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This paper presents a review of a worker owned and controlled co-operative, Tower Colliery, over its 13-year existence within a 'Human Firm' analytical framework. The Human Firm approach highlights the importance of organisational capital in ensuring that firms can simultaneously achieve, satisfactorily, both economic and social objectives. Such organisational capital investments enable the firm to develop capabilities that ensure it is conjointly rational in its decision making; socially responsible; enterprising; and a learning organisation. Full achievement of such goals is defined as an idealised 'Z-firm'. While Tower Colliery made significant progress towards the Z-firm ideal during its operational lifetime, the paper concludes that three significant areas of tension remained unaddressed.

Introduction

From the very moment we took the pit over, I knew we were going to create something the world had never seen before ... I've always believed ordinary people can stand up for themselves and change the world. (Tyrone O'Sullivan — First Chairman of the Board and the driving force behind the Tower Colliery Employee Buy Out)

Tower Colliery was the last deep mine in the South Wales coalfield, situated to the extreme North of the coalfield, just outside of Hirwaun and just above the watershed of the rivers Neath and Cynon. It was in an area where the hard coal anthracite seams start. In 1994, after over 100 years of coaling, Tower, along with the other few remaining South Wales deep mines, was considered uneconomic and threatened with closure. In consequence, a campaign was started by the National Union of Mineworkers [NUM] members at Tower to organise an employee buyout and establish a workers' co-operative. A small group was elected by the workforce each of whom had committed an initial £1,000 of their redundancy money to the project to prepare the tender for the mine. The group was known as the TEBO [Tower Employee Buy Out] team. In November 1994, the Department of Trade and Industry confirmed that it had accepted the TEBO bid and the mine became the property of the workers from 1 January 1995.

Co-operative production straddling the divide between employee ownership and control and operating within a framework dominated by capitalist market relations is somewhat predictably in an ambiguous situation: providing both a practical challenge to the status quo while also affirming it. The analysis of data gathered at Tower Colliery found this ambiguity to be a constant and enigmatic theme of the experience of the co-operative after the buyout.

Many theoretical approaches to evaluation of co-operative enterprises inevitably lead to the degeneration, or economisation, thesis. This argues that worker-owned, self-managed firms operating in a capitalist market economy will inevitably be forced into or will assimilate patterns of behaviour and organisation that are indistinguishable from those of more orthodox capitalist firms (Webb 1930). Initially the research undertaken at Tower was aimed at evaluating this degeneration thesis and its supposed inevitability. During the early stages of the research however, there were indicators that the workers' co-operative had been able, through its democratic processes, to establish and maintain alternative ways of running the business that were different from its previous nationalised experience and contemporary private mines. This initiated further research into understanding how this difference was maintained and how Tower was able to break out of the determinism implied by the degeneration thesis. The research data was derived from the following sources: site observations, individual and group interviews at all levels of the organisation, published documents (including minutes of the management

team and executive board), the co-operative archives and the extensive and intensive local press reportage. These data in their various forms span the 13 years of Tower's operation as a co-operative (1996-2008).

The paper has three main sections. Firstly, it examines the case for a 'Human Firm' framework within which the operation of Tower Colliery can be better evaluated and understood. Secondly, within this framework, it presents the findings of the research undertaken at the co-operative, evaluating its economic and social performance and discussing some of the ambiguities, tensions and creativity that have characterised its operation over its working life. Finally, it draws conclusions concerning Tower's progress towards emancipation of the attributes of the Human Firm and highlights three principal tensions that remained unresolved.

The Human Firm and Tower

A key UK work that engaged generally with the issues of co-operative production was that of Mellor, Hannah and Stirling (1988), which recognised the ambiguity of co-operative production and sought to assess the co-operative 'dream' against the 'reality' of experience. One problem, however, with such an approach is that their presentation of the ambiguity of co-operative production (assessing the co-operative 'dream' against the operational 'reality') is that it leaves a fundamental tension unresolved. This is the fact that the 'dream' draws upon a largely socio-political approach where co-operatives are expected to behave in accordance with social norms, rules and obligations derived from socialist political ideals. However, the 'reality' is measured in accordance with a largely orthodox economic approach where co-operatives are judged as being compelled to behave as independent, economically rational actors within the capitalist system. The inevitable consequence of this is degeneration as the co-operative 'dream' (considered an absolute and definitive indicator of success) is necessarily compromised against the contingent economic institutional 'reality'. Mellor et al, in effect, set up not merely a 'straw man' but an 'impossible dream'. Instead, this paper argues that any co-operative enterprise must be evaluated in terms of the actual socio-economic and political contexts within which it is embedded.

