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## **‘Imagined Outcomes’: Contrasting Patterns of Opportunity, Capability and Innovation in British Musical Instrument Manufacturing, 1930-1985**

David J. Smith and Richard K. Blundel

### **Abstract**

By the mid-twentieth century, musical instrument manufacturing had become an increasingly mechanized activity. Craft skills had been displaced in many areas, yet remained a vital source of competitive advantage in local and international markets and were particularly valued by professional musicians. This paper examines the contrasting experiences of two British musical instrument manufacturers, tracing the unfolding relationship between their pursuit of entrepreneurial opportunities and capability development. Boosey & Hawkes, a large, well-established manufacturing and publishing company, was an early pioneer while Paxman Bros, a small musical retailer, transformed itself into one of the world’s most respected specialist manufacturers. The narrative probes the factors that shaped decision-making in these companies as they developed a series of design innovations for one of the more complex brass instruments, the French horn. It examines how a dynamic interaction between opportunity and capability, coupled with unanticipated contingencies, contributed to divergent outcomes for each company.

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# **‘Imagined Outcomes’: Contrasting Patterns of Opportunity, Capability and Innovation in British Musical Instrument Manufacturing, 1930-1985**

## **Introduction**

This paper examines the contrasting experiences of two British musical instrument manufacturers, tracing the unfolding relationship between their pursuit of entrepreneurial opportunities and capability development. In doing so, it seeks to contribute to recent theorizing in this area. In a 2013 issue of this journal, Daniel Raff encouraged business historians to give greater consideration to methodological issues<sup>1</sup>, and in particular to adopt a more forward-looking perspective that he described as, ‘a history of choices rather than outcomes’<sup>2</sup>. The limitations of retrospective accounts are well-rehearsed<sup>3</sup>, and have prompted recent calls for greater sensitivity towards the ways in which people, ‘experience and behave in time’<sup>4</sup>. These arguments have obvious implications for historical research on the impact of entrepreneurial processes, where actors are making ‘new investments in innovation’ under conditions of uncertainty<sup>5</sup>. They also go to the heart of recent efforts to (re-) conceptualize ‘entrepreneurial opportunity’, which has resulted in a proliferation of literature in the fields of organization studies, entrepreneurship and business history<sup>6</sup>.

Contributors to a recent Special Issue<sup>7</sup> of the journal *Business History* examine entrepreneurship and the pursuit of opportunity in different periods and industry sectors, illustrating both the explanatory potential of historically-informed analysis, and the difficulties that can arise from a retrospective examination of such fleeting, diffuse and emergent phenomena<sup>8</sup>. As the Special Issue editors suggest, the growing interest in process-based, interpretive historical methods on the part of entrepreneurship scholars creates space for a more constructive dialogue with business historians<sup>9</sup>. However, there are substantial obstacles to be overcome. Several of the contributions identify flaws in the ‘discovery’-based approach to entrepreneurial opportunity that has prevailed in the mainstream entrepreneurship literature, citing *inter alia* a lack of engagement with temporal and spatial complexity and an associated tendency to abstract from its emergent properties. More specifically, Roscoe *et al.* introduce the concept of ‘material agency’ and deploy actor network theory to address what they describe as the, ‘historical and material specificity of the entrepreneurial process’<sup>10</sup>, while Popp and Holt argue that the, ‘lived experience’ of this kind of entrepreneurial activity, ‘is better conceived of as an imaginative and historically embedded process.’<sup>11</sup>

In this paper, we seek to connect these insights into the entrepreneurial process by revisiting two earlier theoretical works: Edith Penrose's *The Theory of the Growth of the Firm* and Dorothy Leonard-Barton's *Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation*. Our theoretical framing draws on the Penrosean 'productive services' / 'productive opportunities' dynamic and related elements of her 'single argument'<sup>12</sup>. It also makes reference to G.L.S. Shackle's closely-related subjectivist insights and to Leonard-Barton's analysis of 'core capabilities', 'core rigidities', highlighting their relationship with firm-level knowledge flows and innovations. We use the resulting framework to trace the closely-linked processes of opportunity recognition and exploitation in a particular historical setting. The historical narrative is located in the world of brass musical instrument manufacturing in the mid-20th century. Boosey & Hawkes was a large and well-established incumbent, created through the merger in the early 1930s of two of the largest instrument makers. The company had been responsible for an early design innovation in the French horn, a technically-complex brass instrument that was supplied into two distinct market segments, military bands and classical orchestras. By the end of the Second World War, Boosey & Hawkes had acquired all of the existing British horn manufacturers, while its main rivals in Continental Europe had yet to recover from the hostilities. How was this company effectively displaced in the international market for this instrument by a much smaller London-based musical instrument business, Paxman Bros, which had no prior product design and only very limited manufacturing experience<sup>13</sup>? The narrative reveals how Paxman Bros developed new capabilities that gave rise to a series of innovations in horn design that led to a succession of new models. Paxmans' technological and market base combined traditional artisanal skills and values with entrepreneurial bricolage<sup>14</sup> and the formation of close, collaborative relationships with leading musicians. The resulting interactions contributed to its emerging role as a leading specialist manufacturer at the forefront of innovation in this sector.

In the next section we elaborate on the theoretical framing of the study. This is followed by a brief overview of the disparate and diverse literature relating to musical instrument manufacturing and other sources that are drawn upon in the main empirical study. We then introduce the historical narrative, which examines the experiences of the principal actors in each company in parallel, reconstructing the unfolding of a series of entrepreneurial opportunities and the contrasting ways in which they were acted upon through the development of particular, firm-specific technological and organisational capabilities. The

remaining sections comprise a discussion of emerging themes and a conclusion that identifies the main contributions of the study and reflects on its wider implications.

### **Theoretical framework – Penrosean dynamics and core capabilities**

Business historians have long acknowledged the potential applications of Penrosean learning. In an early review article, Galambos highlighted the way in which Penrose's dynamic theory could be used to inform historical studies: "[A]s Penrose makes clear, it is the interaction between the material and human factors which is decisive in shaping an organization's development."<sup>15</sup> More recently, Lazonick has highlighted her contribution, arguing that, 'more than any other economist in the post-Schumpeter generation, Penrose's work elaborated the foundations of a theory of innovative enterprise'<sup>16</sup>. Her contribution is now located within the broad post-Marshallian tradition that has addressed the interplay between human knowledge and the evolution of economic systems, yet despite a thorough grounding in orthodox neo-classical economics, she drew freely on related disciplines, including industrial organization<sup>17</sup>. Penrose encouraged her readers to consider *The Theory of the Growth of the Firm* as a 'single argument', but for the purposes of this paper it is possible to highlight two elements that have the most direct application to our theme. Firstly, Penrose introduced two vital distinctions, between 'productive *resources*' and the 'productive *services*' that they can render<sup>18</sup>, and between two categories of services: 'managerial' and 'entrepreneurial'<sup>19</sup>. In developing this part of the argument, she also recognized how managerial decision-making over the deployment of resources provides a primary source of the uniqueness of each firm. Secondly, she introduced the concept of 'subjective' productive opportunity, which she defined as what a firm, 'thinks it can accomplish'<sup>20</sup>, based on managerial interpretations of the environment in which it is operating, taking due account of its internal resources, operations and other influences. There is a strong recursive dimension to this process, with the organizational framework of the firm providing the necessary environment for the 'production' of entrepreneurial services, and these services, in turn, becoming a 'significant aspect' of the firm's changing productive opportunity. The subjective and forward-looking concept of productive opportunities has strong parallels with G.L.S. Shackle's work on the central role of imagination in the entrepreneurial process, captured in his insight that, 'men's *decisions* are not choices among *actual* but among *imagined* outcomes'<sup>21</sup>. Even so, Penrose was at pains to emphasise the limits of subjectivism, both

acknowledging the ‘reality’ of the external selection environment and clarifying its temporal relationship to firm-level decision-making:

“In the last analysis the ‘environment’ rejects or confirms the soundness of the judgements about it, but the relevant environment is not an objective fact discoverable before the event.”<sup>22</sup>

In a Penrosean interpretation, the firm provides an institutional setting for conjecture and innovation that gives rise to a variety-generating dynamic. While gales of creative destruction might sweep away particular products or technologies, firms could learn and evolve by making ‘connections’ between their past activities and future options<sup>23</sup>. It provided a, ‘kind of temporary evolutionary equilibrium’<sup>24</sup>, where managerial teams could conjecture over the application of productive services to particular opportunities. However, Penrose also recognized that the scope for conjecture was influenced by a firm’s ‘unique’ history, the managerial team’s perception of productive opportunities being itself shaped by previous experience and the shared interpretive frameworks that this had engendered.

Leonard-Barton’s work on ‘core capabilities’ and ‘core rigidities’ provides a valuable complement to the Penrosean learning dynamic, while also making a direct connection to the innovation literature<sup>25</sup>. Leonard-Barton identified core capabilities as a knowledge set, comprising employee knowledge and skills embedded in technical systems, that is directed by managerial systems and underpinned by values and norms, which provides a company’s competitive advantage. She highlighted the ‘dual nature’<sup>26</sup> of core capabilities, referring to the ways in which the value-creating activities can become institutionalized, taking the form of ‘core rigidities’ that have the effect of inhibiting subsequent knowledge flows and so hampering the innovation process. Leonard-Barton identified a number of sources of path dependency, including skills and knowledge, organizational values, and physical and managerial systems that have served a company well in the past, but that may give rise to core rigidities in a changed product or market context. This generates a necessary tension within the organization between innovation and the *status quo*, as managers struggle to maintain core capabilities yet simultaneously promote their renewal<sup>27</sup>.

In the narrative, we trace the unfolding and recursive relationship between the pursuit of entrepreneurial opportunities, capability development and innovation in two purposive, yet

socially-embedded businesses. Our theoretical framing emphasizes the role of human imagination and the growth of knowledge, which enables organizational actors to become, ‘makers and not mere executants of history’<sup>28</sup>. As Loasby has noted, this distinctively human faculty to construct imagined futures is an essential prerequisite of innovation<sup>29</sup>. However, in adopting a creative process perspective on entrepreneurial agency, we remain attentive both to its material specificity<sup>30</sup> and to the role of human values, emotions and personal idiosyncrasies in shaping the outcome.

