

The Hawthorn Experiments

Introduction

This paper draws on archival material on the Hawthorn Experiments from the Baker Library of Harvard Business School and other sources, especially those concerning organisational behaviour and employee motivation. Together, they provide a fascinating account and insight into a seminal study affecting productivity and motivation, and the relationship, influences and connections.

The sprawling Hawthorne Works in Cicero, Illinois, were part of Western Electric, the manufacturing arm of AT&T. The Bell Telephone System, as the enterprise was known, combined its production, distribution and marketing under one corporation as did most conglomerates. Prime reasons were to protect security, intellectual property rights and stave off competition. Between 1924 and 1933 a landmark study in human behaviour was carried out by psychologist Elton Mayo. Australian by birth, he was a professor of Industrial Management at Wharton School, Pennsylvania and for these studies was assisted by his protégé Fritz J Roethlisberger and others.

Western Electric produced telephones, cables and transmission & switching equipment and by 1929 a staggering total of 40,000 people worked at the Hawthorn plant. Employees were assigned to precisely measured tasks in highly specialised departments, from switchboard wiring to punch-and-die tool making. Manufacture of some equipment, such as automatic telephone exchanges, required hundreds of separate assembly and inspection operations. Western Electric was at the forefront in applying scientific methods to improve productive efficiency and volumes. They were hardly alone as the early 20th century saw the seismic growth of industry and mega corporations, exemplified by the twin Michigan based giants of the motor industry. The Ford Motor Company was founded in 1903 and General Motors five years later.

Development of Scientific Management

The scientific management movement was created out of necessity to improve productive capacity, efficiency, profitability and competitive strength but there were other reasons too. The meteoric expansion of industry meant employing a massive labour force, often poorly educated and with few if any skills. Language presented an obstacle and a barrier to communication as many were immigrants. The imperative was to devise systematic processes that were easy to operate.

Step forward Frederick Winslow Taylor. He became an apprentice machinist at the Midvale Steel Works in Philadelphia before rising to the position of superintendent. Taylor was highly critical of industrial practices devised on the hoof. He sought to achieve much greater productive efficiency, the standardisation of job performance by splitting functions and tasks into constituent elements and a system of hierarchy to ensure complete uniformity. Taylor aimed to standardise and simplify a job with a detailed checklist of each operation to be performed and methods to be used. His mantra was how long should it take, using the most efficient process design and optimum production methods. This also required selecting workers most suited to the task such as fitness, height and dexterity. The intention was to find the quickest and most effective 'one best way.' Taylor's motivational device was the piecework incentive system of pay.

In 1898 Taylor was hired by the Bethlehem Iron Company in Pennsylvania to introduce greater efficiency. A major task was analysing the work of pig iron production handlers who loaded vast quantities onto railroad cars. According to Taylor "the workers were slow and phlegmatic and that nothing would induce them to work faster." Taylor concluded that workers could handle 47 or 48 tons a day using vastly improved and less tiring methods. This was four times greater and might at first sight seem impossible. He recounted a probably invented conversation with an operator to illustrate how such a profound change in working methods and practices might be introduced.

"Now come over here. You see that pile of pig iron?" Yes. "You see that car." Yes. "Well, if you are a high-priced man, you will load that pig iron on that car tomorrow for \$1.85." The usual daily rate was \$1.15. "If you are a high-priced man you will do exactly as this man (foreman) tells you tomorrow from morning to night." Every worker was consigned to a single function that was overseen by a functional foreman. Each had a specific role and was confined to that role only and probably impervious to other foreman roles. In all these eight processes: order of work and route clerk, inspector, time & cost clerk, shop disciplinarian, gang boss, speed boss and repair boss and instruction card clerk. Mind-numbing as this may seem, the impact on workers was far greater with treadmill routine as each task was repeated ad-nauseam using precisely the same methods with no deviation. Writing in 1947, Taylor acknowledged that "a man who is mentally alert and intelligent" is entirely unsuited to "the grinding monotony of work of this character."