An analytical framework that considers the behaviour of business organisations from both a social and economic perspective is found in the Human Firm approach of Tomer (1999). Tomer attempts to introduce a human dimension into the theory of the firm and consequently focuses upon:

... [an] integration of economic analysis with sociological, psychological, managerial, ethical and other non-economic dimensions of firm behaviour (Tomer 1999: 1).

In essence, Tomer recognises that firms such as Tower Colliery are embedded in a society and thus the framework builds upon a theory of the firm that is socio-economic in orientation (Granovetter, 1985). Furthermore, this social embeddedness enjoys analytic parity with the market and regulatory framework (the sole influence in the orthodox neo-classical approach) in terms of influencing the firm's behaviour. The human firm focuses on how people in a firm behave. This is in contrast to the orthodox economic approach which abstracts from people behaviour and focuses on how optimal, rational maximising choices change according to the operational environment.

Thus the human firm approach is better able to capture and evaluate the reality of the operation of a co-operative such as Tower in its struggle to reconcile economic imperatives with democratic and social objectives. The extent to which a human firm is able to achieve both its economic and social objectives is dependent upon what Tomer terms "organisational capital" defined as "... the productive capacity that is embodied in an organisation's people relationships" (Tomer 1999: 196). Such capital utilises resources in order to bring about lasting improvements in organisational relationships, worker well-being, social performance and productivity. Further, such organisational capital is categorised as an important type of social

capital (Coleman 1988, 1990; Fukuyama 1995; Pennar 1997). Perhaps the most useful working definition of this concept is that provided by Adler and Kwon (2002: 23) as:

... the goodwill available to individuals or groups. Its source lies in the structure and content of the actor's social relations. Its effects flow from the information, influence and solidarity it makes available to the actor.

Within this definition, organisational capital (as a sub-category of social capital) allows the development of social relationships that serve as a resource enabling actors (both within and outwith the firm) to achieve their needs. Moreover, organisational capital is likely to have been created intentionally by people who view it as an investment from which they hope to realise economic, political and social gains. It reflects, therefore, the extent and manner in which the firm's actors have become socially related to each other in new ways and to the organisation as a whole, as well as the extent to which the firm has become more self-consciously connected to the wider society.

This emphasis on organisational capital as a source of social capital is crucial in reinforcing the fact that economic production processes are fundamentally social in nature. Moreover, it further emphasises that all businesses organisations are at least partially embedded in society. Tomer concludes his argument by suggesting that if the human firm has invested in appropriate levels of organisational capital (ie to the degree where its internal organisational capabilities are as fully developed as possible in terms of it being able to fully satisfy its economic and social objectives) then it has become the "ideal" or what he calls the "Z-firm" (Tomer, 1999: 197).

A Z-firm is a human firm that has developed its organisational capital to the extent that it is able to achieve its highest human potential. The organisational capital development and investment should therefore ensure that the human firm has a capability simultaneously to be:

- Rational in its organisational decision making.
- Socially responsible in its behaviour.
- Entrepreneurial.
- A learning organisation.

The Z-firm, Tomer (1999: 9) suggests:

is not only outstanding in responding to competitive challenges ... but it has also found fully responsible ways to deal with its external and internal stakeholders and society as a whole.

Of course few, if any, firms even get close to this ideal. Notwithstanding this, the Z-firm concept does constitute a comparator against which the actual performance of socio-economic firms such as Tower can be contextually validated. Consequently, the framework is used in order to evaluate the extent to which Tower developed the necessary organisational and social capital for its own survival and the regeneration of the local economy in Hirwaun during its operation as a co-operative. That is: using two broad themes of economic and social performance, how close was Tower Colliery to being an ideal Z-firm?