### **The literature on musical instruments and instrument manufacturing**

Among the small number of business historical studies that deal specifically with musical instruments, Berghoff<sup>31</sup> examines the marketing of Hohner harmonicas as a differentiated global brand from the mid-19<sup>th</sup> century, while Carnevali and Newton<sup>32</sup> address the changing relationship between piano manufacturers, retailers and consumers in Victorian Britain. Wallace’s<sup>33</sup> detailed company history of Boosey and Hawkes provides useful insights into the company’s publishing interests but says little about instrument manufacturing. Fortunately the latter is covered by two important contributions in the form of doctoral theses. A study by Brand<sup>34</sup> analyses the company’s clarinet production while a recent study by Howell<sup>35</sup> is more broadly based and analyses the manufacture of wind instruments as a whole.

Of the studies addressing manufacturing practice, Bigio<sup>36</sup> examines the leading instrument maker, Rudall, Carte & Co, but concentrates almost entirely on flutes, ignoring the brass instruments that formed an important part of its business. Rayna and Struikova<sup>37</sup> provide a fascinating historical account of the dominance of incumbent electric guitar manufacturer, Gibson, being challenged by a highly innovative new entrant, Fender, in the period 1945-84. Though there are some parallels with the present study, much of the analysis focuses on patent records rather than the organization of production. Lastly, it is worth noting that although biographies of the celebrated horn player Dennis Brain<sup>38</sup> provide a few glimpses of horn makers in the twentieth century, comparatively little has been published about brass instrument makers and almost nothing has focused on producers of French horns.

There is also an extensive specialist literature covering musical instruments in general and brass instruments in particular. The greater part of this material is concerned with detailed descriptions of the history, design and development of individual instruments, together with

the music written for them and issues relating to performance practice, rather than analysing the firms that produce and market them. The literature itself comprises chiefly books and a wide range of scholarly periodicals, including many published by learned societies<sup>39</sup> devoted to specific instruments. Although some of these publications verge on hagiography, nonetheless they provide a wealth of background detail and technical information.

Major works include Baines<sup>40</sup>, Montagu<sup>41</sup> and Herbert and Wallace<sup>42</sup>, all of which are scholarly tracts, covering brass instruments. More specialised books dealing with specific instruments, include Humphries<sup>43</sup>, Morley-Pegge<sup>44</sup>, and Tuckwell<sup>45</sup>, all of which focus on the French horn. Accompanying these major works are more modest offerings comprising scholarly articles published in periodicals specialising in particular instruments or groups of instruments. These include a number that focus on brass instruments such as Bacon<sup>46</sup>, Giannini<sup>47</sup>, Humphries<sup>48</sup>, Myers<sup>49</sup> and White and Myers<sup>50</sup>. While several of these works provide valuable background information including details of one of the two companies that form the basis of this study, they say little about the business of manufacturing and marketing musical instruments.

In addition to drawing on this specialist literature, the following narrative is based on a series of interviews conducted with key informants, including the late Robert Paxman, former employees of both companies, professional and amateur horn players, musical instrument retailers, and curators of instrument collections, together with a range of archival sources. The latter included the business records of several leading brass instrument manufacturers, including Boosey & Co, Hawkes and Son, Rudall Carte & Co and Besson & Co, which provided details of production levels and methods over an extended period.

### **Innovation of the French horn in Britain (1930-1985)**

For much of the 19<sup>th</sup> and a substantial part of the 20<sup>th</sup> century, British orchestras had a distinctive sound. This differentiated them from their counterparts in many parts of Europe and the United States. This sound was the product of the instruments they played, most notably in the horn section of the orchestra. In Britain, horn players typically utilized instruments modelled on the Raoux horn from France. This French horn had a narrow bore, a small bell and piston-operated valves. Although more difficult to play and prone to ‘cracked notes’, this was the instrument that dominated horn playing in Britain for more than a

hundred years. However during the interwar years concert-goers in Britain started to experience a different sound. This emanated from foreign orchestras visiting Britain, who generally used a German horn rather than its French counterpart<sup>51</sup>. The German instrument used rotary valves instead of piston valves, had a wider bore and a larger flared bell. These features gave it a deeper, richer and louder sound. Although the leading British horn players of the time continued to adhere to the French version of the instrument, in the mid-1930s one of the leading British brass instrument manufacturers boldly stepped forward to produce the country's first German horn.

The German horn was to become a dominant design<sup>52</sup> and the clear preference of professional players in Britain in the second half of the 20<sup>th</sup> century. However, the course of this technological and market innovation was far from straightforward as British brass instrument manufacturers responded to competitive pressures and abrupt environmental changes from the mid-1930s onwards. In the event, a new entrant took the lead in refining the design and manufacture of the German instrument, while the original innovator appeared either unwilling or unable to develop its product range. By the end of the period, the incumbent had exited the industry, while the new entrant had become one of the world's leading specialist horn makers. The narrative traces the contrasting experiences of each company in turn, beginning with the established manufacturer, Boosey & Hawkes.

### **The incumbent – Boosey & Hawkes**

Boosey & Hawkes was the product of a merger between the brass instrument manufacturers, Boosey & Co and Hawkes & Son in 1930. The merger came about through the dramatic decline in the market<sup>53</sup> in the late 1920s that was the product of economic depression and changes in technology<sup>54</sup>. In the 1940s, concentration of the sector intensified as Boosey & Hawkes acquired the two remaining major brass instrument makers, Besson & Co and Rudall Carte & Co. Hence, In the course of less than 20 years, Boosey & Hawkes effectively 'swallowed up' the firms who had been their principal rivals in the late 19<sup>th</sup> century<sup>55</sup> (see table 1).

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Insert Table 1

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Prior to the merger, all four firms had been manufacturing French horns, with their London-based factories each employing about a hundred staff. At this time, production methods relied heavily on traditional artisanal skills acquired through a lengthy apprenticeship in brass instrument making. All of the firms manufactured the French style narrow bore horn then favored by British horn players, alongside a variety of other brass instruments. Most firms produced horns for both the orchestral and military markets, though of the four, Hawkes & Son appears to have had a particularly strong relationship with the top professional horn players, who featured prominently in their contemporary promotional literature<sup>56</sup> (see figures 1 and 2).

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Insert Figures 1 and 2

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Founded in the early 19<sup>th</sup> century as a music publisher, Boosey & Co began making woodwind instruments in the 1850s. In terms of capabilities the firm's skill base was initially limited, so much so that instruments were quite often bought in from other firms<sup>57</sup>, particularly small instrument workshops. However its range of capabilities expanded as Boosey & Co moved into brass instrument manufacturing in the 1870s following the acquisition of Distin & Co<sup>58</sup>. The attraction of brass instruments was the rapidly expanding brass band market in Britain at this time. Between 1870 and 1900 Boosey & Co's sales to bands grew from 7 per cent of total sales to 32 percent<sup>59</sup>. However expansion was not without its problems, particularly in acquiring skilled craftsmen. Hence by 1900 around one third of the company's one hundred craftsmen were of continental European extraction, and had learnt their trade abroad<sup>60</sup>. Surprisingly there was little specialization, with each worker required to make a range of instruments.

Almost from the outset, Boosey & Co's technical capabilities in manufacturing extended to innovation in product design. Initially, the company developed new woodwind instruments, the 'Pratten' flute in the 1860s and the 'Clinton' clarinet in the 1890s<sup>61</sup>. The firm's factory manager David Blaikley<sup>62</sup> played an important part in both innovations. He also developed and patented a number of important improvements in brasswind mechanisms. Although many of the innovations of Boosey & Co before the First World War were incremental, nevertheless a leading instrument specialist has noted that, 'in the Blaikley era a well-

informed and earnest endeavor to improve brass instrument design coupled with a high quality of workmanship gave the company a position of advantage<sup>63</sup>.

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Insert Figure 3

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In 1935 Boosey & Hawkes launched the first wide bore German style<sup>64</sup> horn to be produced in Britain (see figure 3). The new horn was designed in collaboration with, and possibly at the instigation of, Alan Hyde, a horn player in Sir Thomas Beecham's London Philharmonic Orchestra. Hyde was a powerful advocate of the German horn<sup>65</sup>, and the new design was modelled on a horn produced by Ed. Kruspe of Erfurt, one of Germany's leading horn makers alongside Alexanders of Mainz<sup>66</sup>. The new horn incorporated rotary valves, a radical departure from the traditional 'French-style' piston valves that were used in British made horns at this time. Many leading British horn players, including Aubrey Brain at the BBC Symphony Orchestra<sup>67</sup> remained committed to the French style of narrow bore horn and initial sales of the new design were unsurprisingly modest (Table 2)<sup>68</sup> But why did such a large and powerful incumbent fail to capitalize on this early innovation in the post-war period, when as a consequence of a combination of factors, German style horns were to become the instrument of choice for horn players in Britain? To answer this question, we consider two distinct but related aspects of the company's entrepreneurial and innovative activity. Firstly the growth of its international music publishing business, and secondly, the way that it reconfigured core manufacturing capabilities in response to changing technological and market environments.

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Insert Table 2

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### ***More than just a publishing opportunity ...***

At the time of the merger both Boosey & Co and Hawkes & Son combined music publishing and instrument manufacturing. However in terms of managerial capabilities, it was

significant that the main instigators of the merger, Leslie Boosey at Boosey & Co and Ralph Hawkes at Hawkes & Son, were each personally much more allied to the publishing side of the business, both having served as Directors of the Performing Rights Society<sup>69</sup>. Boosey & Co, a much larger and wealthier company, had the bigger catalogue, which included a small number of British classical music composers, notably Edward Elgar and Gustav Holst, in addition to more popular ballad music<sup>70</sup>. Hawkes & Son was the junior partner in terms of music publishing, with a catalogue that owed more to ‘tin pan alley’ than serious classical music<sup>71</sup>. However the publishing side of the business was run by Ralph Hawkes, the younger of the two Hawkes brothers. The 32 year old was a keen sportsman, active in winter sports and ocean racing, and was widely regarded as a more capable business leader than his older brother, Geoffrey, who subsequently took charge of the manufacturing side of the business. Ralph Hawkes combined powerful ambitions to promote contemporary classical music with the entrepreneurial drive and social skills to do something about it: the composer Aaron Copland later noted, *‘[h]is flair made up partly of business sense and the pleasure of association with creative personalities’*<sup>72</sup>. Consequently at the company’s first board meeting late in 1930 the decision was taken to develop the company’s classical music catalogue<sup>73</sup>.

