Continuity and change in the Sheffield armaments industry 1919-1930

Chris Corker
The York Management School, University of York, York, UK

Abstract
Purpose – This article aims to explore the impact of the Great War on the Sheffield armaments industry through the use of four company case studies in Thomas Firth, John Brown, Cammell Laird and Hadfields. It charts the evolving situation the armaments companies found themselves in after the end of the conflict and the uncertain external environment they had to engage with. The article also examines the stagnant nature of armaments companies’ boards of directors in the 1920s and the ultimate rationalisation of the industry at the close of the decade.

Design/methodology/approach – The research design is based around a close examination of the surviving manuscript records of each of the companies included, the records of the speeches recorded by chairpersons at annual meetings and some governmental records.

Findings – The article concludes by outlining how the end of the Great War continued to affect the industry for the following decade and the complex evolving situation with a changing external environment and continuity of management internally ultimately leading to mergers in the industry.

Originality/value – This article uses a number of underused manuscript records to examine the Sheffield armaments industry and explores the effect of a global mega event in the Great War on one of the most technologically advanced industries of the period.

Keywords Directors, Rationalisation, Armaments, Great War, Sheffield, Washington Naval Treaty

Paper type Research paper

Introduction
As one of the key turning points in world history, the Great War is known to have caused widespread social, economic and political upheaval in the UK, while also having severe repercussions across various sectors of British business. Nowhere was the outcome of the conflict and its aftermath in the 1920s felt more acutely than in the armaments industry, and principally with companies residing in Sheffield. This small group of companies – Thomas Firth, John Brown, Cammell Laird and Hadfields – were steel companies with a specialist interest in armaments production and research, between them manufacturing armour plate, projectiles and gun forgings in the Edwardian period principally for naval purposes. Here, the selection of cases follows previous studies on the Sheffield armaments industry, focussing on steel companies with an interest in armaments and excluding Vickers, arguably the most well-known armaments company of the period, which despite having important steelworks in Sheffield was a national armaments company with an interest in steel (Corker, 2016). Beginning in the late Victorian period, each company highlighted and used a sophisticated, multi-faceted corporate strategy which embraced technological development, investment in bespoke production facilities, marketing materials for the sale of both products and patent rights and inter-firm collaboration with research and production. By the outbreak of the Great War, Sheffield was undoubtedly the world centre of armaments production and research, with licencing agreements and sales across the globe. Writing in
the 1920s, John Brown’s Chairperson Aberconway (1927, p. 61) estimated that before the Great War, Sheffield made about 70 per cent of all the armour made for British warships, and 70 per cent of war material made by private companies, including guns, gun forgings, shell and projectiles and steel for small arms. However, the Great War and its aftermath in the 1920s fundamentally changed the nature of the armaments business, rendering most of the strategies used by the industry inadequate and ineffective, each company attempting to adjust to the new post-War world they inhabited. As Hornby (1958, p. 25) has suggested, “generally after 1918, it may be said, that with the loss of home and overseas demand, the armament industry reached the verge of extinction.” In the view of Packard (2009), the armaments industry had an identity crisis after the Great War. The armaments producers also suffered a double blow because of a tandem decline in the steel industry. As Pollard (1992, p. 52) highlights:

The iron and steel industry was another of the basic staple trades which suffered a decline in exports. Moreover, the war had created a large surplus capacity and the post-war boom of 1919-1920 burdened it with much watered capital, and this hung like a millstone around its neck until the re-armament of the late 1930s.

Following the methodology, the sections will examine three key aspects of continuity and change in the armaments industry after the Great War. First, there will be a discussion of the changing and uncertain external environment in which the armaments companies operated. Of principal consideration is their relationship with the government regarding the future of the industry and the disruption caused once the Washington Naval Treaty was agreed in 1922. This is followed by an exploration of the composition of the board of directors of each company, and how at a time when new ideas and new blood were needed, management stagnated and stuck with what they knew best from before the conflict. Finally, the changing structure of the industry in the late 1920s will be explored, as mergers reduced the number of companies operating in the Sheffield armaments industry. Overall, the article is concerned with understanding the case presented through using periodisation and considers some problems with using this approach. As will be highlighted, using set timeframes for investigation may capture significant change outside of an organisation, yet from an internal or managerial perspective, continuity may be the most significant feature. Furthermore, change inside an organisation may not be fully captured by externally determined segments of history.