Evaluation of Tower Colliery: Economic Performance

Like many earlier co-operatives such as those set up in the 1980s in the UK, Tower colliery was established primarily as an attempt to keep the mine open and to preserve employment. In this aim, it was successful. During its operational lifetime an initial workforce of 230 expanded to some 300 co-operative members at its peak. The same period saw a rapid decline in mining employment in the UK with production of deep mine coal falling from 35m tonnes in 1995 to 6.6m tonnes by 2007 (UK Coal, 2002). Against this trend, Tower's production in 1995 was 420,000 tonnes; by 2002 this had increased by over 50% to 670,000 tonnes. In fact, during its

13 years of operation Tower colliery produced an average of 500,000 tonnes of coal per year (3,000 tonnes of coal per day) and generated average sales revenue of £25 million per year.

Tower also developed strong links with local authorities in the South Wales Valleys, supplying coal direct to more than 100 schools and public buildings via a central contract with a consortium of local authorities. By 1997, Tower had become Rhondda-Cynon-Taff's nominated supplier of solid fuel (Cato 2004).

(i) Employment

Since we are dealing with just one mine, it is clearly not possible to generalise to the whole Welsh economy in terms of 'widespread' employment creation. However, within the local Hirwaun and Aberdare area, the impact was very significant. After the buyout, the mine continued operations for 13 years and employment created can be viewed as medium to long term. During this period, a small number of mining apprentices were recruited, indicating an employment policy that was long term and contributing to the industry beyond the immediate workplace. At the periphery, the mine maintained and generated additional employment directly in service industries such as engineering, railways and tip maintenance and also through its diversification strategy. This involved the purchase of a coal delivery and bagging facility; aiding a manufacturer of solid fuel boilers (see below); and the establishment of an electricity generating plant using methane gas at the pithead.

Tower was in an area where a large-scale loss of full-time male jobs had occurred. Tower therefore appeared to offer some degree of amelioration to this trend in that it actually expanded the numbers of full-time male jobs during a period in which such jobs had been shrinking locally. For example, between 1981 and 2001 the numbers of full-time male jobs in the area declined by 13.75% (Cato, 2001). The few women employed at Tower, mainly in the offices and in the canteen, were also full members of the co-operative and benefited equally from any pay increases. Tower had the full range of job categories in a working deep mine. There was extensive use of ICT in controlling and monitoring the mining process. The IT control room was typically staffed by ex-face workers who had been re-trained for this 'white collar' work.

Furthermore, over the period of its operation as a co-operative, Tower was able to achieve employment advantages better than under British Coal, and in comparison with 'traditional' privatised production. A sick pay scheme that provided for 6 months on full pay, serves as an indicative example of this as well as average wage rates for face workers amongst the highest in the UK.

(ii) Finance and marketing

At its inception as a co-operative, Tower was dependent on two main customers for about 60% of its output, Aberthaw power station took 45% and Corus, a steel-making company, 15%. Dependency on the steel contract was run down over the period 1999-2001, although the power station contract was extended and remained in place throughout the operational life of the pit. During the period of the co-operative, marketing was one of the major successes for Tower. The marketing manager was previously a NUM Lodge Secretary — a trade union officer — and had little experience in marketing before the co-operative. However, Tower broke through the dominant position of the coal factors and sold directly to the market, securing the contracts for concessionary coal and heating for a consortium of local authorities. Coal was also sold to France, Ireland and Italy for domestic use. In part, Tower having a good product in high quality anthracite helped in this process. Marketing directly was something that British Coal had failed at or was not able to do as the nationalised industry was 'hemmed in' by the coal factors, who themselves were dominated by the old coal owners.

Furthermore, as part of its diversification strategy an outreach wing (Tower Energy Services) was established. Its principal task was the creation of an innovative marketing strategy. Tower

established a joint venture with a specialist heating engineering company, Lionheart Heating Services to offer a “total energy package” of fuel supply, heating equipment, installation and maintenance. This ensured establishment in new markets and increased value-added as well as creating loyalty among the local populace (Cato 2004).