Over the next ten years Ralph Hawkes pursued his mission to develop the company’s serious music catalogue in earnest. Although his most important early signing was the young British composer, Benjamin Britten, his efforts were especially focused on making the company’s music publishing an international enterprise<sup>74</sup>. Among those he signed during the course of the 1930s were the Hungarian composers Bela Bartok and Zoltan Kodaly<sup>75</sup> and from America, Aaron Copland and Leonard Bernstein. Boosey & Hawkes opened a number of international offices, including an Australian company in 1934, and by the time war broke out in Europe in 1939, Ralph Hawkes was making plans to split the company, moving the publishing arm to New York while instrument manufacturing remained in London. The outbreak of war brought an end to these plans, but they surfaced again in the immediate postwar period when Hawkes was President of Boosey & Hawkes Inc and living in the East Coast town of Westport, Connecticut. Though these plans were not implemented following Ralph Hawkes’ premature death in 1950, they indicate the extent to which the international publishing side of the business had developed during his tenure.

### ***Mass market manufacturing***

Boosey & Hawkes' initial plans for instrument manufacturing, involved rationalization and consolidation, with both Leslie Boosey and Ralph Hawkes seeking 'great savings'<sup>76</sup> from combining and re-structuring this part of their business. In 1931 Boosey & Co's entire instrument manufacturing business was transferred from Stanhope Place in Central London, to Hawkes & Son's large, modern factory at Deansbrook Road in the north London suburb of Edgware<sup>77</sup>. The scale of the rationalization and the capacity reduction that these changes brought about is apparent from pre- and post-merger production figures. The merged company manufactured an average of 2,723 instruments per year in the period 1930-39, less than the 2,923 instruments per year that Boosey & Co alone produced during the preceding decade<sup>78</sup>. Having consolidated production facilities, the following year in 1932, Boosey and Hawkes introduced the *Regent* range of inexpensive popular instruments such as cornets, trumpets and trombones, which Myers describes as, 'the first step toward mass production'<sup>79</sup>. Other cheap instruments introduced at this time included the *Lafleur* range. However probably the most significant step towards mass production took the form of a process innovation. This was the introduction in the mid-1930s of hydraulic forming for producing bends and loops in brass tubing. This was the brainchild of Arthur Blaikley, the son of David Blaikley, who was factory manager throughout the interwar period. Like his father, Arthur Blaikley was also an innovator, but whereas his father was responsible for product innovations in the form of new or improved instruments, David focused mainly on process innovations. He held a number of patents associated with machine tools<sup>80</sup>, but his most significant contribution was the introduction of the hydraulic expansion process forming bends of all types in brass tubing. As well as dramatically reducing the amount of time required to produce bends, it eliminated wrinkling on the inside. However, the capital investment and tooling costs for these machines could only be justified by a dramatically greater output of standardized instruments.

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Insert Table 3

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These developments in publishing and manufacturing left the company's French horns as an increasingly marginalized area of activity. The technical complexity of the horn, combined with a relatively small market<sup>81</sup> compared to those of simpler and more popular brass instruments like the trombone and the trumpet, meant it was not suited to high volume

production. Although batch sizes for these instruments increased during the second half of the 1930s, they continued to be produced in relatively low volumes (see table 3), reflecting only modest progress towards mechanization<sup>82</sup>.

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Insert Figure 4

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During the Second World War, instrument production was confined to a small section of the Edgware factory as the company switched to the production of aircraft components and munitions for the war effort (see figure 4). War production brought investment in new machinery and the introduction of line production to the manufacture of standardized items comprising, ‘*engine tubing, exhaust pipes and other stuff*’<sup>83</sup>, for military aircraft. Increasingly unskilled machine operators, many of them women, replaced skilled craftsmen<sup>84</sup>. By the end of the war the Edgware factory had been transformed from traditional workshops producing hand-crafted instruments aided by a small amount of machinery into an industrial production system through the application of mass production methods<sup>85</sup>. The ending of hostilities saw the machinery adapted to instrument making, enabling the company to progress developments begun in the 1930s leading to mass production of low-priced models. As Howell<sup>86</sup> notes this, ‘*led to a complete change of ethos*’ within the company. The increasing use of unskilled machine operators resulted in a diminishing role for skilled craftsmen. Batch sizes for popular instruments rose dramatically. Line production of trumpets began as early as 1945 and other popular instruments followed in the early 1950s. Although output was initially slow to increase, during the course of the 1950s it rose rapidly with output of brass instruments increasing from 50 per week in 1946 to 600 per week in 1958<sup>87</sup>.

The company’s much enhanced manufacturing capability, in particular its ability to mass produce low-priced popular instruments complemented the dominance of the brass band market that it enjoyed following the acquisition of Besson & Co in 1948. Boosey & Hawkes were also helped by a resurgence of the brass band movement in the 1960s<sup>88</sup>. As a small independent instrument maker with 40 years’ experience of the trade observed, ‘*Brass band is its own little world. They [Booseys] had it to themselves...for a long time they had it all to*

*themselves*<sup>89</sup>. Instruments for schools and colleges also formed an important part of Boosey & Hawkes business at this time, helped by the rapid growth of music education in Britain in the 1950s<sup>90</sup>. Similarly lower costs through mass production enabled the company to export an increasing proportion of its output at this time, although many fewer brass instruments were exported than woodwind ones.

However Boosey & Hawkes dominance of the brass band and education markets came at a price. According to Howell the advent of mass production led to falling standards of quality control as, *'the company started to lose sight of the high standard of their top range instruments and the requirements of their professional customers'*<sup>91</sup>. Professional players were put off by Boosey & Hawkes' focus on the brass band and education markets. As the instrument maker quoted earlier observed, *'There's three markets in brass. There's what we laughingly call legit, which is the classical, straight ahead, traditional market. There's the commercial jazz/pop market ... and there's brass bands, a whole different world of their own – their own politics, their own instruments – and the two don't meet'*<sup>92</sup>. As Howell notes *'the harsh reality was that many British professional players favored instruments made abroad'*<sup>93</sup>. The same author goes on to point out that Boosey & Hawkes' high quality brass instruments were bought mainly by band musicians, only a very small proportion was used for orchestral playing<sup>94</sup>. This was especially true of horns. This most complex of brass instruments, did not lend it itself to mass production with the result that horn output languished, becoming confined to just two of the company's remaining craftsmen (see table 2).

Having pioneered the production of German horns in Britain in the 1930s, Boosey & Hawkes were unable to seize the opportunity and build on their initial product innovation. As the instrument maker quoted earlier put it, *'Booseys were very good at piston valves stuff, brass band instruments, that was their thing...[but] ...there's a delicacy about a French horn, about the way it's built and the balance of it and all that and Booseys couldn't quite get their heads round it...they went at it like it's a tuba'*<sup>95</sup>. Not only did their horns fail to find favor with the traditional/classical market, professional musicians were deterred precisely because the brass band market was such an important part of Booseys' business. As the interviewee noted, *'...I think that's where the French horn thing suffered. Not only was it just crudely made, but the traditional market couldn't take Booseys seriously because they made brass band instruments'*<sup>96</sup>.

Hence by the 1960s, French horns represented only a tiny fraction of Boosey & Hawkes' output of brass instruments. The same horn, described in the instrument books as a 'rotary horn' and branded as the 'Emperor' model remained in production in the 1950s and 1960s. The company flirted with innovation in the mid-1960s by introducing a redesigned double horn, but as Howell notes, this proved to no avail<sup>97</sup>. Unlike other instruments batch sizes for horns remained very small and made by the same two craftsmen who had made them in the pre-war era. Then towards the end of the 1960s Boosey and Hawkes, stopped manufacturing their own rotary valves, thereby abandoning a key manufacturing capability. Instead valve clusters were outsourced<sup>98</sup>, a strategy the company increasingly relied on as it wrestled with what has been described as a 'mind boggling' range of instruments in its product portfolio<sup>99</sup>.

Finally outsourcing was carried to its logical conclusion when in the 1970s, Boosey and Hawkes decided to outsource horn production in its entirety to the firm of Josef Lidl of Brno<sup>100</sup>, Identified as the 'Model 400' it was branded as a Boosey & Hawkes horn, though it was clearly inscribed 'Made by Josef Lidl' on the bell. Lacking the cache of better known brands of orchestral horn<sup>101</sup> it was rarely used by professional horn players and sales continued to be modest<sup>102</sup>. The trigger for the outsourcing of horn production was apparently the retirement of one of the company's two remaining horn makers. However in reality it was part of a broader trend whereby Boosey & Hawkes increasingly outsourced the production of instruments to countries like Czechoslovakia, Taiwan and Pakistan<sup>103</sup> in the 1980s. This not only reflected a continued attempt to lower costs, but the company's pursuit of acquisitions, especially overseas ones<sup>104</sup>. This in turn resulted in a lack of investment in the company's core asset, the Edgware factory. The outdated plant combined with greater reliance on outsourcing meant further dilution of the Boosey & Hawkes brand.

As Howell comments the company's attention to the popular (i.e. brass band) and education markets was at the expense of its traditional customer base<sup>105</sup>. She notes how Boosey & Hawkes increasingly lost sight of its long-established professional customers and standards within the factory. By pursuing expansion and mass production the company, '*lost its focus on craftsmanship, quality and custom-built instruments*'<sup>106</sup>. Boosey & Hawkes decision to outsource horn production, represented a key turning point. It not only marked the exit from horn manufacturing of the last of the four incumbent horn makers who produced the instrument in the prewar era, it marked the loss of Boosey & Hawkes' artisanal skills and technical capabilities in this field, which had accumulated over a hundred years. It was to

prove a prelude to the company's eventual closure of its Edgware plant in 2001<sup>107</sup> as it exited brass instrument manufacturing completely.

### **The new entrant – Paxman Bros**

While the early years of the twentieth century saw the demise of small workshops making brass instruments as part of a move to factory production<sup>108</sup>, this trend began to reverse in the years after the Second World War. Among the first of a new generation of small brass instrument manufacturers was Paxman Bros of London, which specialized in the production of French horns. Unlike their predecessors who had made French style narrow bore horns fitted with piston valves, Paxmans chose to innovate<sup>109</sup>, by manufacturing a wide bore German style horn, an instrument that was becoming increasingly popular at the time.