Methodology

The research was principally undertaken from a survey of the remaining corporate records of the four company case studies. The records for Brown, Firth and Hadfields were viewed at Sheffield Archives, Sheffield, UK, where all of the existent records for the period 1918-1930 were identified from the available finding aids. For Brown and Firth, the records have been extensively catalogued, and for Hadfields a box list is available. Once identified, the records were viewed and photographed for future examination. This process was repeated for the records of Cammell which are held in the Wirral Archives Service, Birkenhead, UK, where a basic listing of the records is also available. In the Hadfields, records copies of the annual general meeting (AGM) speeches were captured, and in the Cammell, records extracts from the Journal of Commerce of their company AGM speeches were also photographed. For Brown, their AGM records were unavailable in their corporate records and were sourced from The Times online archive and downloaded for further study. The records of Firths AGM meetings were also captured from their minute books in handwritten form. Finally, these records were supplemented with material from The Engineer trade
journal records available from GracesGuide.co.uk, and Cabinet Records available from the National Archives online. Away from the archival capture, the photographed records were later viewed and cross-referenced to build a reconstruction of the business of each company and relevant data were extrapolated, including an overview of their directors, annual production and profit data and core information from minute books, AGM reports and correspondence. This data forms the core of this investigation as presented below.

External change in the armaments industry 1919-1926

As the Great War progressed and the demands for munitions continued to mount, many within the industry prophesised that when peace came, whenever that may be, the armaments companies would face a difficult fight for survival. Brown’s Chairperson, Baron Aberconway, understood these issues and predicted in early 1915 that:

[...] when the war was over it might be years before any of the armament firms got an order for battleships, guns, armour plates, or many of the things which they now produced in such large numbers. They might find that after a short period in which they would make a little money they might practically be without profits at all (The Times, 1915).

Somewhat unfortunately for Aberconway, his prediction was proved almost entirely correct during the 1920s. As peace came, many orders at the Sheffield companies were cancelled, and in the winter of 1918-1919, large stockpiles of military stores of all kinds were available (Adams, 1978, p. 185). At Brown, it was reported that “we have large numbers of gun forgings and considerable weight of shell material cancelled and it is somewhat difficult to find work for departments which were handling these orders” (John Brown, 1918). At their shipyards, Brown also had contracts for five destroyers cancelled in 1919, their last orders for British Navy vessels for a decade (Slaven, 1990). At Cammell, one battlecruiser, nine submarines, two flotilla leaders and four submarine engines were all cancelled at the end of the War. Some of the orders had been in an advanced state of construction and had to be scrapped on their slipways (Cammell Laird, 2018). Reflecting on the industrial nature of the War, The Engineer (1919, p. 4) noted that “The whole area of Sheffield and neighbouring works has been one great arsenal throughout the war, pouring out day and night almost every kind of munitions required.” Against this backdrop, the relative position of the Sheffield armaments industry was in serious doubt in the future peace, a situation not lost on the companies involved.

Once the conflict ended, the armaments companies began pressing for answers about the future of the industry. William Lionel Hichens, Chairperson of Cammell, wrote to the Government in December 1918, calling for the need to retain the Coventry Ordnance Works (COW) as a nucleus factory for future armaments needs, and that most of the works could be used for peace products. The COW company had been established by Brown, Cammell and the Glasgow-based Fairfield Shipbuilding Company in 1905 to produce finished naval guns and provided the companies involved a means of sharing the financial and technological risks involved in their production (Corker, 2016). Hichens urgently pressed for a response, highlighting that it was increasingly difficult to retain their skilled staff which years of training had produced with an empty order book, most of their work having been cancelled at the time of the armistice. Reminding the Government of their use of COW during the War, Hichens (1918) suggested that:

It would be grossly unjust if, after having taken every advantage of the organisation and facilities possessed by the Coventry Ordnance Works, the Government were to throw them on the rubbish heap like a sucked orange.
Hichens also used the company OGM in April 1919 to attack the Government’s lack of direction for the industry:

We are wholly in the dark as to what the future policy of the Government in regards to private armament firms is to be [...] My point is, at the moment, that the Government ought not to keep us dangling indefinitely at the end of a string [...] they ought to make up their minds promptly, on the policy they intend to adopt. And meanwhile we may at least fairly claim I think, that if they cannot give us work for those parts of our factories which are exclusively equipped for armaments production and which must be retained until some policy has been decided upon by the Government, they should enable us to maintain a nucleus organisation (Journal of Commerce, 1919).