The financial and managing director of Tower was one of the few people from outside the mining industry who bought into the co-operative. He left an accounting partnership and bought an £8,000-member share on the same basis as all other employees. His professional expertise and advice made a significant contribution. Secondly, in relation to finance, Tower was able to reduce its dependence on external sources. The original £2m loan from Barclays Bank to purchase the mine was not fully taken up and the debt was repaid within the first year of operation. The TEBO paid the state £11.5m for the purchase of the colliery. This sum of money was made available as a form of ‘hire purchase’ agreement with £2m having to be paid each year. Tower was able to achieve this with ‘technical’ support from the Labour Government in the form of short-term subsidies subject to EU approval “... designed to establish a viable future [for deep mined coal] in a competitive energy market” (HM Treasury, 2001: 142). The value of such subsidies to Tower was c£3.3m in 2002 and c£3.8m for 2003.

Ownership succession became a problem within the co-operative as at one point in 2003 a single Tower share was worth about £32,000; this could have proved costly to finance if employees decide to leave. Although Tower was not obliged to buy any shares back immediately, the potential liquidity problems this may have created led to the establishment of a trust fund to ease the process of such purchases as and when required.

Social Performance

(i) External environmental contribution.

Coal never has been considered a ‘green’ product, however Tower coal was less of a pollutant than other types of coal as it had a low ash and sulphur content and could be deemed, in terms of coal, relatively non-polluting. Nonetheless, Tower did contribute to pollution and global warming through its product and its production processes and the co-operative board was cognisant of such environmental issues and attempted to address the problems head on. For instance, methane gas (or firedamp) had long been an undesirable by-product of coal mining. The gas itself, whilst dangerous for the mining process, does have commercial possibilities as it is indistinguishable in quality from natural gas. To this end, the colliery got involved in, at the time, a world-leading project that, through negotiations and agreement with a local generating company, led to turbines being installed at the pit. These used the waste methane gas as the source of power and Tower was able to generate a peak of 6.5MW of electricity annually, with a generating efficiency of 95%. This generation allowed Tower to be self-sufficient in electricity and was also environmentally beneficial as methane is one of the gases that contribute to the greenhouse effect. The UK Government’s then Department of Trade and Industry stated the project demonstrated ‘best practice’ because:

Operating mines to best practice guidelines for CBM [coalbed methane] ensures maximising the safety of miners working at the coalface, minimising influence on the surrounding environment, reducing pollution costs and enabling self-sufficiency in terms of energy requirements (DTI, 2000).

Beyond this particular project, Tower demonstrated other strong commitments to environmental standards and these too were recognised by government. For example, the coal-tip, where waste ore was stored, was treated with organic material to ensure successful later vegetation; dust and noise nuisance were kept to a minimum; and water discharges were filtered and carefully monitored. Tower, via its Energy Services Division, also developed an expertise in energy efficiency. It offered free advice on best practice to its customers, allowing them maximum efficiency from their coal use to minimise environmental impact.

(ii) External social contribution

The co-operative was also very active in sponsoring local projects. During its lifetime it sponsored Mountain Ash Rugby Club, the Aberdare Motor Cycle road race, the local children's hospice and the South Wales based Opera Box Opera Company. Tower promoted its role as a co-operative and this, combined with the many years of NUM activist experience of the co-operative's leaders, resulted in constant demands to provide advice and support to community groups, community enterprise, credit unions, business, National Assembly for Wales (NAfW) and educational bodies.

(iii) Organisation of work

Work organisation at Tower was very traditional and varied little from how the mine was organised under British Coal. In one sense this was hardly surprising as deep mining operates under an extensive statutory regime with certain layers of mine management being a statutory requirement. The mine itself was semi-automated and there was an element of technological determinism influencing work organisation. Research findings indicated that while there had been a fundamental change in ownership, the tangible effect of this on daily work-relations between workers and managers was less visible. Everything had changed but as one underground shift-captain observed at the time "We're all supposed to be on the same side now, but management is still management". In part, what underlies this comment is the fact that operational work organisation did not and could not change to any great extent.