Paxmans started life as a retailer selling a range of musical instruments. Harry Paxman had ambitions to pursue a career as a professional clarinet player, but injuries sustained during the First World War, prevented this and instead he turned to selling musical instruments. The firm was founded as Paxman Bros in 1919 by Harry Paxman and his brothers William and Bertram, with premises in Southwark Street, near London Bridge<sup>110</sup>. Prominent among their customers were northern brass bands and military bands. Like many dealers in musical instrument the firm's capabilities at this time extended beyond retailing and distribution to include metal-working skills associated with the maintenance and repair of brass instruments. For this purpose Harry Paxman, set up a workshop doing repairs<sup>111</sup>, and among his early clients for repair work were several military bands based at Aldershot<sup>112</sup>.

Having initially sold a variety of musical instruments<sup>113</sup>, Paxmans began to specialize in brass instruments, including French horns. This increasing specialization is evident in its decision to become an agent for the Paris-based horn maker Courtois<sup>114</sup> and in the way its advertisement in the Musicians Union Handbook for 1936 is located in the section listing professional horn players. Bearing the strap line, 'First Class Repairs'<sup>115</sup>, it indicates the firm's developing capabilities in the field of repair work, which would subsequently open up the opportunity for its move into instrument manufacturing.

In 1935 the firm relocated to new premises at 165 Shaftesbury Avenue<sup>116</sup>, in the heart of London's theatre district. This move reflected the decline of the traditional brass band market<sup>117</sup> during the depression of the early 1930s<sup>118</sup>, and Harry Paxman's active role in



targeting sales of instruments to professional musicians including those playing in dance bands. The move to Shaftesbury Avenue led to a new development for the firm, producing as well as selling and repairing instruments, a step that reflected its growing capability in terms of the technical skills and expertise of its staff. Initially, production was confined to a single instrument, the sousaphone, which was popular with dance bands in the 1920s and 1930s. Lacking the necessary resources and capabilities to produce the instrument *ab initio*, Harry Paxman instead chose to improvise by modifying an existing brass instrument, the helicon<sup>119</sup>, which was of similar design. This involved substituting a larger forward facing bell for the somewhat smaller one found on helicons. However the firm's capabilities at this time did not extend to the construction of the large flared bell of the sousaphone since its compound shape presented one of the most technically demanding challenges in brass instrument manufacturing<sup>120</sup>. Lacking the specialized skills and equipment needed to produce its own bells, Harry Paxman decided to seek out a sub-contractor. He again opted to improvise, but on this occasion approached one of his neighbors to help him out. According to his son, "*...he got a company which spun cooking utensils for the trade – giant dustbin-type things – to produce flares [bells] and by making what amounts to a couple of right angle bends... the flares connected to the body of the thing with a bayonet arrangement and a locking nut*"<sup>121</sup>. By pursuing this somewhat convoluted route, Paxmans became brass instrument manufacturers, albeit on a very small scale. With the onset of war in 1939, this experiment was discontinued and the firm had to fall back on repair work.

In 1940, having been bombed out of during the blitz, Harry Paxman continued to repair instruments from his home in suburban Twickenham<sup>122</sup>. However as the war drew to a close, he returned to Central London, having acquired spacious new premises in Gerrard Street, Soho<sup>123</sup>. The new building provided space for an enlarged workshop, and Harry Paxman lost little time in seeking out skilled craftsmen in order to extend the firm's capabilities. This posed a challenge since, '*there was a shortage of skilled people around because of the war and the casualties and so on*'<sup>124</sup> Harry Paxman's initial response was to draft one of his sons into the business in early 1945. At the time Robert Paxman was training to be a plumber, but Paxman senior was confident that his metal working skills were transferable to instrument making. Robert's mother was also reluctant for him to take up plumbing on account of his weak chest, providing an additional prompt for this change of occupation<sup>125</sup>. Harry Paxman was also successful in 'poaching' three skilled craftsmen from Boosey & Hawkes at this point: Harry Page, Charles Staneford and Joe Dobson were all experienced, time-served brass

instrument makers. Now, with five employees in the workshop<sup>126</sup>, there was scope not just to repair and adapt instruments<sup>127</sup>, but also to resume manufacturing. Building on the firm's pre-war reputation as something of a specialist in horns<sup>128</sup>, Harry Paxman was keen to begin making this instrument.

Paxman decided to produce a German style horn, recognizing both the increasing popularity of this wide bore design, especially among younger horn players, and the fact that the two leading manufacturers of high quality horns, Alexander and Kruspe, were German companies and unlikely to offer serious competition in the immediate aftermath of the conflict<sup>129</sup>. This ambitious step presented significant challenges, despite the progress that the firm had made in developing its capabilities, especially in traditional artisanal skills associated with metal work techniques and brass instrument making. The biggest challenge was the manufacture of valve clusters. This was especially difficult since German style horns employ rotary valves rather than the piston valves normally found on British made horns at this time. Morley-Pegge<sup>130</sup> in his definitive study of the horn notes that rotary valves are significantly more complex mechanically. As a former Paxman employee noted, '*... a rotary valve French horn is a much more delicate piece of kit*'<sup>131</sup>. In Germany the smaller horn makers, whose scale of production was insufficient to justify the capital investment in precision machining that was required, could source their rotary valves from third parties. However, in Britain this option was out of the question since there were no specialist valve manufacturers<sup>132</sup>.

Harry Paxman came up with a novel solution to the problem of acquiring this substantive capability. In a classic piece of entrepreneurial bricolage, he persuaded two machinists to 'moonlight' from their day job at the local gas board. As his son<sup>133</sup> put it, '*...we were fortunate enough regarding the bells and the valves, to engage on a part time basis, normally on a Saturday, these people to come in and produce things*'. Neither had any prior experience of musical instruments, but they were employed to carry out precision machining of prototype gas fittings and their metalworking skills were transferable, since the tight tolerances needed to produce rotary valve clusters were very similar to those needed for gas fittings<sup>134</sup>. In time one of them joined the company on a full time basis<sup>135</sup>. Nor was this the only example of improvisatory techniques being used in order to facilitate the production of horns. For example, Robert Paxman explained how his father, '*... became associated with a general engineer who lived in Hampton in Middlesex, only a relatively short distance from where my father lived, and he got him to knock up a mandrel*'<sup>136</sup>.

Having acquired the capabilities necessary not just to adapt and convert instruments but to manufacture them as well, Paxmans began producing its first horns. These were essentially copies of the Alexander 103 horn, a logical choice given that as one interviewee noted, ‘...Alexanders were the principal suppliers to the profession from before the war’<sup>137</sup>. However the company’s initial output was very modest. By 1948, three years after production started, the firm’s annual output had only just crept into double figures<sup>138</sup>. Despite this, the firm’s capabilities were clearly improving as it was establishing a reputation for its rotary valves. The leading British horn player, Dennis Brain made extensive use of Paxmans<sup>139</sup>. On several occasions in the late 1940s Paxmans modified horns for Brain including fitting additional rotary valves. A letter from the horn player to Paxmans praises the firm’s ‘expert workmanship’<sup>140</sup>.

During the course of the 1950s the firm’s capabilities in terms of instrument manufacturing were gradually extended. A catalogue for the mid-1950s describes the firm as, ‘*specialist makers of Rotary Valve Horns and Repairers of Horns of all descriptions and rotary valve work*’<sup>141</sup>. In terms of capabilities a degree of specialization had developed around three key craftsmen. Robert Paxman made bells while Fred Leach was ‘the valve man’<sup>142</sup>. Having perfected the machining and turning of rotary valves, he was now able to craft very high quality valve blocks. The third person was Ted Adams, the horn builder. Unlike the others, he was himself a horn player, which meant that as well as being, ‘*a really good craftsman*’, he was someone who, ‘*really cared about making beautiful horns*’<sup>143</sup>. This small close-knit team of craftsmen, each of whom contributed in a different way, was to form the cornerstone of Paxmans’ horn manufacturing capability over more than thirty years. However, for much of the 1950s horn manufacture remained almost a sideline, attracting little attention in the market. In 1958 a customer could still describe Paxmans as ‘a repair shop’<sup>144</sup>, and express surprise on learning that in addition to selling and repairing horns, the firm was also manufacturing its own instruments. Production levels remained modest and by 1959 Paxmans was making some 30 horns a year.

### ***The Paxman / Merewether partnership***

While Paxman’s capabilities in terms of the employee skill base had continued to develop, the firm was constrained in terms of technical capabilities by a lack of design knowledge and

expertise<sup>145</sup>. However, it was at this point that design expertise entered the picture, in the form of an Australian horn player now working in Britain. As a professional musician, Richard Merewether was what Von Hippel terms a ‘lead user’<sup>146</sup>, that is someone performing at the leading edge of his profession. Merewether specialized in the high registers of the horn, among the most difficult parts of the repertoire to perform<sup>147</sup>. He had studied at the Sydney Conservatorium of Music, where his circle of friends included the conductor Charles Mackerras, the violinist, Patricia Tuckwell and her brother, Barry Tuckwell<sup>148</sup>, who was later to become a horn player of international renown. Merewether followed Mackerras to Britain in 1950, with Tuckwell arriving shortly afterwards. By the late 1950s he was working as a freelance horn player in London where, as Robert Paxman observed, ‘... *his bread and butter earnings when he was a player would have been in the theatres in the West End*’<sup>149</sup>. In this role he, ‘*made something of a specialization of very, very high register parts*’<sup>150</sup>. But Merewether was unusual. Not only was he a highly talented performer with distinguished musical connections, he also had a keen interest in horn design based on new ideas about the physics and construction of the instrument<sup>151</sup>.

In the mid-1950s Merewether persuaded Alexanders of Mainz to build him a horn to his own design specifically for his personal use. When in 1959 he wanted further modifications, rather than make the trip to Mainz, he got Paxmans to carry out the work<sup>152</sup>. The following year he returned with a new design, this time for a double descant horn in F/F-Alto. Having learnt that Paxmans possessed the capacity to manufacture rotary valves in-house, he asked them to build it. As a ‘one off’ this particular instrument, built solely for Merewether’s own personal use playing pieces in the higher registers, it proved extremely effective. Gradually the word ‘*got around*’<sup>153</sup> about the outstanding performance characteristics of this Merewether designed, Paxman-manufactured horn. As another interviewee noted, ‘...*Once the principal’s got one it’ll spread down the line and that’s enough to get the big cheese in the other orchestra interested*’<sup>154</sup>. As a result Paxmans began making this horn in small numbers.