He also stressed that, given much of Sheffield had converted back to commercial production, “it is only in the highly specialised armament shops that we are paralysed by the indecision of the Government” (Journal of Commerce, 1919). In March 1919, Brown’s works committee suggested there was a “necessity of paying special attention to our general trades now that armour cannot be reckoned on” (John Brown, 1919). The situation with projectiles was the same. Robert Abbott Hadfield had been providing agitation to the British Navy from mid-January 1919 for some assurance to the future demands for armour piercing (AP) projectiles. In writing to the Director of Navy Contracts, he remarked:

We called your attention to our letter [...] of January 16th, in which we pointed out that this manufacture represents a highly complex and specialised art [...] There is probably no more difficult process in the Metallurgical Art than that of hardening an Armour-Piercing Shell, the complete manufacture of which involves a series of operations from the making of the Special Steel onwards, representing the accumulated experience derived from thirty years of research and experiment (Hadfield, 1919c).

The Admiralty’s response came in October 1919, regarding the possibility of paying subsidies to Hadfields for the maintenance of their plant. A resultant meeting between Hadfields, Firth and the Admiralty at the end of the month centred on what terms the two companies could maintain their projectile plant, with Hadfields suggesting a subsidy of £50,000 per annum or an agreement to keep 20 per cent of their projectile capacity in production (Clerke, 1919). Despite the discussion, no new or revised agreement was forthcoming. Instead, former agreements continued to be extended. Hadfields’ last agreement with the Admiralty had been signed in January 1913 for a period of three years, and it had been extended in December 1915 through to January 1919 (Hadfields, 1913; Hadfields, 1916). The 1913 agreement promised Hadfields half of all the orders to private industry for large calibre AP and common pointed capped projectiles (Hadfields, 1913). Given the general uncertainty from the Admiralty regarding their future requirements for AP projectiles, the contract was extended for six months in January 1919, while in correspondence the Admiralty highlighted that:

In view of the uncertain position at present existing as to the types and descriptions of Naval Shell which will be required in the future, it is not possible to consider at the moment the question of entering into a fresh agreement with you (Hadfields, 1919a).

The contract was further extended in July 1919 for six months, February 1920 for six months, July 1920 for one year and in August 1921 for a final six months (Hadfields, 1919b). After the agreement lapsed in 1922, it was not renewed.

Even with agitation from private industry, the government knew the value of maintaining their sources of supply. As the Admiralty recorded in March 1919, “The retention of naval supply under Admiralty control [is] an essential part of naval strategy”
An article which is required solely for war purposes and requires the greatest skill, not only of the chemist and the metallurgist but also in the actual manipulation by the skilled workers [...] if provision [...] is not made, we shall get left behind (Quoted from Davenport-Hines, 1979, p. 28).

Davenport-Hines (1979) highlights how “The history of the next decade and a half is that of these recommendations being ignored.” This may, in part, be accounted for by the various approaches to procurement that were attempted in the early 1920s (Gordon, 1988; Packard, 2009; Davenport-Hines, 1979).

Not that the prospects for armour producers immediately improved. Charles Ellis, Managing Director at Brown, reported in October 1919 that “it was a great misfortune that orders for armour had not been forthcoming, especially as the armour department was a very big one” (The Times, 1919). By 1920, the company had “no further use for the armour department” and had placed the plant at the disposal of the government should they require it for future armour production (The Times, 1920). At Cammell, the same year Hichens highlighted the poor trading conditions for the armaments companies, noting that “it is unlikely that the armament firms will find any outlet for their special experience in the near future” (Journal of Commerce, 1920). He went on to note that:

We have been manufacturers of armour in Sheffield since 1863, and the costly equipment of our armour department is useless for any other purpose [...] If we cease to be manufacturers of armour we must scrap the whole of this plant and start afresh (Journal of Commerce, 1920).

Even when Cammell secured an order for the construction of HMS Rodney in 1922, Hichens remarked to the company OGM the next year “I think you will wish me to say something about the battleship order we were fortunate – or unfortunate – enough to secure last November,” going on to suggest that the work was worth having at a certain price, and it would boost the fortunes of their Birkenhead shipyard (Journal of Commerce, 1923).

By August 1920, the prospects for the armaments industry appeared favourable. The Director of Naval Construction invited Vickers, Armstrong, Cammell and Brown to discuss the manufacture of machinery, guns, armour and hulls of four new 45,000-ton battlecruisers. The armour production would be split between the four, and as Vickers could not construct vessels of the size required, each of the other three would be invited to construct at least one of the new generation of ships. The armour orders for the four ships were issued to the trade in October 1921, but were quickly cancelled because of changes in the international theatre (Warren, 1989, pp. 200-201).