Tower established a training scheme for any potential Board members and it even offered facilities to allow workers to progress into the more 'professional' jobs, such as financial management. However, it would be wrong to see the existing work tasks (ie mining coal) as somehow unrewarding. Given the intrinsic dangers of mining, virtually all roles carried a significant responsibility for safety and there were in fact very few unskilled jobs at Tower or indeed in modern mining. The level of discretion that this engendered within the more 'owned' environment of Tower enabled groups of workers to develop their own domains within the workplace, (such as the security officers, the coal tip controller and the workers who operated the coal washery). Of course, this point can be made about more traditional work places, but within the democratic context of Tower, it allowed workers to operate with a greater autonomy that appeared to provide a platform for enhanced political and democratic participation.

Another issue explored in the field work was the extent to which the co-operative led to an enhanced role for coal-face workers. Under the previous British Coal regime, shift captains played an important representative role; and this role continued. Nonetheless the impression created was that worker-ownership relations between the shift-captains and operational management softened and, although a 'them-us' attitude continued to prevail, there was far greater willingness to accommodate each other's perspectives and values than had been the case under the British Coal regime. Differential interests became more muted; control issues more diffuse and mutual interests became enhanced.

(iv) The management structure and organisation of Tower Colliery

The surface appearances of authority-control structures at Tower were more familiar than might be expected. As noted above legislation and company law prescribed the remit and responsibilities of the Board; more exceptionally, the coal industry is probably almost unique in British industry in that there is a legal requirement that its managers must possess specified qualifications before being licensed to practice operational management. Such constraints meant that, prima facie, little appeared to have changed. There were new 'bosses' (owners) but colliery management, work organisation, work roles and operational practices were virtually identical to the situation under British Coal. Except that, well, everything was different. It was possible to identify four mutually implicated and sometimes mutually competing sources of effective authority:

Charismatic Authority. The driving force behind the buyout, Mr Tyrone O'Sullivan, sometime Chairman of the Board, Personnel Officer and the NUM Lodge Chairman was (and still is) possessed of that illusive quality described by Weber as 'charisma'. An exceptional speaker and negotiator, people followed him for who he was. While sometimes the subject of aggressive criticism, it seems undoubted that his remarkable leadership skills and key historical role secured him an institutionalised role as the figurehead of Tower. That said his position by no means went unquestioned and O'Sullivan, when accused of 'losing touch' with the underground owner/workers, shifted his office alongside the pithead baths and had the connecting door sawn in half. This was simultaneously a graphical and symbolic indication of his determination to stay in touch with his fellow owner/workers (Wylie 2001).

Employee Authority. Ownership of Tower was vested in the employees and, as shareholders, they elected members of the main board who had to stand for re-election on a two year rotating cycle. Elections in 1999 and 2001 resulted in defeat for two of the founding board members indicating not only the commitment to the authority of "primitive democracy" (Webb and Webb, [1897] 1902) but also that no member of the Board was safe. Also the Directors, who were all working directors, had to account for their actions at the company AGM which were never innocuous affairs. While it would be dangerous to generalise, it seemed that a continual tension existed between the politicised vision of the majority (which included nearly all the Board members) and a significant minority among the shareholders who had a more instrumental approach to the objects of co-operative enterprise.

Legal Authority. As noted above, unqualified formal management authority is legally vested in the Colliery Manager (who is not a Board member) and his team of mining experts. The mine could not operate without his assent. However, for the most part, this was not an issue because his authority, which derived as much from his technical knowledge as his legal standing, was uncontested. Insofar as other managers represented his views, they too enjoyed strong 'line authority' although this was never unconditional. Nonetheless, this legal context is a persuasive explanation for the apparently privileged position that surrounds some managerial functions. It also begins to suggest some entirely defensible reasons for the apparent distance between the ideals of democracy and the realities of managing a complex and dangerous industrial production process.