The technical success of this instrument prompted further collaboration between the horn player and the horn makers, a relationship that was facilitated by Paxmans’ location in the heart of London’s entertainment district. As Robert Paxman explained, ‘*He was a freelance professional musician operating around the West End doing all the musicals. You know, there was quite a lot in those days, so he had quite a bit of free time, which he was able to spend with us. So he gradually talked about new ideas starting from the basis of what we had*

got ...<sup>155</sup>. In time this led to further additions to Paxmans' product range including a similar instrument in Bb/F-Alto<sup>156</sup>. Whereas hitherto Paxman horns had been little more than copies of the Alexander horn, these new double descant horns represented genuine innovations in horn design. In addition to satisfying the increasing demand in Britain for German wide bore horns, they were meeting the need for more specialized instruments. The new generation of horn players was being asked to perform an expanding and increasingly demanding repertoire, influenced by the work of leading horn players, especially Denis Brain who had done much to popularize the instrument in the early postwar years<sup>157</sup>.

Paxmans' innovative new horns were well received by professional horn players like Barry Tuckwell<sup>158</sup>. As one observed, '*all descant horns that were made before Merewether came along did have flaws*'<sup>159</sup>. Among other weaknesses, '*they were difficult to play*' and '*they were fairly out of tune*'. The critical acclaim that greeted these instruments proved to be the prelude to a highly productive partnership between craftsman and horn player which was to last more than 25 years and lead to a succession of innovations in horn design.

When Harry Paxman retired in 1961, Robert Paxman became the firm's managing director and Richard Merewether, though still playing the horn professionally, joined him as a member of the board. Re-named Paxman Musical Instruments Ltd, Merewether was joined by two of the firm's established craftsmen, Fred Leach and Ted Adams<sup>160</sup>. A catalogue<sup>161</sup> for the firm from mid-1960s reflects the impact of the Paxman/Merewether partnership. It includes an expanded range of twelve horns (all German style rotary horns), termed 'Paxman RM horns', featuring, '*the Merewether valve system ... that provides minimum interruption of the air column*'<sup>162</sup>. The catalogue went on to note that the horns were 'of the highest quality' and stressed their adherence to traditional artisanal methods of manufacture such as the use of, '*hollow rotors built from tube and sheet metal as used by the finest German makers before the War, but now abandoned by them in the cause of mass production*'<sup>163</sup>.

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Insert Figure 5

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Towards the end of the 1960s the Paxman/Merewether partnership unveiled another significant innovation in horn design. This was the world's first triple horn<sup>164</sup>. Described by

the horn virtuoso Barry Tuckwell as, ‘*an ingenious machine*’<sup>165</sup>, it was an offshoot of the double descant horn and was pitched in F, Bb and F-alto. Constructed of three full sections of tubing Paxmans was able to keep the weight of the instrument down by using the hollow valves for which they were noted and which were a product of their outstanding craftsmanship. The triple horn proved a particular success in the United States, helping to establish the company’s reputation in North America for horns of the highest quality. It brought Paxmans to the attention of Osmun Music, a leading instrument dealership in New England who became an agent for Paxman horns<sup>166</sup>. The innovative features and outstanding quality of this instrument were even recognized in Germany. Among the leading horn players to adopt this horn in the 1970s was the German virtuoso, Herman Baumann (see figure 5). This was a significant step as Baumann was and still is internationally recognized as one of the world’s leading horn players. From this point onwards Paxman horns gained international recognition. As one of Paxmans’ employees at the time noted, ‘...*Orchestras are probably a bit more like football teams than jazz musicians inasmuch as there’s a premier division and there’s a first division and a second division. All you really need is a few people in those orchestras. By that we’re talking LSO, Berlin Philharmonic, New York Symphony, Boston Philharmonic. They travel all over these world; local ones don’t*’.<sup>167</sup> Hence the introduction of the triple horn not only won recognition for Paxmans as an innovator in horn design<sup>168</sup>, it also marked the beginning of international recognition for Paxman horns<sup>169</sup> as a leading brand of the highest quality and used by top international horn players.

In 1971 Richard Merewether was forced by ill health to retire from horn playing. This provided him with an opportunity to work for Paxmans full time and gave added impetus to the Merewether/Paxman partnership. As a former employee<sup>170</sup> at the time explained, key features of this unique partnership were, ‘*Bob was the craftsman. He was good on sort of techniques of making things. He might not have been quite as good at everything is the impression I’ve got but he was good at the technical stuff. And Dick’s great thing was his ability to visualize, particularly being able to sort of figure out some of the significant points*’.

Paxmans continued to innovate by producing new horn models. A Paxman catalogue for 1975<sup>171</sup> reveals the product range had expanded dramatically with the company now offering no less than 36 different models of horn. With this extensive range of specially designed

horns Paxmans was able to meet the varied needs of professional horn players, and the company was now producing more than 200 professional quality hand-built horns per year<sup>172</sup>.

This growth presented new problems, in particular around sub-contracting of production activities. However Robert Paxman was seen by colleagues as particularly astute in distinguishing, ‘which stuff you do in-house and which stuff you outsource so that your time is used effectively’<sup>173</sup>. In practice, a large proportion of the work was retained in-house. From a capabilities perspective, retaining control of production enabled the company to build horns of the highest quality, with horns produced at this time regarded as, ‘*really good quality, an almost totally British made horn ... [built by] people who were really proud of their work*’<sup>174</sup>. Not only did it enable Paxmans to ensure the highest quality, it helped to retain the manufacturing capabilities in the form of knowledge and artisanal skills that had been built up over more than 30 years.

In 1985, the Merewether-Paxman design partnership came to an end with the untimely death of Richard Merewether. By then, the collaboration had produced some 50 horn models and was widely acknowledged as having made a major contribution to the development of the instrument<sup>175</sup>. Paxmans were now internationally renowned as makers of horns of the very highest quality. As a brand, it ranked alongside the world’s leading horn makers such as Alexanders and Kruspe. As a former employee explained, ‘*.....they’d [Paxmans] become recognized within the UK as making very high quality horns ...but by the late ‘80s and early ‘90s they had become internationally recognized as pretty much the top*’<sup>176</sup>.

The firm’s position as one of the leading brands of French horn reflected the development of core capabilities over a long period. Foremost among these capabilities was the unique combination of traditional artisanal instrument making skills accumulated by its employees over many years allied to a highly creative design capability that drew on the first-hand experience of a lead user. Nor was this all, for these were complemented by other capabilities. These included managerial capabilities that centred on the pursuit of specialization, in particular Harry Paxman’s decision at the end of the Second World War to focus exclusively on the French horn, and company values that embraced both an active interest in musicianship and the pursuit of quality in manufacturing.

## **Discussion – contrasting visions and capabilities**

This account has contrasted the fortunes of a large incumbent and a new entrant firm in brasswind instrument manufacturing in Britain over a period of five decades. Leonard-Barton's analytical framework, in particular her notions of 'core capabilities' and 'core rigidities', has much to offer in explaining the changes that took place, especially in terms of the market for horns in Britain. We have sought to trace the resulting patterns of capability development by combining a broadly Penrosean theoretical interpretation of the growth process with G.L.S Shackle's key insight into human imagination in the entrepreneurial process. Boosey & Hawkes pioneered the introduction of the German style horn in Britain in the 1930s, yet failed to capitalize on the knowledge gained by developing the instrument further. Instead this large and established firm replicated manufacturing practices that it first learned in in the pre-war period, but which became further entrenched as a consequence of its engagement in wartime production. Under the often erratic leadership of Geoffrey Hawkes, its core capabilities in manufacturing were largely oriented around process innovations in pursuit of mass production methods. Meanwhile, with Ralph Hawkes pursuing his own personal vision, much of the company's entrepreneurial energies were devoted to building its international music publishing business. Secure in its dominant position in the brass band market, a product of the greatly increased market concentration that emerged following acquisitions in the 1930s and 1940s, the manufacturing operation in Britain was content to rely on standardized products, mainly popular instruments like trumpets and trombones.

By relying on process innovations Boosey & Hawkes managed to lower unit costs, which was the managerial priority in the depression of the 1930s. However, this came at a price in that it demanded massive increases in the scale of instrument manufacturing, to justify the expense of mechanization. Most operational processes (e.g. the use of hydraulic forming for pipework), were reduced to repetitive tasks, and were carried out by semi-skilled staff, rather than by specialists who had been through a brasswind apprenticeship. As a result, instrument manufacture for the commoner models became primarily a matter of assembly. By the 1960s these core capabilities were fast becoming core rigidities. They had enabled the company to cater for mainstream customers such as the important brass band market, the lucrative educational market, and a growing export market<sup>177</sup>. However the gradual loss of traditional artisanal knowledge and skills meant that Boosey & Hawkes was unable to pursue productive opportunities in the growing international market for premium quality professional instruments. The folly of the company's failure to invest in design and craftsmanship became apparent as its product began to experience increasingly intense



competition from volume manufacturers such as the Japanese firm Yamaha and its American counterpart Selmer.

In contrast Paxmans focused on an entirely different set of core capabilities. Unlike the incumbent they specialized in a single instrument. Over a number of years they acquired and developed a range of craft skills, particularly in the field of valve machining and bell making. This, combined with recourse to entrepreneurial bricolage in order to make the necessary resources available within a relatively small business, gave the company the necessary core capabilities to secure a competitive advantage in producing instruments of the highest quality. Perhaps most important of all however was their ability to combine these distinctive manufacturing capabilities with novel insights into horn design.

The partnership between Robert Paxman and Richard Merewether brought together specialised craftsmanship, design capability and a distinctive vision for this particular musical instrument. As one former employee observed, *‘Bob [Paxman] was the craftsman. He was good on... techniques of making things. He might not have been the quite as good at everything is the impression I’ve got but he was good at the technical stuff. And Dick’s great thing was his ability to visualize, particularly being able to sort of figure out some of the significant parts.’*<sup>178</sup> As a professional horn player Richard Merewether was able to draw on first-hand experience as *‘a high note specialist’*<sup>179</sup> tackling the most demanding pieces in the horn repertoire. By coupling this with an active interest in the scientific aspects of horn construction, he was able to make a decisive contribution as a lead user who was *‘well positioned’* at the *‘leading edge’* of contemporary practice<sup>180</sup>.

