new pickups, or unique instruments but had little impact.

The most influential were the two remaining firms, Charvel and Dean, where guitarist founders incorporated professional guitarist input to update standard designs by Fender and Gibson respectively. While Fender's and Gibson's guitars had been the staple of 60s rock-and-roll and classic rock, they were not suitable for the new kinds of music that emerged by the late 1970s — hard rock, heavy metal, trash metal – which require new playing techniques. As these genres and techniques became mainstream, the Charvel and Dean updated designs became an instant success; in fact, Charvel created the dominant design for what would become known as

Commented [TR14]: I know we don't have enough room, but It's a pity we can't say why. Well, perhaps for the final paper. :)

Commented [JW15]: Are these all guitars or only electric guitars?

Commented [TR16R15]: Yes!

Commented [JW17R15]: Yes, what?

Commented [JW18]: There were 4 premium, 4 niche, Charvel and Dean — which is 10 not 12.

Commented [TR19R18]: I have four premium, 8 niche (I completely forgot that I created a second version of the table – it has UK at the end – because the changes I made were left on my computer home and I had to redo them again – Sorry ! The right table is the one with UK in it) including Charvel and Dean. So that is 12 overall, 4 premium, 6 niche that remained niche, and 2 niche that became mainstream.

"Super Strats", which would be the *de facto* standard. Many of these Charvel and Dean innovations were suggested by users, including a two-octave slim neck, double locking vibratos, high output pickups, slimmer bodies with contours enabling access to upper frets, more 'aggressive' shape using 'flashy' (e.g. neon glow) colors. Overall, these 1970s entrepreneurs filled the gaps left by the poorly run Fender and Gibson (which were divested in 1985 and 1986 respectively).

With the rise of Grunge music and the Blues revival in the early 1990s brought a shift in user preferences away from the Super Strat and back to the 'vintage' models. When Fender and Gibson were unable to meet that demand, users organized a highly vibrant second-hand vintage market that competed with new product sales, until Gibson and Fender were able to recreate the designs and manufacturing knowledge for their now in-demand vintage designs.

So after decades of innovation stalemates, and a proliferation of firms and guitar models based on novelty and niche tastes, the definition of an electric guitar remains remarkably consistent. Table 4 lists statistics regarding more than 2,000 currently available guitars. Of these, 91% are solid body, 78% have two pickups, 73% have a maple neck, while 87.5% of the solidbody guitars have bodies made of one of five types of wood. The most variety comes in the body shapes, where the Stratocaster and its enhanced imitators (Super Strat) together account for 42.6%, three other 1950s designs— Les Paul, Telecaster and V — together account for 24.6%, and nothing else attracts more than 6.1%.

Discussion

By examining a single industry over nearly two centuries, we have documented how the sources and nature of innovation changed due to the industry's evolution. We can observe variation between closely related product categories — one that was mature when the industry was born and another that was created by American firms during this period. These parallel

trajectories highlight differences in both firm innovation capabilities and the relative importance and use of innovative user knowledge.

Entry in the US Guitar Industry

While many (if not most) of the guitarmakers are "me too" entrants with little chance of differentiation, we observed three types of competitive entry strategies as defined by Porter (1985): differentiation, low cost and focused differentiation.

Differentiation by Product innovation. The two major subcategories required different skills for product innovation:

- Acoustic guitars required *skill instrument makers* or similar finished woodworking skills (e.g. cabinet makers). This was largely unchanged from earlier generations of stringed instruments and instrument makers, whether violins, lutes, mandolins or classical guitars. From about 1830-1910, many founders apprenticed or otherwise were trained as general instrument makers, but over the past 100 years, the guitar market has dwarfed all others, attracting engineers and founders who are primarily (if not entirely) focused on guitarmaking.
- Pioneering electric guitar designs require *electrical or electronic engineers,* focused both on converting string vibrations to signals and then transmitting those signals from the guitar to amplification. But when the rate of innovation slowed and key technologies became commoditized — or sourced as off-the-shelf components— opportunities for technical innovation largely disappeared.

Some innovations became mainstream and helped the inventor become a mass-market vendor (Gibson's archtop, Fender's guitar pickups). Others sought to transform the industry but became only niche solutions (Valco's resonators, Ovation's synthetic guitar materials).

In the periods of rapid product innovation, input from user innovators proved invaluable.

However, consistent with prior research (Anderson & Tushman, 2018), the opportunities for innovation were greatest during the period of ferment leading up to the dominant design for an electric guitar, and the end of that period proved traumatic for the leading innovators.

Economy. Innovation slowed down at various times, which meant that previous innovations became commoditized and technological innovation was not required, enabling entry by low-cost economy entry, technical skills not required. Discount makers succeeded by manufacturing scale economies, other cost reductions, and distribution. No coincidence that Sears first acquired Harmony and built the Silvertone discount brands. Meanwhile, the leading mass-market firms created offshore discount brands: Gibson's Epiphone in 1970,[18] and Fender's Squier in 1982.