Union Authority. The source of this authority was rooted in the 200 or so years of working-class culture that typifies valley communities in South Wales. Everyone working at Tower was a member of a trade union, with the majority belonging to the NUM, (including the 15% who were not shareholders). Such membership was based on symbolic togetherness and solidarity and should not be undervalued. Indeed, initially it is probably accurate to say that the local NUM lodge, as the instigator and organiser of the co-operative, was the only authority. In this respect, it can be said that the co-operative was founded on the ideals of politicised unionism — although whether it should be dubbed socialist in deference to those who continue to promote the selfsame ideals or whether, in deference to Morrison's 'middle-class romantics', it should, in pursuit of academic analysis, be labelled syndicalist remains problematic. While they were still key actors, the unions' authority appeared to be somewhat marginalised. Institutionally, they continued to both signify and directly represent the publicly proclaimed (and deeply ambiguous) distinction drawn between the 'member-as-employee' and the 'member-as-shareholder'. There were annual negotiations over terms and conditions but, while all enjoyed high wages and excellent welfare benefits, collective bargaining appeared to have lost its former edge. However, the presence of unions clarified and maintained the continued sectional conflicts over distribution - though few, if any, could now draw the lines with the same clarity or genuine conviction that they could have done before the workers' buyout.

Generally, the contradictions that emerged in the 'management' of Tower were immanent and continuous. Tower, rescued from closure to ensure the survival of a culture that had been formed by mining, continued to resonate deeply with what might be called the 'anarcho-socialist' tradition in which the achievement of nationalisation was a very poor substitute for worker

control. Unionised workers now owned the enterprise but with what contrived deference South Wales miners could muster, they diligently abided (on most occasions) by managerial dictat.

In retrospect, this area should be considered as a dynamic. Over the 13 years of operation as a co-operative, Tower experienced production problems that probably would have shut the pit in the days of British Coal. Most dramatically, in 1998, the face collapsed and buried the cutting machinery. Essentially the whole mine revolved around this piece of equipment (which would have cost about £1m to replace). Methods were devised to dig the machinery out, repair it and re-start coaling. Later on in 2002, methane gas under pressure came into the face from old workings shutting the face for over 3 months. This resulted in four miles of domestic plastic waste pipe being surreptitiously purchased from building stockists around the country (secrecy was necessary to stop prices being raised against them) to help channel the gas out. Tower managed to start coaling again just before the coal stocks disappeared and customers went elsewhere. Although the changed work experience only lasted during the course of these events, they were collectively owned experiences that were often referred to in discussions and interviews. Individuals were clearly aware that Tower had overcome problems that would have defeated British Coal.

(v) Political

Within Tower, a number of trends and tensions were identified concerning the operation of the mine. Before describing these tensions, it is also important to place Tower within its own historical and political context (its social embeddedness), in order to provide a direct and ongoing link to wider debates.

Firstly, political support from the (Conservative) Government of the day was essential for allowing the TEBO bid to go forward. In addition to this, the TEBO team gathered huge sympathy amongst the trade unions and population of South Wales. It was seen, contrary to the political support that was already there, as a defiant challenge to pit closures and a final defence of the coalfields ravaged by the same Conservative Government. This general political support continued under the Labour Government and was re-enforced by devolution and the creation of the National Assembly for Wales.

During the last 10 years of British Coal ownership of Tower, many NUM activists were transferred to the colliery joining an already very active NUM lodge. Both the Chair and the Secretary shared a long history of rank and file and political activism throughout South Wales. Many of the activists were supporters and workers for the TEBO team and became founder directors of the Tower Co-operative. The Lodge Secretary became a board member and was briefly the personnel officer; he also served as Chair of the Management Board and was a tireless 'propagandist' for the co-operative. The Lodge Chair retained his position for three years before becoming the Personnel Officer.

Beyond the founders and trade union activists, the majority of employees were less directly involved in daily decision-making, although this lesser involvement should not be interpreted as disinterest in the debates. From interviews, observations and other surveys undertaken, many employees indicated some disenchantment with the way the co-operative was being run, particularly related to a claimed lack of information, an alleged lack of contact with the Board and a continuation of British Coal management attitudes. Such tensions came to a head in an astonishing 48-hour unofficial strike which was the result of a group of underground workers being disciplined for 'belt-riding', which was a — not uncommon — breach of health and safety regulations. Old habits die hard but, at the heart of this event was the issue of whether or not managers, backed by statutory authority, could exercise management control in a non-democratic and directive manner. Practically, the matter was quickly settled in favour of the 'management'. But it led to a wider debate about the question as to how the owner/ workers should tackle such issues and other disputes over managerial authority — was it as employees or as shareholders? Ultimately, the matter was resolved in favour of the dictum that once a member came through the gates they became an employee but the whole affair was a

vivid reminder of the complex of organisational ambiguities which characterise any attempt to exercise worker control through a co-operative form of management and organisation.