The Washington Naval Treaty severely restricted the Navy’s procurement plans, and most contracts were rapidly put on hold and then cancelled. While in the early 1920s, there were efforts by the League of Nations towards universal disarmament, the Washington Naval Treaty was the only successful agreement to restrict the construction of weapons (Webster 2005; Webster, 2008; Tenfelde, 2005). Signed on 6 February 1922, the Treaty between Britain, the United States, Japan, France and Italy agreed to limit their capital ships in their fleets to the ratio of 5:5:3:1.75:1.75, limit the size of vessels to no more than 35,000 tons, and implement a ten year break on new ship construction (Packard, 2009, pp. 51-52). This caused a drastic reduction in Admiralty expenditure to private trade for the rest of the
decade and severely damaged the prospects for private manufacturers of armaments. Vickers’ official historian has summarised the situation for the company after Washington remarkably well:

For Vickers the Washington Treaty marked the final termination of an era. It had for some time hardly been realistic to keep on the large expert staff, the whole great apparatus of research and development upon which armament capacity so depended: now it became impossible. When every possible transfer of skilled men to non-armament work had been made, there were still dismissals – “a very large reduction” – and large as it was, it was worse still in that it meant the breaking up of an organisation, and worst of all because it brought home to everyone in the company an anxiety which up to now had been confined to the board room and its annexes – a chronic anxiety about the basic conditions of survival. Nothing like this had ever happened before (Scott, 1962, p. 144).

It was certainly the beginning of the end for some armaments companies. Bastable (2004, p. 165) has suggested that neither Vickers nor Armstrong “could survive the post-1918 context. No entrepreneurial skill could save them, and by 1926 both were bankrupt.” Elsewhere in the industry, order cancellations were common. At Beardmore, of the £4.2m of orders received by November 1921, only £11,000 were executed owing to the signing of the Washington Treaty (Davenport-Hines, 1979, p. 137). The Treaty also stifled expansion plans for the armour producers in Sheffield once their orders were cancelled.

In 1920, Brown commenced a reconstruction programme, and their Works Committee suggested that the armour plant should be capable of producing 5,000 to 7,000 tons of armour per year (John Brown, 1920). The following April, the Works Committee recorded their anticipation that new armour orders would be forthcoming, which “it was quite hoped would improve matters and stimulate business” (John Brown, 1921a). Once details of the potential armour orders were known, £25,000 was approved to be spent on Brown’s armour department to make them capable of producing the size and weight of plates required (John Brown, 1921b). When the orders were finally received in October 1921 for 9,700 tons of armour, it was hoped that the work would keep their armour plant in operation for the next two years. One of the four new battleships was also to be built at Brown’s Clydebank shipyard (John Brown, 1921c). Their adulation was short-lived as the orders were suspended in November, Brown recording that they “might or might not end in cancelment [sic], but had for the present very disastrous results on the operation of the company” (John Brown, 1921d). The stoppage on work for the four battlecruisers after the Washington Treaty was described in 1922 by Brown’s Chairperson Lord Aberconway as “a serious matter, not only for John Brown and Co, but for Sheffield” (The Times, 1922). The following year at their AGM, Aberconway dismally proclaimed that “the city was practically abandoned by the Government owing to the consequences of the Treaty of Washington” (The Times, 1923).

An unknown Brown’s director produced a memorandum in 1922 in which issues for the future of business in Sheffield were highlighted. It opened by stressing that:

The effects are undoubtedly most serious at Sheffield, since Sheffield has always been the chief centre for the manufacture of the armour, guns, heavy steel forgings of all kinds, [and] shell for warships (John Brown, 1922).

At the time of the new naval orders being placed, unemployment in Sheffield was the worst in living memory, with around 40,000 men out of work. It had been hoped that the new orders would give many of them employment (John Brown, 1922). The memorandum also stated that “the placing of the orders for the four new warships removed a load of anxiety from the minds of the Sheffield manufacturers, and was received with satisfaction and delight by all classes of the workmen” (John Brown, 1922). The unknown author stresses
that the suspension of naval work should be reversed and work allowed to continue “without prejudice to any ultimate decision that may be reached on the completion of the ships” as similar steps had taken place in America and Japan (John Brown, 1922). It was stated that “it has taken years to train the officials and men to carry out the highly skilled metallurgical and mechanical operations required” and that the plant cannot “be used for work other than that for which it was designed” (John Brown, 1922). Despite the hope of the director to resume work and keep the plant in operation, no changes were forthcoming. The cancellations also had an effect on Cammell’s armour plant expansion and production.

At a board meeting in November 1921, Cammell proposed a scheme to bring their armour department up to date at a total cost of £250,000, the project being cancelled the following month “in consequence of work on the armour order being in abeyance” (Cammell Laird, 1921a, 1921b). Hichens announced his disdain at the situation at the company OGM in 1922. It was believed that the orders received in late 1921 would keep their armour plant in operation for two years:

[…] but the Washington Conference has dashed our hopes to the ground, and now the most we can expect is that orders will be placed for two much smaller ships, after which there will be a naval holiday until 1932 (Journal of Commerce, 1922).