The Hawthorne Experiments

Between 1924 and 1927 Western Electric undertook a behavioural experiment to determine the effects of lighting on worker efficiency in three separate manufacturing departments. Analysis of these studies revealed no correlation between productivity and light levels, even when lighting was greatly improved, prompting researchers to explore other factors that might affect worker output. Of great surprise was an increase in production when lighting levels were actually reduced in the experimental room, all other factors holding steady. Equally surprising was increased production in the control room where no changes whatsoever had been made in working conditions. Intriguing the researchers were psychological factors affecting not so much the physical changes but the way in which these were introduced and managed.

In 1927 a new experiment focused on the relay assembly department with the repetitive assembly of pins, springs, armatures, insulators, coils and screws. Western Electric Company produced over 7 million relays annually. As the speed of individual workers determined overall production levels, the effects of factors such as work hours and rest periods were of particular interest. So was how workers related to each other within their own groups as productive efficiency and accuracy was dependent on the previous co-worker and their own on the next co-worker.

As a psychologist Elton Mayo had, by 1920, recognised the need for a shift in emphasis and focus from prescribed, precise and rigid production methods to the effects on the employee. Elton Mayo realised complex psychological and social factors were involved. He was appalled at a mechanistic approach to production across the USA. Mayo commented, "So long as commerce specializes in business methods which take no account of human nature and social motives, so long may we expect strikes and sabotage to be the ordinary accompaniment of industry." For Elton Mayo the imperative was to unlock and understand the psyche of the worker.

Robert Yerkes, Chairman of the Personnel Research Federation of the National Research Council, came to the same view two years later and so did some large companies. They began to introduce a form of welfare capitalism to inspire loyalty, discourage high turnover and absenteeism and promote employee well-being. At Western Electric, in addition to a pension scheme, sick pay, disability benefits and stock purchase options, the workers were able to participate in a range of recreational and educational programmes. The Company had become increasingly interested in social, behavioural and medical sciences linked to employment but were not able to deduce what methods worked best with the realisation too some pertinent factors might have been omitted.

In 1923 Mayo was a research assistant at the University of Pennsylvania's Wharton School, studying the effects of fatigue on employee turnover. His work soon came to prominence when researching a spinning mill in Philadelphia where turnover in one department was 250% per annum; in other words the average employee stayed five months only whereas it was 6% in other parts of the company. After improving working conditions and rest periods the labour turnover in this one department had reduced to the company average. Mayo concluded that, whilst monetary rewards might motivate in the short run, a more powerful motivator was social factors. Mayo soon came to the attention of the Dean of Harvard Business School, Wallace B. Donham who stated: "The subject of human relations in industry is one of the most important things in the whole field of business and one which we much investigate and teach."

A punched hole recorded the production rate for each worker. Whilst an enormous amount of production data was gleaned, researchers were unable to tell if productivity achieved was affected by alteration of rest periods, working hours, wage incentives, group working or variation in working conditions, or other unidentified reasons. In 1928 Western Electric turned to Elton Mayo at Harvard Business School. George Pennock, superintendent for Western Electric, wrote at the time, "to see what he can tell us about what we've found out." The data was available but meant little to a company skilled only in the analysis of production levels, not the causation or influences.

Data was sifted and sorted into employee attitudes on working conditions, job type and content, and favourable and unfavourable comments and those of supervisors too. In his autobiography, *The Elusive Phenomena*, Roethlisberger wrote about grappling with hard and soft data, noting that in the "gooey soft data there existed uniformities about human behaviour that had to be coaxed out ... by the method of clinical observation and interviewing." He discovered that what employees found most deeply rewarding were "informal relationships of interconnectedness." Social cohesion was predicated on collective relationships and employee belief in a sense of common purpose and value of their work.