This unique combination of skills, domain knowledge and technical systems formed the basis of Paxmans’ core capabilities over several decades. When allied to the company’s distinctive values and embedded position within the horn community, they gave it a unique position in this industry sector. Fuelled by Merewether’s passion for design and Robert Paxman’s entrepreneurial ingenuity, the company seized this productive opportunity to produce a steady succession of innovations in horn design. The new instruments met the needs of an expanding community of professional horn players, that reflected the emergence of a new generation of horn virtuosos<sup>181</sup>, and saw the horn increasingly used not just in classical orchestras but chamber ensembles and in the 1960s even in well-known recordings of popular music as well<sup>182</sup>. At the same time as a small company specializing in a single instrument they were able to provide professional horn players with the support required for a complex musical

instrument. As the former employee noted, '*they [professional horn players] want to be able to fiddle with it and when you're dealing with a small company, generally speaking you're in a better position than you are in a big one*'<sup>183</sup>. This helped give the firm credibility with serious musicians and in time helped create an internationally recognized brand<sup>184</sup>.

The emergence of a small specialist firm like Paxmans is consistent with another aspect of the Penrosean theory of firm growth. Penrose argued that large, growing firms tend to focus on those activities/market segments where large scale operations provide them with the most profitable opportunities. In the process they leave other opportunities open, which Penrose termed 'interstices'<sup>185</sup>, that small entrepreneurial firms can take advantage of by exercising, '*unusual ability, original ideas and considerable versatility*'<sup>186</sup>. Thus, in the case of brasswind instrument manufacturing, by the 1950s Boosey and Hawkes had gained a dominant position in the mass market for popular instruments, but much of the company's growth was focused on its publishing division. As a consequence, the market for professional quality French horns represented just this kind of productive opportunity, which Paxmans **were** ready to pursue. Being a complex instrument, manufacture of the French horn was much less amenable to large scale operations, providing scope for a small specialist firm to enter the market and through developing its manufacturing and design capabilities, ultimately to prosper. There are also parallels with Carroll's 'resource partitioning model', which has been used to explain the growth of micro-brewing in Britain and the US<sup>187</sup>. In this model, large 'generalist' firms meet a uniform demand for a standardized product through reliance on scale economies, leaving small 'specialist' firms to cater for niche markets by adapting themselves to the limited resources available.

There is evidence that the Paxman story is part of a broader pattern in this sector and across other creative and craft-based industries, which has continued into the 21<sup>st</sup> century. During the course of the last 40 years several new entrants have emerged in musical instrument manufacturing, including a number of firms established by former employees of existing instrument makers. Notable examples in Britain are Rath Trombones and Smith-Watkins Trumpets. In both cases these are firms that specialize in a single brasswind instrument, producing very high quality products aimed at professional musicians. Nor is this a purely British phenomenon. In Italy, Paolo Fazioli set out in 1980 to design a piano that would sound superior to any other instrument on the international market<sup>188</sup>. Like Paxmans, Fazioli relies on a combination of artisanal skills and design expertise. Producing only 140

instruments a year his hand-made products are seen as embodying ‘true craftsmanship’<sup>189</sup>. As such, they are firmly aimed at the top niche in the market rivalling the leading incumbents, including the legendary Steinway brand. Similar patterns are evident in other sectors where one finds distinctive market niches that include users requiring high quality, high performance products and where artisanal knowledge and skills are at a premium. For example, in the sports equipment sector, several specialist manufacturers of bespoke, hand-crafted cricket bats continue to operate successfully alongside much larger mainstream brands.

### **Concluding remarks**

This article has made a theoretical contribution by responding to calls for historical examinations of entrepreneurial activity to adopt a more forward-looking perspective that Daniel Raff has described as, ‘a history of choices rather than outcomes’<sup>190</sup>. The theoretical framing combined a long-established yet rarely applied Penrosean ‘productive opportunities / productive services’ dynamic with the radical subjectivism of Shackle’s ‘imagined outcomes’ and Leonard-Barton’s conceptualization of ‘core capabilities’ and ‘core rigidities’. This was used to analyse the pursuit of entrepreneurial opportunities and capability development in a manufacturing industry sector that has experienced increasing consolidation, and recourse to volume production, while at the same time witnessing the growth of specialist, craft-based businesses.

Utilizing this theoretical framing a number of distinctive findings emerged from the empirical analysis. It was found that personal interests and passions were influential in driving the Penrosean productive opportunities/ productive services dynamic. In both of the musical instrument manufacturers studied, the personal interests of key players played a crucial role in terms of the entrepreneurial opportunities pursued and the capabilities developed. Thus Ralph Hawkes’ personal passion for contemporary classical music was shown to have exerted a powerful influence on Boosey and Hawkes’ development, in particular the way in which the publishing side of the business, especially its portfolio of contemporary classical composers, came to the fore. Similarly Richard Merewether’s interest in and enthusiasm for horn design, strongly influenced Paxman’s pursuit of the international orchestral market through a string of innovations in horn design.

Another aspect of the theoretical framing that found support in both cases was the cumulative influence of past decisions in shaping the capabilities and future direction of each business over time. Thus Boosey and Hawkes' pursuit of industry consolidation in pre-war years combined with an emphasis on volume production during World War Two, led to the company's development of large scale production and the pursuit of mass markets in the postwar era. Similarly at Paxmans their pre-war involvement in instrument retailing and repair work, especially their location in the heart of London's entertainment district, led to close relationships with professional musicians and this was to play a key part in the company's postwar success as a specialist manufacturer of high quality orchestral instruments.

As well as providing insights into entrepreneurial processes, especially opportunity recognition and exploitation and the development of capabilities, this article has wider implications. It contributes to the literature on musical instruments, a literature that is very extensive but dominated by technical and performance aspects of instruments. In this instance however the contribution is different, as it focuses on much neglected business aspects of musical instrument making. In the process it provides a valuable insight into the business of musical instrument design and manufacturing. In particular the Paxman story challenges many of the prevailing assumptions about craft production. These frequently fail to recognize the potential for innovation present in this form of production. In contrast the Paxman case reveals how small specialist craft-based businesses operating as traditional workshops can successfully co-exist alongside much larger industrial counterparts.

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**Table 1 Mergers of Brass Instrument Makers**

Date	Acquirer	Acquired	Products	Changes in activity
1917	Boosey & Co.	J R Lafleur & Son	Manufacturer & importer	n/a
1925	F. Besson & Co.	Quilter	Not known	n/a
1930	Boosey & Co.	Hawkes & Son	Brass manufacturer	Marble Arch plant closed & transferred to Edgware
1930	Mayers & Harrison	J Higham	Brass Manufacturer	Plant closed/ production ceased
1940	F. Besson & Co.	Wheatstone & Co	Instrument manufacturer	Manufacturing transferred
1941	Boosey & Hawkes Ltd	Rudall Carte & Co	Flute & Brass manufacturer	Plant closed 1939 & production transferred to Edgware
1948	Boosey & Hawkes Ltd	F. Besson & Co	Brass manufacturer	Plant closed & production transferred to Edgware
1970	Boosey & Hawkes Ltd	Salvation Army Brass factory	Brass manufacturer	Plant closed & production transferred to Edgware

Source: Smith and Blundel “Improvisation and entrepreneurial bricolage”, 65.

**Table 2 Boosey & Hawkes production of orchestral horns 1935-54**

Year	French horn	German horn	Total
1935	59	18	77
1936	42	17	59
1937	32	3	35
1938	49	0	49
1939	27	0	27
1940-44	production displaced in wartime		
1945	15	0	15
1946	4	0	4
1947	28	0	28
1948	3	18	21
1949	18	18	36
1950	17	30	47
1951	39	18	57
1952	19	8	27
1953	18	34	52
1954	30	29	59
Total	400	193	593

Source: Boosey & Hawkes archive, A227 Instrument books

**Table 3 Boosey & Co: horn production 1920-39**  
(Boosey & Hawkes from 1931)

<b>Model</b>	<b>Military horn</b>	<b>Orchestral horn</b>	<b>Total</b>
<b>Year</b>	<b>A41 (Eb)</b>	<b>A40 (Eb)</b>	
1920	12	27	39
1921	46	25	71
1922	39	11	50
1923	42	19	61
1924	0	36	36
1925	49	16	65
1926	30	0	30
1927	30	16	46
1928	36	10	46
1929	24	15	39
1930	30	8	38
1931	24	8	32
1932	6	2	8
1933 <sup>a</sup>	11	9	20
1934 <sup>b</sup>	62	15	77
1935	22	77	99
1936	31	59	90
1937	28	35	63
1938	13	49	62
1939	12	27	39
<b>Total</b>	<b>547</b>	<b>464</b>	<b>1011</b>

<sup>a</sup> In 1933 Boosey & Co's *A40 Orchestral horn* began to be replaced by Hawkes & Son's *No. H1 Professional Raoux model*.

<sup>b</sup> In 1934 Boosey & Co's *A41 Military horn* began to be replaced by Hawkes & Son's *No. H2 Military and Orchestral model* now designated as B4707.

Source: Boosey & Hawkes archive, A227 Instrument Books.

**NOTE: FIGURES ARE NOT INCLUDED IN THIS PRE-PRINT**

**Figure 1**

**French horn catalogue of Hawkes & Son, circa. 1930**

Illustration reproduced courtesy of Bate Collection, University of Oxford

**Figure 2**

**British horn players of the 1920s**

Illustration reproduced courtesy of the Bate Collection, University of Oxford.

**Figure 3**

**Boosey & Hawkes German horn circa 1935 (on the left)**

Illustration reproduced courtesy of the Horniman Museum and Gardens, London.

**Figure 4**

**Boosey & Hawkes brass instrument production during World War Two**

Illustration reproduced courtesy of the Horniman Museum and Gardens, London

**Figure 5**

**1<sup>st</sup> International Brass Congress at Montreux, 1976**

Willi Watson, Richard Merewether, Herman Baumann and Robert Paxman (left to right)

Illustration reproduced courtesy of Mr Willi Watson

## Footnotes

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<sup>1</sup> Daniel M.G. Raff, “How to Do Things with Time”. The essay was accompanied by a series of critical responses and a rejoinder: Christine Meisner Rosen, “What is Business History?”; Andrew Popp, “Making Choices in Time.”; Stephen W. Usselman, and Sidney G. Winter; and Daniel M.G. Raff, “Rejoinder”. See also, Rowlinson *et al.*, “Research Strategies” for a broader overview of methodologies adopted in business history and organization studies.

<sup>2</sup> Raff, “How to Do Things with Time”, 445.

<sup>3</sup> For example, Chester Barnard’s oft-cited dictum, ‘Much of the error of historians, economists and all of us in daily affairs arises from imputing logical reasoning to men who could not or cannot base their actions on reason.’ Barnard, “The Functions of the Executive”, 305.