The company could not maintain their armour shops idle for ten years, and Hichens in his closing remarks called on a government subsidy during the naval holiday (Journal of Commerce, 1922). The lack of subsidies continued into 1925, when Hichens again attacked the government, stating at their OGM that “The time has I think come when the Government should decide upon a policy in respect of the armour plate makers” (Journal of Commerce, 1925). In 1925, Admiral Sir Emile Chatfield, Controller of the Navy, gave a speech at Cutlers Hall in Sheffield, highlighting that:

It would be a bad day for the Empire if the plant and the skilled men who designed it, who brought it into existence, and who used it, were allowed to decay (Hadfields, 1926a).

An agreement between the Admiralty and the armour manufacturers to protect the armour business was ultimately signed the same year with the armour manufacturers to last for one year and was renewed annually into the 1930s. The companies involved promised to maintain their plant and skilled staff ready to produce a minimum specified quantity of armour per year and continue to be available for development and experimental work. In return, the Admiralty promised to only order from them, so long as the companies could meet the requirements satisfactorily regarding price, quality and delivery (Davenport-Hines, 1979, pp. 225-230; Edgerton, 1995, p. 166). That year, subsidies were paid to the armour manufacturers, with £41,365 for Cammell, £49,078 for Brown and £86,000 each for Vickers and Armstrong (Davenport-Hines, 1986, pp. 153-154).

In projectiles, arrangements were also made to protect capacity for any future requirements from 1922. Changes in the industry, with former producers closing or abandoning manufacture had left Hadfields and Firth in a position to manufacture large calibre AP projectiles. Furthermore, the plant involved was highly specialised and not easily adaptable to commercial work. The plant Hadfields maintained included units and machines which had been specially developed for projectile production and represented a capital outlay of some £500,000. The company continually stressed the specialty of their plant and emphasised that none of the machinery could be adapted for commercial purposes. At Firth’s Gun Works, principally based on forging technology, commercial products had re-entered production in 1919 (Clerke, 1919). Following a conference between the Admiralty, Hadfields and Firth in March 1922, a new collaborative arrangement was
signed between the three parties. Each agreed to maintain their productive capacity and trained staff for AP projectiles until the end of 1925, with minimum requirements for weekly output and skilled personnel working double shifts also imposed. In addition to the maintenance of the two companies’ projectile plants, Hadfields would receive 5/8ths and Firth 3/8ths of the orders forthcoming for the Navy (Clerke, 1925; Brown, 1923). The agreement was renewed in January 1926 for a further five years (Hadfields, 1926b). As part of the renewal, the companies had to allow free entrance of Government inspectors to their hardening and treatment shops. Both were adverse to the request but reluctantly allowed their admission (Thomas Firth, 1925). Reflecting after the start of rearmament in 1936, Clerke remarked of their relationship with the Admiralty: “when the time came to renew these agreements […] we had of course to accept it “faute de mieux” [for lack of something better]” (Clerke, 1936). Overall, as Packard has highlighted:

The Admiralty clearly wished to help its main suppliers and continued to place a large amount of trust in the private armaments industry or, at least, certain key firms. To some extent, this demonstrated the endurance, or even a strengthening, of the naval-industrial complex in the inter-war years (Packard, 2009, p. 57).

This may have been the case from within the Admiralty, but the constant changes in the external environment made the period exceptionally difficult for the armaments companies. Against this backdrop, management of the industry stagnated and stuck to their Edwardian mentalities regarding the role of armaments in their future business prosperity, much to their detriment. For each company, exit from the armaments industry was unthinkable. Their public image and corporate narrative was built around them as defenders of the British Empire, supporting the prominence of the Royal Navy for decades. While conveniently ignoring the 1915 shell crisis, this narrative was enhanced by the Great War. Internally, their corporate strategy, managerial expertise and manufacturing investment had been built around a specialism for producing high-technology products for a narrowly defined yet highly lucrative market. The prosperity of each organisation had been built on armaments, and for all there was a belief it could be re-built on armaments. None had any imagination for an alternative strategy, if any truly existed, and with the backing of Government subsidies continued their narrative of protecting the Empire and stuck with a decades old strategic direction and managerial mentality.