Focused Differentiation. Two approaches emerged for focused differentiation, not seeking to transform the broader market. Beginning in the 1970s, premium and luxury guitarmakers entered both product categories differentiated by product quality —in terms of sound, appearance and experience. Many are boutique firms producing hundreds of higher-priced guitars every years, versus hundreds of guitars a day for mass market firms.

Meanwhile, other firms produced specialty guitars, either as a major part or the bulk of their output. For example, both National Reso-Phonic (est. 1989) and Mule were created to update the ampliphonic designs pioneers in the 1930s by John Dopyera and his co-workers.

The Role of User Knowledge

Much of the user entrepreneurship literature has emphasized the role of user innovators creating early firms if not product categories or industries. In many of these industries — such as sporting goods (Shah, 2006) or juvenile products (Shah & Tripsas, 2007) — the insight provided the user knowledge was scarcer and more valuable than (say) the design or production expertise

[18] Gibson purchased Epiphone in 1957, but initially manufactured guitars under that brand at Gibson's U.S. factories.

from incumbent or adjacent industries.

But the U.S. guitar industry suggests an opposite pattern. In the earliest years of the acoustic guitar industry, the key innovations — key design decisions that dramatically improved sound volume — came from luthiers, not guitarists. The innovations that made possible (among other things) steel-stringed, archtop, dreadnought and ampliphonic guitars were innovations came from instrument makers and other woodworkers who understood what was possible.

Similarly, the innovations creating the electric guitar was largely similar — engineers understanding capturing and amplifying weak electromagnetic signals;

For electric guitars, the need for engineering expertise was similar even if the technology was different. With structural and acoustic engineering less of an issue, instead first-generation innovators were those who understood both the physics — of strings and the magnetic fields they created — and also the state-of the-art of fabricating reliable electrical pickups (and later on-board electronics). The notable exception utilizing user knowledge came when Hawaiian guitarist George Beauchamp collaborated with engineer Adolph Rickenbacker to make and sell the pioneering Rickenbacker electric guitars.

Instead, the boom in user entrepreneurship for guitarmakers began in the 1960s and 1970s, when major product innovations in both industries were in the past. For both electric and acoustic guitars, the new entrants used their understanding of more subtle user requirements — such as playability — to offer improved products to already mature industries. In this regard, this pattern of innovation in mature markets is consistent with what Geoff Moore terms "fractalization". According to this model, innovators offer products that are closer and closer to user requirements, even though as markets mature, they must identify and execute on more subtle refinements to the product features and experience (Moore, 2005: 110-114).

Parallels to Other Cultural Artifacts

Commented [JW20]: Need to fully engage the Google Drive lit on "Use/impact" for guitars, especially electric guitars

Most similar to the co-evolution of electric guitars is the study by Nelson and his colleagues (2023; Anthony, Nelson & Tripsas, 2016) of the competitive dynamics in music synthesizers from 1975-2016.[19] More than two decades after the electric guitar, their synthesizers also replaced an existing physical instrument while retaining many performance skills. In both cases, the capabilities and use of the instruments co-evolved during an initial period of ferment.

Anthony et al (2023) focus on the cognitive positioning of the four leading producers, both how they perceived the market and were perceived by the market. In our case, two incumbents dominated the early period with dramatically different user feedback and product success. Meanwhile, Nelson et al (2023) demonstrate how the new synthesizer product category undercut performers' occupational meaning, while in electric guitars, the explosion of both product capabilities and performance opportunities in the early days of rock and roll enabled a wide range of expressive opportunities for the guitarists of popular bands.

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[19] The parallels are not exact: their studies utilize more systematic data on fewer firms in a more homogeneous technology.

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Tables

Table 1: Dominant design for guitar and three major subcategories

	Classical Guitar	*Modern Acoustic Guitar*	*Electric Guitar*
Date of dominant design	c. 1780	1843	1954
Strings	Gut (later Nylon)	Metal	Metal
Body	Hollow	Hollow	Solid
Shape	Hourglass	Hourglass or single cut	Double cut
Body thickness	4-5”	4-5”	1.5-2”
Neck	Cedar or Mahogany	Mahogany	Maple
Acoustic sound	Sound hole	Sound hole	n/a
Amplified sound	External microphone	External microphone or †piezoelectric bridge pickup	2-3 magnetic induction string pickups
Electronic controls	n/a	†Top-mounted controls	Front-mounted controls
	Shared attributes		
Major design elements	Headstock, tuners, neck, body, bridge, strings		
Strings	six		
String pitches	E, B, G, D, A, E		
Tuners	Tuning pegs and gears		
Frets	20-24 metal frets		
Neck length	24-25.5”		