<sup>4</sup> Popp, “Making Choices”, 467. See also, Popp and Holt, “The Presence of Entrepreneurial Opportunity”.

<sup>5</sup> Galambos and Amatori, “The Entrepreneurial Multiplier Effect”, 765.

<sup>6</sup> Recent examples include: Alvarez *et al.*, “Forming and Exploiting”; Dimov, “Grappling”; and Shane, “Prior Knowledge”. Though the authors adopt contrasting positions on entrepreneurial opportunity and associated processes, this literature is characterised by a generalized absence of reference to Penrose’s seminal contribution. As a result, it has tended to elide this important, historically-informed tradition, exemplified in studies such as Macpherson and Holt, “Knowledge” and Best, “Greater Boston”.

<sup>7</sup> Mason and Harvey, “Entrepreneurship: Contexts Opportunities and Processes”.

<sup>8</sup> *Ibid.*, 4-5; Popp and Holt, “The Presence of Entrepreneurial Opportunity”, 9-10.

<sup>9</sup> Mason and Harvey, “Entrepreneurship”, 6; Decker *et al.*, “New Business Histories!”, 35.

<sup>10</sup> Roscoe *et al.*, “How Does an Old Firm Learn New Tricks?”, 55.

<sup>11</sup> Popp and Holt, “The Presence of Entrepreneurial Opportunity”, 24.

<sup>12</sup> Penrose, “The Theory of the Growth of the Firm”, xlviii; Blundel, “Beyond Strategy”.

Edith Penrose’s seminal insights are largely unacknowledged in recent literature on entrepreneurial opportunity. Business historians, who have long recognised the Penrosean contribution, appear particularly well-placed to incorporate it into their ongoing dialogue with entrepreneurship scholars. See: Galambos, “Business History”; Lazonick, “The Chandlerian Corporation”; Mason and Harvey, “Entrepreneurship”.

<sup>13</sup> Paxmans had manufactured small numbers of sousaphones in the 1930s but these were produced by modifying existing helicons through fitting a new and larger forward facing bell. See Smith and Blundel “Improvisation and entrepreneurial bricolage”.

<sup>14</sup> Baker and Nelson define entrepreneurial bricolage as, ‘making do with by applying combinations of resources at hand to new problems and opportunities’. Baker and Nelson, “Creating something from nothing”, 155.

<sup>15</sup> Galambos, “Business History”, 6. This essay, which was published in 1966, includes an extended review of Penrose’s (1959) book, *The Theory of the Growth of the Firm* along with a contemporary study by the economist, William J. Baumol. It opens with arguments that continue to resonate, six decades on: “For some years now, business historians have been much perturbed about their discipline. This concern springs from very real problems indeed; it is obvious, for instance, that business history is producing few generalizations.’ *Ibid.*, 3.

<sup>16</sup> Lazonick, “The Chandlerian Corporation”, 342. For an extended critical evaluation of Penrose’s contribution to theorising of growing enterprises, and its relationship the work of her near contemporary, Alfred D. Chandler, see also Lazonick, “Innovative Enterprise and Historical Transformation”, 16-26.

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<sup>17</sup> See Brian J. Loasby, “Penrose and Richardson”, 230. Loasby has suggested that, ‘It was only later that Penrose appreciated, and welcomed, her own close affinity with Marshall, because (she told me) she had been given a misleading account of Marshall’s economics, which has not been uncommon.’ Loasby, “Knowledge”, 549.

<sup>18</sup> Penrose, *Theory of the Growth of the Firm*, 22 – emphasis added. While Penrose’s carefully-selected term, ‘services’ was not widely adopted, ‘capabilities’ has been generally regarded as a suitable synonym.

<sup>19</sup> *Ibid.*, 32-37.

<sup>20</sup> *Ibid.*, 37.

<sup>21</sup> Shackle, *The Nature of Economic Thought*, 126. See also, Popp, “Making Choices”, 468-473; Loasby, “Knowledge”; 551-554.

<sup>22</sup> *Ibid.*, 37 – emphasis added

<sup>23</sup> Kay, *Pattern in Corporate Evolution*, 82.

<sup>24</sup> Penrose, “Foreword to the Third Edition, xiv. These comments form part of her reflections on *The Theory of the Growth of the Firm* more than three decades after its publication.

<sup>25</sup> Leonard-Barton, “Core capabilities” 111.

<sup>26</sup> *Ibid.*, 121.

<sup>27</sup> For example, with respect to values and the ways in which they are operationalized, Leonard-Barton refers to the lasting imprint of organizational founders, citing examples from the 1940s, including Hewlett Packard and the Cross Corporation. See Leonard-Barton, “Wellsprings”, 51-52.

<sup>28</sup> Shackle, *Epistemics and Economics*, 444.

<sup>29</sup> Loasby, “Knowledge”, 72.

<sup>30</sup> Roscoe *et al.*, 55.

<sup>31</sup> Berghoff, “Marketing diversity”.

<sup>32</sup> Carnevali and Newton, “Pianos for the People”.

<sup>33</sup> Wallace, *Boosey & Hawkes*.

<sup>34</sup> Brand, *From Design to Decline*.

<sup>35</sup> Howell, *Boosey & Hawkes*.

<sup>36</sup> Bigio, “Rudall, Rose & Carte”.

<sup>37</sup> Rayna and Striukova, “Engineering v Craftsmanship”.

<sup>38</sup> Pettitt, *Dennis Brain* and Gamble and Lynch, *Dennis Brain*.

<sup>39</sup> For example the Galpin Society, the American Musical Instrument Society and the Historic Brass Society.

<sup>40</sup> Baines, *Brass Instruments*.

<sup>41</sup> Montagu, *The French Horn*.

<sup>42</sup> Herbert and Wallace, *The Cambridge Companion to Brass Instruments*.

<sup>43</sup> Humphries, *The Early Horn*.

<sup>44</sup> Morley-Pegge, *The French Horn*.

<sup>45</sup> Tuckwell, *Horn*.

<sup>46</sup> Bacon, “The Pace Family”.

<sup>47</sup> Giannini, “The Raoux Family”.

<sup>48</sup> Humphries, “W. Brown & Sons”.

<sup>49</sup> Myers, “Brasswind Manufacturing at Boosey & Hawkes”.

<sup>50</sup> White and Myers, “Woodwind Instruments of Boosey & Hawkes”.

<sup>51</sup> An example was the visit of the Berlin Philharmonic Orchestra and concerts they performed in London in 1927 under their conductor Wilhelm Furtwängler. *The Times*, 3<sup>rd</sup> December 1927. Confusingly horns that adopt the German design are nonetheless normally referred to as French horns.

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<sup>52</sup> Anderson and Tushman define a dominant design as, ‘a single basic architecture that becomes the market standard’. Anderson and Tushman, “Managing Through Cycles of Technological Change”.

<sup>53</sup> The decline was most apparent in the brass band sector of the market where the number of bands declined rapidly in the late 1920s. Russell, “What’s Wrong with Brass Bands?”, 59.

<sup>54</sup> The new technologies included the gramophone, radio and sound film (the ‘talkies’). Of these sound film probably had the greatest impact in reducing live music performances and the work of musicians. Smith and Blundel, “Improvisation and entrepreneurial bricolage versus rationalisation”, 63.

<sup>55</sup> Myers, “Brasswind Innovation and Output of Boosey & Co”, 408.

<sup>56</sup> Hawkes & Son catalogues of the 1920s featured leading classical musicians, such as Francis Bradley, principal horn at the London Philharmonic Orchestra and Thomas Busby of the London Symphony Orchestra.

<sup>57</sup> White and Myers, “Woodwind Instruments of Boosey & Co”, 65.

<sup>58</sup> *Ibid.*, 3.

<sup>59</sup> Myers, “Brasswind Innovation and Output of Boosey & Co”, 400.

<sup>60</sup> Rose, *Talks with Bandsmen*.

<sup>61</sup> These instruments were developed in collaboration with professional musicians notably the flautists Robert Pratten and the clarinetist George Clinton.

<sup>62</sup> David Blaikley was factory manager from 1873 to 1918. He then headed up Boosey & Hawkes’ R&D section before finally retiring in 1931. Myers, “Brasswind Innovation and Output of Boosey & Co”, 392.

<sup>63</sup> *Ibid.*, 408.

<sup>64</sup> The generic term for the horn is the French horn. However they are of two types. The French version which uses piston valves and a narrow bore and the German version which uses rotary valves and a wide bore. The former was in use in Britain before World War 2, while the latter came into use in the postwar era. Britain was effectively catching up with most of continental Europe and the US.

<sup>65</sup> Baines, *Brass Instruments*, 225.

<sup>66</sup> Copying design for brass instruments in this way was not unusual. In the 1920s Hawkes & Son very proudly described one of their models of orchestral horns as a Raoux horn since it was a copy of a French Raoux horn from the early 19<sup>th</sup> century.

<sup>67</sup> Pettitt, *Denis Brain*, 48.

<sup>68</sup> Boosey & Hawkes archive, A227 Instrument book.

<sup>69</sup> Wallace, *Boosey & Hawkes*, 2.

<sup>70</sup> *Ibid.*, 9.

<sup>71</sup> *Ibid.*, 6.

<sup>72</sup> Copland, *Ralph Hawkes*.

<sup>73</sup> *Ibid.*, 9.

<sup>74</sup> *Ibid.*, 15.

<sup>75</sup> *Ibid.*, 21.

<sup>76</sup> *Ibid.*, 8.

<sup>77</sup> Known as the ‘Sonorous Works’, this was a large purpose-built production facility opened in 1924 and it contrasted with the workshops used by other brass instrument makers which were much smaller and based in central London.

<sup>78</sup> Myers, “Brasswind Manufacturing at Boosey & Hawkes”, 61.

<sup>79</sup> *Ibid.*, 61.

<sup>80</sup> *Ibid.*, 58.

<sup>81</sup> Brass instruments divides into three main market segments: classical, jazz/pop and brass/school bands, of which brass bands comprise much the largest segment. Since French



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horns are not normally used by brass bands, sales are very modest compared to popular instruments like the trumpet and the trombone.

<sup>82</sup> Howell, *Boosey & Hawkes*, 157.

<sup>83</sup> Interview with Robert Paxman, 12<sup>th</sup> February 2010.

<sup>84</sup> Howell, *Boosey & Hawkes*, 156.

<sup>85</sup> Interview with Bradley Strauchen-Scherer, 5<sup>th</sup> October 2015.