Internal continuity – armaments boards of directors 1919-1930

In contrast to the constantly uncertain and evolving external environment for armaments companies, internally the management of the armaments industry adapted very little to the new world they found themselves occupying in the 1920s. The boards of each armaments company before the Great War generally comprised a mix of relatives from a founding or second generation managing family, several internal appointments and a vital combination of armaments technology experts, ex-governmental and ex-military members. In these latter cases, this allowed each company and their board of directors to retain a close relationship with the supply ministries, vital for intelligence on future technological requirements or potential orders. Crucially, before the Great War, these boards were in a constant state of renewal. Once a director with technological expertise or important links to the government and the military retired or died, they were quickly replaced by a director with equal or greater connections, knowledge and established reputation for armaments research (Corker, 2016).

After the Washington Naval Treaty in 1921, with the market for armaments in Britain declining and with it any need to continue to maintain close relationships with the supply...
ministries washed away, the management at each company in the Sheffield armaments industry stagnated. Each board of directors aged along with the companies they managed. Dominated by pre-war appointments, each retained older mentalities about what the armaments industry was, clinging to the belief that the vitality the industry enjoyed before the Great War would return. It has been claimed that after the War the armaments industry fell back on what they knew before the conflict, concentrating on close links with the admiralty and naval production (Packard, 2009, p. 43). This suggests that the armaments companies brought in new external appointments to further build their links with the supply ministries, but as will be demonstrated this was not the case.

At Hadfields, Robert Abbott Hadfield continued to serve as Chairperson of the company, a position he had held since 1888, with management required to adapt to his personal style of leadership. During the War, Hadfield relocated to his London home at 22 Carlton House Terrace, which became the temporary head office of the company for the remainder of the conflict with all issues related to government orders passing though the property. Fellow directors Alexander Jack, Peter Brown and Augustus Clerke all moved to London to assist with the running of the company, as all of their board meetings took place at Hadfield’s house, and up to four or five daily directors’ conferences (Hadfields, 2018). With Hadfields’ board of directors there were a number of appointments during the conflict, and once two of the oldest serving directors retired in 1920, Alexander Jack with 23 years membership and Henry Cooper with 15, the final addition of the period was made in 1921. During the 1920s, the board shrank in size because of deaths, yet these were not replaced. Before the War, Hadfields had expanded their directorship with a number of ex-government and military members, rapidly replacing any which retired or died. With limited need to retain close connections with the supply ministries, this approach was not replicated in the 1920s, the board shrinking from 12 members in 1919 to 7 by the end of 1930.

Brown’s board demonstrates a similar pattern to Hadfields, with one new appointment during the conflict, Lord Pirrie, following the recruitment of their managing director Charles Ellis to the Ministry of Munitions in 1915. After the War, Ellis returned to his position in 1919 and one new appointment was made in Alan Grant. Once again, the retirement and death of a number of board members in the 1920s was not followed by their replacement, the board shrinking from 10 members in 1919 to 7 in 1930. A family appointment was made in 1925, Chairperson Baron Aberconway’s son Henry McLaren joining the board, followed in 1928 by Captain Crease who had been employed by the company on armament matters since 1922. Consequently, Crease is the only appointment by any of the four companies examined to have prior military or governmental links during the 1920s. While this had been common before the Great War, with the limited demands for armaments after the conflict Crease is an exception.

At Firth, management remained static during the Great War, with an example from the conflict demonstrating the insularity of management in the industry. In 1915, Arthur Daulby Wedgwood, a director of Cammell until 1913, was appointed General Manager of Firth’s National Projectile Factory (Thomas Firth, 1915). When Wedgwood resigned from the position because of ill health in 1916, Firth’s Chairperson Bernard Firth drew attention to “the difficulty of appointing a stranger to the position” and after some discussion, Firth director Frederick Fairholme took up the role (Thomas Firth, 1916). Recruitment from within the industry was clearly the preference for the company. Two new appointments were made in the early 1920s, Edward Dixon in 1921 and Percy Fawcett in 1922, with an addition made after the death of two long-serving directors in 1925 and 1926 which fell back on older family links with the enrolment of John Charles Bradley Firth in 1927. A director since 1909, armaments technology expert Major Strang resigned from Firth’s board in March 1930, but
was retained by the company as a technical consultant with armaments work, paying him £500 per year (Thomas Firth, 1930). Even with a decade of limited orders, Firth still saw themselves as an armament company and aimed to retain the skilled connections they had developed over the previous decades yet did not recruit any new directors with military or governmental links during the 1920s. Finally, Cammell too demonstrates a lack of change in their board of directors, the only new appointments in the 1920s to managing director positions for their three works in Birkenhead, Sheffield and Nottingham (their former National Projectile Factory, converted to produce rolling stock). Retirements and deaths reduced the size of the board from 11 members in 1919 to 7 in 1928, with long-time connections to the Government in Samuel Roberts MP and Major Handley not replaced after their deaths in 1926 and 1927.