What these debates that surrounded the strike indicate is that, when action results in this approach being articulated, collectively thinking through the complexity of striking against yourself could not be avoided.

Conclusion: Tower Colliery: A Human Firm?

Following the take-over of Tower by the workers there appears substantial evidence from the data, that organisational capital and other forms of social capital were created through organising ownership co-operatively. In the preceding discussion, there are clearly identifiable instances of Tower performing more than satisfactorily in terms of both its economic and social performance. Moreover, in 13 years of operation it performed significantly better in both than under the ancien regime of British Coal. Indeed, they were extremely successful financially and used that surplus to increase the numbers employed, improve benefits, invest in the mine and support local community projects. Management/work relations were highly democratised, even on a daily supervisory basis with 100% trade union membership and collective bargaining operating alongside 100% membership of the co-operative as owners.

Although technology, statute and market circumstances were constraining influences, it was found that they were all modified, sometimes very creatively, as a direct result of the control and democracy that came from collective ownership combined with the radical leadership. Moreover, conceptually, it is useful to think of the co-operative as an alternative and different social space with boundaries that could be identified in social processes such as the contracts for coal and the physical geography of the land that they owned.

It is further evident that due to Tower worker share ownership and the internal democratic structures there was an organisational context for a high degree of internal debate. Such debate impinged even on the daily relationships between managers and employees, working relations and control over work processes. These were issues that were most unlikely to become the subject of debate within workplaces with a more traditional 'top down' ownership and management pattern.

Notwithstanding these successes, the question of whether Tower invested in sufficient levels of organisational and social capital to fully satisfy its economic and social objectives, in relation to its internal and external stakeholders, is much more ambiguous and contentious. It is evident, despite 13 years of operation as a co-operative that tensions persisted in the organisational structure and relationships at Tower. This was despite the fact that lasting improvements were made in the wider socio-economic milieu — including substantial improvements in organisational relationships, workplace democracy and control, worker wellbeing, social performance and productivity. Three generic issues that articulated the tensions experienced within Tower over its 13 years have been identified.

Firstly, there was 'revenue tension'. Tower survived and increased the surplus available for distribution. This was achieved, during a period of relatively stable coal prices, through an absolute growth in output. However, without new investment capital — particularly that needed to sink a new shaft — it was inevitable that productivity would plateau, and then subsequently decline slowly as the pit reached the end of its operational life. Nevertheless, the increase in revenue experienced during that initial period enabled wages, benefits and dividends to rise and kept at bay the issue of absolute distributional shares. However, distributional and cost control issues were debated beyond the confines of the Board meetings and remained a major source of tension.

Secondly, the age-old structural tension between 'bureaucracy and democracy'; managing the organisational tension from above and from below was also the source of a range of debates. Both of these established patterns of social relations came under pressure and a tension

developed between the established bureaucratic and technical systems and the inevitable democratic pressures from the power that the employees enjoyed, due to ownership.

Despite an outwardly deceptive appearance of a strict top down hierarchy of almost machine like appearance, coal mining requires constant shared decision-making at all levels. Modern mining may look like a production line but close up considerable variation takes place. At Tower, this required the winning over of the active participation of the workers who were the possessors of the specialised skills needed and, consequently, this meant that they enjoyed considerable levels of work discretion. For as long as the mine remained open these skills were in demand and were not easily substituted. Being a co-operative Tower was much more reliant on this special category of members. Added to these circumstances was the new dimension of the employees also being owners.