† Only for acoustic-electric guitars

Table 2: Key U.S. innovations in acoustic guitars

Date	Innovation	Inventor	Breakthrough	Benefit	Impact
1843	X-shaped cross bracing	C.F. Martin (Martin Guitars)	Mass-produced acoustic guitars strong enough for steel strings	Greater volume	broad
1898	Archtop acoustic guitar	Oroville Gibson (Gibson Guitars)	Borrows aspect of violin design for greater sound transmission from guitar top	Greater volume	niche
1916	Dreadnought acoustic guitar	Martin Guitars	Largest practical acoustic guitar shape	Greater volume	broad
1929	Ampliphonic resonator guitars	John Dopyera	Metal resonator amplifies sound and produces unique sound	Greater volume	niche
1947	Nylon strings	Albert Augustine	Replace unreliable, expensive catgut strings for classical guitars with more consistent synthetics	Greater durability, lower cost	broad
1966	Parabolic acoustic guitar	Ovation (Charles Kaman)	Fiberglas materials make possible parabolic shape and reduce humidity impacts	Greater volume	niche
1971	Piezoelectric acoustic pickup	Ovation	First pickup that allowed amplification of the soundboard vibrations and authentic acoustic tone	Greatest volume	broad
1989	CNC-machined fretboard	Bob Taylor (Taylor Guitars)	Reduces time and skilled labor, increases consistency of fretboard production for acoustic guitars	Greater quality, lower cost	broad

Table 3: Influential early electric guitar designs

Date	Model	Inventor	Users Involved	Influential Design Elements	Sales
1939	The Log	Les Paul	Les Paul	Solid wood centerpiece	None
1948	Bigsby Electric Guitar	Paul Bigsby	Merle Travis	Solidbody guitar, six-in-line tuning gears	Handful
1950	Fender Telecaster (née Broadcaster)	Leo Fender and others	Doc Kaufman	'industrialized'/low-skilled manufacturing; maple fretboard; bolt-on neck; adjustable saddles (by pair); wide pickguard	Strong
1952	Gibson Les Paul	Ted McCarty, John Huis and others	None	Carved top; humbucker pick-ups (1956–)	Weak
1954	Fender Stratocaster	Leo Fender and others	George Fullerton, Rex Gallion, Bill Carson, Freddi Tavares	Modular manufacturing; body contouring (e.g. all electronics in pickguard); adjustable saddles (individual); self-contain fulcrum tailpiece/bridge/vibrato unit; custom colors	Strong
1958	Gibson ES-300 series	Ted McCarty and others	None	Solid wood centerpiece (as the "Log"); first commercially successful semi-hollow body	Weak

Commented [JW21]: Do we need to add Jazzmaster?

Table 4: Attributes of current U.S. electric guitars

Body Shape		**Neck Wood**	
Super Strat	35.0%	Maple	73.0%
Les Paul	10.3%	Other	27.0%
Telecaster	9.0%		
Stratocaster	7.6%	**Body (for solid body models)**	
Double Cut	6.1%	Mahogany	39.5%
Offset	6.1%	Alder	20.7%
V	5.3%	Basswood	10.6%
Single Cut	4.2%	Ash	9.8%
Other	16.3%	Poplar	6.9%
		Other	12.5%
Body Type			
Solid Body	90.9%	**Number of Pickups**	
Semi-Hollow	5.8%	Two	77.6%
Hollowbody	3.3%	Other	22.4%

N=2,249
Source: FindMyGuitar.com (2025)

Appendix 1: The Vintage Craze and the Survival of Niche Guitar Designs

Assessing innovations in the electric guitar industry is complicated by the vintage craze phenomenon that arose in the later part of the 1960s and has, arguably lasted until this day. Following the purchase of Fender and Gibson by conglomerates in the second half of the 1960s, the quality of the guitars manufactured by the two leaders sharply decreased – or at least was perceived to have done so. As a consequence, the price of second-hand guitars manufactured by the two companies before those acquisitions skyrocketed. This vintage craze related first to traditional flagship models that had been continuously successful since their introduction – e.g. Fender Telecaster and Stratocaster.

However, as the price of those instrument rose and made them virtually unaffordable, guitarists started to purchase far less successful and desirable guitar models, but that had been manufactured in this golden era. As a result, guitars like Fender Jazzmaster or Jaguar, or Gibson Explorer or Flying V – some of which were even butchered to make them look like the much more desirable models – started being used by young guitarists, some of which became very successful, hereby creating in turn a greater demand for guitar models that had not been originally successful.

Perhaps more surprisingly, instead of stopping at instruments from the golden years, this vintage craze then spilled over post-sell out era, and guitar models introduced in the "dark ages" were eventually purchased by young guitarists — who were unable to afford any of the "golden era" instruments, but sought something that would be closer in age to this era on the theory that guitar quality did not instantly go bad, but quality slipped over time. Following this logic, guitar models like the Telecaster Custom, the Fender Starcaster, or even the ill-fated Gibson S-1, Marauder, etc. became more in demand, and were at times even reissued by the manufacturers, but nonetheless far less so than the historical flagship models.

This vintage craze tends to blur our vision of what actual innovations occurred in the electric guitar industry, as some models, originally unpopular have, as a result survived to this day or enjoyed a niche-following. To distinguish actual innovations from vintage revivals, two criteria can be used:

1) Did the guitar model met success at the time of its initial release?
2) Did some of its features cross over to a significant number of different guitar model (i.e. those that are not direct copies)?