The experimental room attempted to secure the active involvement of workers and the concept of teamwork. Conditions were changed one at a time: rest periods of different lengths and times; a shorter working day and working week and food with soup or coffee in a mid-morning break. The output chart showed a continuing increase, whilst workers said they felt less fatigued. Not only were they consulted on all changes but were permitted to make suggestions to management. A twelfth experiment returned to the original conditions. Daily and weekly output rose to its highest level in the ensuing twelve weeks to the end of this experiment period. A 13th experiment showed a further increase in production. Unpicking the experiments showed that three experiment periods had broadly the same conditions applying, yet production in period 7 was 2,500 units, 2,800 in

period 10 and 3,000 units in period 13. Not only had production output varied by 20% overall but had actually increased in each of the subsequent experiment periods. Over the course of the study the six individuals, all women, had become a team. They were astonished to learn that production had increased on each occasion as all felt they were now working under less pressure.

The Interview Programme

Donham, the Dean of Harvard Business School, shifted the emphasis from scientific methods and applied economics to human relations. Working with Elton Mayo and L. J. Henderson, physiologist and biochemist, this changed focus had a lasting effect on the direction of Harvard's curriculum research. Their work involved a complex web of applied and empirical based studies, biology, physics, biochemistry, psychology, sociology and anthropology too. The Hawthorne experiments involved extensive interviewing, conducting more than 21,000 interviews from 1928 - 1930 that went beyond the experimental group to include the original control group and other sections.

Interviewers were trained in interview process techniques such as giving your full attention to the worker, listen to what was said, what wasn't said and what help was required for a worker to express any ideas or suggestions, such as technical aspects of the job. Interviewers were instructed not to argue or give advice, summarise points to ensure clarity, confirm details and maintain strict confidentiality, other than discussion between professional colleagues who were analysing and interpreting interview data.

Mayo and Roethlisberger discovered that, rather than directed questions, the employees expressed themselves more candidly if encouraged to speak openly. As a research study noted, "the interview must be a listening rather than a questioning process," more akin to a conversation. Interviews that previously took 30 minutes now expanded to 90 minutes, or even two hours. This not only allowed employees to be put at ease but enabled disclosure too. This meant often revealing highly personal details about day to day life that also depicted an intimate portrait of the American industrial worker in the years leading to and following the Wall Street Crash.

Such comments as "this is the best thing the Company has ever done" were frequently heard. It was, said Elton Mayo, almost as if workers were waiting for this opportunity to express feelings, hopes, anxieties and ideas only vaguely understood by the Company. He was profoundly affected by the social change taking place in the USA since the turn of the century and its effect not only on workers but supervisors and managers. Rather than a disjointed unit of disparate individuals a team had emerged, albeit unwittingly. Before, workers felt a lack of security and certainty, not just about job guarantee and remuneration but comradeship and self worth. In these situations a void and feeling of emptiness replaces the absence of group structure, concluded Mayo. An important observation was interviews being a form of emotional release that enabled possible reasons for low productivity and variations to be explored – and rectified.

In 1933 Elton Mayo wrote a ground-breaking book entitled "The Human Problems of Industrial Civilization" that appeared in the journal, *The Human Factor*. The Depression and massive layoff of employees at Western Electric were instrumental in bringing the Hawthorne experiments to a halt in the early 1930s. The studies took on a new life with Mayo's public lectures. Harvard Business School published numerous articles with reviews appearing in professional journals. Apparent to

Mayo was not treating workers as appendages to machines but as thinking individuals. This had a profound effect on motivational influences, job satisfaction, reactions to change, group dynamics, worker participation and effective leadership. Elton Mayo summarised this as "The change which you and your associates are working to effect will be not be mechanical but humane."