The management of the Sheffield armaments industry corroborates Wilson’s observation that continuity was a major feature of British business from 1914 through to the 1940s, as it had been from the 1870s to the start of the Great War, with attitudes and the practice of management changing very little (Wilson, 1995). The combined directorships of the four companies reflect this continuity. Up to 1928, the combined experience of the board of Cammell was 113 years with an average tenure of 14 years, Hadfields 126 years with an average tenure of 15 years and 9 months, Firth 173 years with an average tenure of 19 years and at Brown a total of 200 years with an average tenure of 22 years, with a total of six directors having served over 35 years as a board member. E. Willoughby Firth (35 years at Firth), Tolmie John Tresidder (37 years at Brown), Bernard Firth (40 years at Firth), Charles Ellis (40 years at Brown, excluding time at the Ministry of Munitions), Robert Abbott Hadfield (40 years at Hadfields) and Baron Aberconway (45 years at Brown) reflect the stagnation of management and leadership in the armaments industry during the 1920s. At a time when new blood and ideas were needed, the companies stuck to what they knew best. If continuity was the common feature of management in the industry, conversely change in its structure characterised the period from 1927 to 1930.

Rationalisation 1927-1930

With a turbulent external environment, managerial stagnation and uncertainty regarding the future role of armaments in the world, the business of all the companies in the industry began to decline during the 1920s and served as a prelude to future mergers in the industry. Away from Sheffield, Vickers’ armaments business declined rapidly, the company last paying a dividend in 1923, while Armstrong paid no dividends from 1925, and Beardmore paid none for 10 years after 1921 (Warren, 1989; Davenport-Hines, 1984: Chapter 8). In Sheffield, the steel industry as a whole may have been in an even worse position than it found itself were it not for the rise in stainless steel production, a legacy of the research and development commitment of the armaments industry before the Great War (Sayers, 1950; Corker, 2016). Nevertheless, the 1920s were difficult for all the armament companies. Brown were hit hard after the Washington Treaty, their only brief revival occurring in the mid-1920s with the construction of two new capital ships. The official history of John Brown observed that in the 1920s, “The Atlas Works produced some heavy armour for H.M.S. Rodney, but there was nothing else of much importance to record” (Grant, 1950, p. 69). When Brown passed their annual dividend in 1926 it was the first time they had done so for 50 years, the company failing to pay another dividend for the rest of the decade (The Times, 1926). At Cammell, the company passed their dividend in 1923 and failed to pay one again before their merger into the English Steel Corporation in 1929. In the wake of the Washington Treaty, the business of the two Sheffield armour producers collapsed, yet the picture for projectile manufacture was equally gloomy. In October 1920, Firth’s shell shops
were shut down because of a lack of orders (Thomas Firth, 1920). Conditions changed and by the end of 1921 the company had £200,000 of shell orders on hand from the Government, but the infrequency of demand influenced their profitability (Thomas Firth, 1921). In 1923, the dividend was passed for the first time, the downturn in their fortunes exacerbated by the difficult trading environment and a lack of government orders, and the company failed to pay a dividend again until 1927. Unlike their contemporaries in Brown and Cammell the company was able to resurrect their fortunes in the late 1920s thanks to a brief resurgence of demand for projectiles, but by 1930 orders had once again disappeared. Their ordnance output shrank, and with a lack of commercial work to take up the shortfall, the dividend was passed once again. Hadfields also attempted to navigate the uncertainty of the inter-war period, but by 1930, they too failed to pay a dividend to their shareholders. In 1931, Robert Abbott Hadfield drew attention to the continued depression in trade, adding that “A further handicap has been imposed upon some of our special lines of work by the general policy of Naval Disarmament” (Hadfields, 1930). As will be demonstrated, Hadfields was the only company to survive the rationalisation movement in the armaments industry with their independence.