<sup>86</sup> Howell, *Boosey & Hawkes*, 156.

<sup>87</sup> *Ibid.*, 181.

<sup>88</sup> *Ibid.*, 199.

<sup>89</sup> Interview with Andy Taylor, 19<sup>th</sup> November 2015.

<sup>90</sup> Howell, *Boosey & Hawkes*, 177.

<sup>91</sup> *Ibid.*, 162.

<sup>92</sup> Interview with Andy Taylor, 19<sup>th</sup> November 2015.

<sup>93</sup> Howell, *Boosey & Hawkes*, 165.

<sup>94</sup> *Ibid.*, 174.

<sup>95</sup> Interview with Andy Taylor, 19<sup>th</sup> November 2015.

<sup>96</sup> *Ibid.*

<sup>97</sup> Howell, *Boosey & Hawkes*, 205.

<sup>98</sup> Valve clusters were sourced from Germany, coming from the long established horn makers, Alexanders of Mainz. Interview with Jeffery Emerson, 23<sup>rd</sup> May 2016.

<sup>99</sup> Wyse, “Test Your Strength”.

<sup>100</sup> Interview with Jeffery Emerson, 23<sup>rd</sup> May 2016.

<sup>101</sup> Rees, *I Found My Horn*, 105.

<sup>102</sup> Sales continued at the level of 30-50 per year for the next 30 years. Interview with Jeffery Emerson, 23<sup>rd</sup> May 2016.

<sup>103</sup> Howell, *Boosey & Hawkes*, 222.

<sup>104</sup> Acquisitions included the French instrument maker Buffet Crampon in 1981 and the German saxophone maker, Keilworth in 1989. *Ibid.*, 221.

<sup>105</sup> *Ibid.*, 186.

<sup>106</sup> *Ibid.*, 216.

<sup>107</sup> Wyse, “Test Your Strength”.

<sup>108</sup> Myers, “Design, Technology and Manufacture”, 117.

<sup>109</sup> In Schumpeterian terms this was a case of market innovation rather than product innovation, since Paxmans were introducing an existing product that had for the most been produced elsewhere.

<sup>110</sup> Mathez, “Paxman Bros Ltd”, 72.

<sup>111</sup> Interview with Robert Paxman, 12<sup>th</sup> February 2010.

<sup>112</sup> *Ibid.*

<sup>113</sup> A photograph of Paxmans’ stand at the National Brass Band Championships in the early 1920s shows them offering a wide variety of brass and woodwind instruments.

<sup>114</sup> Interview with Robert Paxman, 12<sup>th</sup> February 2010.

<sup>115</sup> *Musicians Union Handbook 1936*.

<sup>116</sup> *Ibid.*, 75.

<sup>117</sup> Myers, “Design, technology and manufacture since 1800”, 117.

<sup>118</sup> 1935 was also the last year that the National Brass Band Championships were held at Crystal Palace since the building was destroyed by fire in 1936.

<sup>119</sup> Smith and Blundel, “Improvisation and entrepreneurial bricolage”, 70.

<sup>120</sup> Barclay, “Design, technology and manufacture since 1800”, 34.

<sup>121</sup> Interview with Robert Paxman, 12<sup>th</sup> February 2010.

<sup>122</sup> *Ibid.*

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- <sup>123</sup> Larkin, 'Paxman', 40.
- <sup>124</sup> Interview with Robert Paxman, 12<sup>th</sup> February 2010.
- <sup>125</sup> *Ibid.*
- <sup>126</sup> At the turn of the century the noted cornet maker William Brown employed a staff of five in his workshop in Kennington. Rose, *Talks with Bandsmen*, 189
- <sup>127</sup> Larkin notes that by this time Paxmans had, 'built a reputation for adapting and converting brasses to customer specifications', Larkin, "Paxman" 41.
- <sup>128</sup> The Musicians Union handbook for 1936 includes an advertisement for Paxman Bros in the horn players section. *Musicians Union handbook 1936*.
- <sup>129</sup> Kruspe, being located in Erfurt, was now in East Germany and lacked access to high quality raw materials. Alexander's operations were also severely disrupted by the war but it has since re-established its position as a leading specialist maker; for the last 35 years Paxmans has been its sole UK dealer.
- <sup>130</sup> Morley-Pegge, *The French Horn*, 50.
- <sup>131</sup> Interview with Andy Taylor, 19<sup>th</sup> November 2015.
- <sup>132</sup> Boosey & Hawkes for example had the capacity to manufacture their own valves. Horniman Archive.
- <sup>133</sup> Interview with Robert Paxman, 12<sup>th</sup> February, 2010.
- <sup>134</sup> We are grateful to Jeremy Montagu who pointed out the similarities between gas fittings and musical instruments, where in both cases fine tolerances are required in order to achieve airtight valves. Interview with Jeremy Montagu, 11<sup>th</sup> September 2015.
- <sup>135</sup> Interview with Robert Paxman, 12<sup>th</sup> February 2010.
- <sup>136</sup> *Ibid.*
- <sup>137</sup> *Ibid.*
- <sup>138</sup> Interview with Luke Woodhead, 21<sup>st</sup> July 2010.
- <sup>139</sup> Gamble and Lynch, *Denis Brain: A Life in Music*, 121; Pettit, *Denis Brain: A Biography*, 98.
- <sup>140</sup> Morley-Pegge papers, RMP 2/6/5a, Bate collection, Oxford University.
- <sup>141</sup> *Ibid.*
- <sup>142</sup> Interview with Luke Woodhead, 21<sup>st</sup> July 2010.
- <sup>143</sup> *Ibid.*
- <sup>144</sup> Watson, "An interview with Richard Merewether", 88.
- <sup>145</sup> Though they were both proficient musicians, neither Harry Paxman nor his son were horn players. In fact both played the clarinet.
- <sup>146</sup> Von Hippel, "Lead Users: A Source of Novel Product Concepts", 791.
- <sup>147</sup> Paxman, 'In Memoriam: Richard Merewether', 13. John Humphries, the historian of the horn, describes Richard Merewether as 'a fine horn player'. Humphries, *The Early Horn*, 56.
- <sup>148</sup> It was Merewether who gave Barry Tuckwell his first lesson on the horn. Phelan, *Charles Mackerras: A Musician's Musician*, 40.
- <sup>149</sup> Interview with Robert Paxman, 12<sup>th</sup> February 2010.
- <sup>150</sup> Interview with Michael Thompson, 16<sup>th</sup> June 2010.
- <sup>151</sup> Larkin, "Paxman", 41.
- <sup>152</sup> Mathez, "Paxman Bros Ltd", 76.
- <sup>153</sup> Watson, "An Interview with Richard Merewether", 88
- <sup>154</sup> Interview with Andy Taylor, 19<sup>th</sup> November 2015.
- <sup>155</sup> Interview with Robert Paxman, 12<sup>th</sup> February 2010.
- <sup>156</sup> Larkin, "Paxman", 40.
- <sup>157</sup> Gamble and Lynch, *Denis Brain: A Life in Music*, 147.
- <sup>158</sup> Tuckwell, *Horn*, 56; Baines, *Brass Instruments*, 226.
- <sup>159</sup> Interview with Tony Halstead, 29<sup>th</sup> May 2010.

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- <sup>160</sup> Mathez, “Paxman Bros Ltd”, 77.
- <sup>161</sup> Morley-Pegge papers, RMP 2/6/5a.
- <sup>162</sup> This was designed to facilitate horn playing and reflected Merewether’s own health problems, in particular his failing eyesight which was a direct result of his playing. Interview with Andy Taylor, 19<sup>th</sup> November 2015.
- <sup>163</sup> *Ibid.*
- <sup>164</sup> Tuckwell, *Horn*, 55; Montagu, *The French Horn*, 26
- <sup>165</sup> *Ibid*, 55.
- <sup>166</sup> Interview with Bob Osmun, 11<sup>th</sup> November 2015.
- <sup>167</sup> Interview with Andy Taylor, 19<sup>th</sup> November 2015
- <sup>168</sup> Anthony Baines in his book, ‘*Brass Instruments: Their History and Development*’, noted in connection with the triple that it showed how much the firm had done to improve the horn. Baines, *Brass Instruments*, 226.
- <sup>169</sup> The proprietor of Osmun Music, Bob Osman, recalled that, ‘I first became aware of Paxman around 1970, when they were virtually unknown in the United States.’ Interview with Bob Osmun, 11<sup>th</sup> November 2015.
- <sup>170</sup> Interview with Andy Taylor, 19<sup>th</sup> November 2015.
- <sup>171</sup> Morley-Pegge papers, RMP 2/6/24, Bate collection, Oxford University.
- <sup>172</sup> Watson, ‘An interview with Richard Merewether’, 88.
- <sup>173</sup> *Ibid.*
- <sup>174</sup> *Ibid.*
- <sup>175</sup> Baines, *Brass Instruments*, 225; Tuckwell, *Horn*, 56.
- <sup>176</sup> Interview with Andy Taylor, 19<sup>th</sup> November 2015
- <sup>177</sup> Myers, “Brasswind Manufacturing at Boosey & Hawkes”, 61
- <sup>178</sup> Interview with Andy Taylor, 19<sup>th</sup> November 2015.
- <sup>179</sup> *Ibid.*
- <sup>180</sup> Von Hippel, “Lead Users”, 791
- <sup>181</sup> For example Dennis Brain, Dale Clevenger, Barry Tuckwell and Michael Thompson.
- <sup>182</sup> Probably the best known example of this phenomenon is the French horn accompanying the Beatles on Sgt Pepper’s Lonely Club Band, though very many of the most successful bands of the 1960s and 1970s utilized the instrument for one or more of their recordings.
- <sup>183</sup> Interview with Andy Taylor, 19<sup>th</sup> November 2015.
- <sup>184</sup> Hembd, “Thoughts on ‘Quality’”.
- <sup>185</sup> Penrose, *The Theory of the Growth of the Firm*, 222
- <sup>186</sup> *Ibid*, 222. See also: Carnevali, “Golden Opportunities.”, which examines how small firms in a jewelry manufacturing district combined specialty with mass production to compete against larger rivals.
- <sup>187</sup> See: Carroll, “Concentration and Specialization”; Carroll and Swaminathan, “Why the Microbrewery Movement”.
- <sup>188</sup> The Economist, “Piano nobile”, 76.
- <sup>189</sup> Rusbridger, Alan, *Play It Again*, 337.
- <sup>190</sup> Raff, “How to Do Things with Time”, 445.