Conclusions from the Hawthorne studies

Four major conclusions arose from the Hawthorne Works studies:

- 1) The aptitude of individuals (as measured by industrial psychologists) are imperfect predictors of job performance. Although such measures may give some indication of the physical and mental potential of an individual, the amount of productive work is strongly influenced by social factors.
- 2) The informal organisation as distinct from rigid structures, hierarchies, spans of control, job demarcation and precise job criteria etc does affect productivity in the form of group working and the manner in which directives are given and carried out.
- 3) Work-group norms do affect productivity, for the better or worse which may then suggest that other factors are involved too. The Hawthorne researchers were not the first to discover this, even to the point of restricting production, though capable of exceeding the norm and where financially remunerated to achieve a stated output.
- 4) The workplace is a social system. The Hawthorne researchers came to the view the workplace is a social system made up of interdependent elements.

Others refined and developed Taylor's ideas. Two names stand out: Frank Bunker Gilbreth and Henry Laurence Gantt. Besotting Gilbreth was finding the quickest method, using time and motion studies. A notable example was bricklaying. Stooping, walking and reaching were reduced with 5 motions only per brick instead of 18, enabling 350 bricks to be laid instead of 125 within a defined time. His philosophy was simple. "Better standards of living are impossible without producing more." Gantt is famed for planning methodology and charts that spawned later techniques.

The findings and papers of Elton Mayo had an extraordinary influence on the psychology of human behaviour from a work standpoint. Many of the reward systems and welfare economics such as work conditions, security and status came to be regarded as basic requirements of an employer. Frederick Herzberg, psychologist and pioneer of job enrichment in the late 1950s, described these as hygiene factors that would not have any enduring effect on motivation. That would require analysis of the job itself, level of self-responsibility, group work, team dependence, achievement, recognition and level of responsibility plus opportunity for advancement.

Just one year later in 1960 Douglas McGregor published *The Human Side of Enterprise*. His theory X and theory Y is a salutary reminder even today. In a typical theory X environment, the style of management is likely to be authoritarian and imposed with little if any discretion. The threat of punishment is ever present with a management attitude that workers will of their own accord do as little as they can get away with. The security of a job dominates with a reluctance to accept any responsibility. The clock rather than job content rules their working day. In total contrast Theory Y is prevalent in organisations promoting a participatory management style. With encouragement, employees apply self control, seek teamwork, have respect for others and the organisation, are

committed to corporate and team goals and enjoy responsibility that is delegated rather than just assigned. With this comes use of imagination, discretion, ingenuity and creativity. The contrast may appear too simplistic but the theory was hugely popular – and a wake-up call.

It is almost 100 years since Elton Mayo advanced his theories of the social and emotional side of a job rather than mechanistic routines in complying with rigid procedures and methods. His was a brave voice in an era of scientific management that espoused specific production methods and a fully compliant workforce. The paradox of increased production when lighting levels were reduced, and when working conditions were changed for better or worse, was solved. They were not catalysts but social interaction was through involvement, team work and an element of discretion in how work was accomplished in a spirit of co-operation with the work group as a social unit.

Given the frenzied industrial activity of the USA and elsewhere in developed nations in the first few decades of the 20th century it took time for the penny to drop. Workers are not machines, treated like automatons in complying with prescribed and highly detailed processes and achieving a stated output. They have voices, intellects, ideas and collaborate, or otherwise, depending on the system and regime, yet here we are today having to remind ourselves of this. Various theories and models have been developed in the decades since the birth of modern management as we know it but, paradoxically, we may wonder in this mechanised and digital age if the clock has not been turned back. We need only look at Amazon, Sports Direct, financial services and use of Sat Nav and data apps to find out that workers often see themselves as automatons in highly directed and target driven jobs with online performance tracking in real time.

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Reference Sources:

- Harvard Business School - Baker Library Historical Collections; 'A New Vision'
- Organization Theory: Selected Readings – edited by Derek Pugh
- Organizational Behaviour – David A Buchanan & Andrzej A Huczynski 1985
- Economist 3 November 2008