It is perhaps surprising that these tensions did not create more problems than they appear to have done. Perhaps this did not happen because of the very active debates that took place across a wide range of issues and wide range of circumstances. Such debates, although they could be viewed as tangential to the purpose in hand, time wasting and frustrating, were in essence the social processes that 'managed' the tensions between the bureaucratic/technical systems and the reality of the democracy. It was helpful, therefore in the long run, to legitimise these debates, to accept that maintaining the hard line between employee and owner was not always possible and that such levels of discussion are an essential feature of a co-operative. It did of course make managing work even more political (and probably more difficult) and required a different approach to managing than that which is required by the traditional mining practices.

The third tension can be described as the 'strategic tension' between prioritising the objectives of business success as opposed to co-operative and social objectives. The financial and technical trajectory and supporting culture were based upon the desire for Tower to survive as a successful business. Tower was established to save jobs, the mine, and the way of life it sustained, and — to some extent — to provide a broad example to others. These wider social objectives could only be achieved if the mine successfully secured its economic boundaries. Over the 13 years the combination of these two ideas tended to give a priority to the financial and technical strategic arguments. In part, it is one reason for staying with the structure and working practices that existed before the buyout and with the attempt to sustain the difference between owner and employee. This strategy continued to be successful in terms of employment, production and general profitability over the lifetime of the mine. It was also successful in achieving an improved market position.

Nonetheless, this strategic trajectory had its own internal tensions. Its very success placed an emphasis on those who provide the technical knowledge to sustain the strategy ie the professional mine managers and the accounting and marketing roles. Their expertise and success were used to justify them continuing to hold leading roles within the Board. However, this could only be sustained through the democratic process and, from time to time, this placed an emphasis on a wider basis of representation. Throughout its lifetime the co-operative just about managed to maintain a reasonable balance of professional and lay representatives and maintain a degree of parity between the social and democratic strategy alongside the successful financial and business strategy.

Notwithstanding this, the research and analysis at Tower suggests that the experience was more ambiguous than definitive. The research indicates that Tower did move closer toward the 'ideal' Z-firm form suggested by Tomer, however, while this in itself was significant achievement, it is not a foregone conclusion that such a trajectory would be repeated even in similar circumstances. Indeed, the overall picture is complicated by the dynamics of the contingent environment. Tomer (1999: 197) states that the Z-firm is an organisation that has reached "... its highest potential with respect to competitiveness and responsibility". Tower undoubtedly achieved some of this potential. However, it is acknowledged that competitiveness and responsibility are themselves dynamic concepts and therefore prone to creating further

tensions even as current tensions (perceived or real) are reconciled. This is particularly the case when periods of commensality break down and competition or even predation emerges between the economic and the socio-political objectives of the organisation. Nonetheless, the research suggests that there was always an acute awareness of such tensions (and their dangers) within Tower's owners/employees and creative efforts were made to ensure that adequate organisational capital was created to overcome or reconcile any such tensions.

To summarise, the Tower co-operators managed to create considerable new organisational capital, maintain an alternative view and develop a distinctive idea about the role and status of employee-owners. Moreover, within the context of the Human Firm approach, Tower showed an ability to be simultaneously rational, socially responsible, entrepreneurial and capable of learning. It also demonstrated use of 'practical adequacy' when dealing with its internal and external stakeholders, although the remaining unresolved tensions identified would suggest that further improvements were possible.

Tower's experience also contains some useful pointers to the practice of emancipation, specifically associated with Crossley's (1999) concept of 'working utopias'. This is where initial defensive resistance can lead to a form of emancipated social and economic space. This facilitates a process whereby — in this case — employees/shareholders 'work at' a different cultural and political identity. Conjointly, they expand their space by challenging the contextual contingent powers through the creation of organisational and social capital that ensures the maintenance of the emancipated space.

25 January 2008 marked the closure of Tower Colliery as a working mine, some 13 years after British coal had decided that that it was to close as it was "too expensive to run". The workers' co-operative, over its 13-year existence, managed to produce some 7 million tonnes of coal worth some £300 million. As the NUM Lodge Chairman Dai Davies said at the ceremony to mark the closure:

The Government hasn't closed us, British Coal hasn't closed us, we have made our own decision. We got to the end with our pride and dignity intact. It's a victory for the miners.

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