During 1927, the armaments business of Vickers and Armstrong merged to form Vickers-Armstrongs, with Vickers continuing as the parent company of the new group (Warren, 1989, Chapter 29). This merger was followed by a further rationalisation of steel manufacturing capacity at the companies. After incurring losses for several years Cammell joined discussions regarding the amalgamation of their steel works with those of Vickers and Vickers-Armstrongs, and from 1929, Cammell became part of the English Steel Corporation (Warren, 1998, Chapter 15; Davenport-Hines, 1979, pp. 157-162; Tolliday, 1987, pp. 193-197). Hichens spoke at length at Cammell’s OGM in 1929 after the English Steel Corporation amalgamation about the depressed state of the armaments industry and its effect on his company. His words deserve full repetition:

The armour trade, which in pre-war days was our principal activity, has completely collapsed. In pre-war days our shipyard was seldom without either a battleship or one or two cruisers or several destroyers; to-day we have one submarine on the stocks and have just received an order for another. We used to consider our armour shops empty if we had not 6,000 tons or so of armour passing through them each year; to-day we have, perhaps, a couple of hundred tons. Our trade in big armour piercing shell is gone altogether, as has our trade in guns and gun-mountings which was carried on at the Coventry Ordnance Works. We were left with a wreck in a raging sea, and it is small wonder that some of the spars and rigging have been carried away. We are lucky to have escaped shipwreck (Journal of Commerce, 1929).

This depressed state continued in the following years, and in 1930, the gloomy trading situation for the armourers was publicly commented on by Brown’s Chairperson Baron Aberconway, who noted that:

The consequences of all this have been felt quite keenly at our steel works in Sheffield owing to the diminution of orders for armour plate, gun forgings, and all the other high-class steel forgings and castings that were required for warships and big passenger liners, and their machinery and equipment. The quantity of armour required in recent years has been very small, and last year less than 50 tons were ordered by the Admiralty. It is obvious that this costly and most efficient plant can only be said to have value so far as it can produce work, but if you are faced with an almost total cessation of orders you may consider this value to be comparatively small (The Times, 1930).

Aberconway was perhaps foreshadowing Brown’s merger with Firth in his speech. The two companies had maintained close connections since 1903, when Browns purchased 7/8ths of the shares in their neighbouring company. After long discussions, in December 1930, the
amalgamation of Firth and Brown was completed, Firth taking over all of the steel-making capacity of Brown in Sheffield and Scunthorpe under the new name of Firth–Brown. John Brown remained a shipbuilding company, controlling the share capital of Firth–Brown (Grant, 1950, pp. 73-75; Tweedale, 1995, pp. 257-258). The 1920s had been a difficult decade for the Sheffield armaments industry, and as 1931 commenced, its structure in the city had drastically changed. The five companies which produced arms had been reduced to three through mergers, the vertical links so characteristic of the Edwardian period replaced by horizontal combinations, with only Hadfields emerging unaffected.

The reduction in the number of companies also led to a reduction in the productive facilities available for armaments. This loss of capacity in the industry was regrettable to the Government, and “it was the dispersal of research, development and production specialists within the companies, and the loss of their records and traditions, that caused the keenest anxiety to procurement officers” (Davenport-Hines, 1986, p. 153). It was this skill, knowledge and expertise of the directors, managers, research staff and workers that the industry was built on. Collaboratively, they had made Sheffield the centre of world armaments production and technology and created the knowledge base upon which the special steels of the 1920s would develop (Corker, 2016). By 1930, the industry was on its knees, never to return to its technological and productive glories.

Conclusions
If the Sheffield armaments industry had been at its zenith in 1914, it was at its nadir in 1930. The fallout of the Great War and the uncertainty surrounding the future role of armaments in the world caused difficulty for all the companies involved. Government indecision and the Washington Naval Treaty certainly exacerbated matters, and internally the companies stuck to what they knew best with armaments, any alternative strategies not discussed or imagined and exit from the industry unthinkable. This curious mix of external change and internal continuity both contributed to the declining fortunes of the companies involved in the Sheffield armaments industry. While taking a decade to fully materialise, the rationalisation movement which fundamentally changed the structure of the industry was the ultimate outcome of the Great War for the group of armaments companies which had built their empires and fortunes in the Edwardian period. Considering the use of periodisation with the armaments industry also highlights some implications for using static or externally defined periods, namely, that while significant change can be observed outside an organisation, during the same timeframe, internally organisations can demonstrate significant continuity. As demonstrated with this case, the implications of this tension can ultimately impact the organisations involved. It is for future management, business and organisational historians to balance this conflict and consider if externally determined periods of history truly reflect the idiosyncrasies of the cases they investigate.

The case of the Sheffield armaments industry also highlights several future areas of theoretical investigation for the industry from the end of the Great War through to the rationalisation movement completed by 1930. Narratives of defending the Empire and of work in the Great War highlight implications for organisational memory, and the managerial stagnation of the industry demonstrates a potential for investigation into change management. Finally, the path dependence of corporate strategy in specialist, high-technology industries has also been highlighted with the Sheffield armaments industry and warrants further research.
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Corresponding author
Chris Corker can be contacted at: chris.corker@york.ac.uk

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