From 'Workers' to 'Operators': Labour of Moelven Brug

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Introduction

Actual construction work introduces a certain element of precarity to any building project: availability of workforce, workers' levels of skills and mastery of craft directly affect projects' budgets and planning. In the post-WWII period that witnessed an extensive reconstruction effort across Europe one of the ways to mitigate these uncertainties and obtain a greater control of the 'human factor' was a turn to prefabrication. Prefabrication transformed a process of construction from building to assembly, gathering different types of construction specialists under one roof and driving professionalization, specialization and process planning. This turn to prefabrication, however, had an ambiguous effect on labour: although a more technologically-driven process required better technical knowledge, it simultaneously diminished the role of craft, deskilling the workers. However, as more recent inquiries focusing on issues of labour in construction show, this was not a zero-sum development and questions of craft, skill and technical knowledge continued to complicate production of prefabricated structures [1].

This paper investigates this duality between professionalisation and deskilling through a study of a Norwegian construction company Moelven Brug. A former sawmill, in the post-WWII period Moelven turned to prefabrication, building housing, schools, sports halls and representative buildings from a system of flat-packaged prefabricated timber panels and housing sections. In just two decades between 1950-70 the company evolved from a small local business largely reliant on hand-craft into a large industrial enterprise with high levels of mechanisation, profoundly transforming ways work was performed. As Moelven incorporated international management models, adapted new technology and process planning, construction work became increasingly fragmented, specialised and professionalised. While this transformation made away with a tradition of local craft, replacing it with a more technological process, it also allowed for a broader pool of workers to be hired, driving local development. As Moelven employees evolved from 'workers' into 'operators', the study of the company's continuous negotiation between craft, technology and scientific expertise at the time of rapid industrial expansion offers new insights into professionalisation of labour within the prefabrication industry.

In Search of Lost Time

Founded in 1899 some 100 kilometres north of Oslo, by the mid-1940s Moelven Brug—literally a 'sawmill of Moelv'—faced a significant crisis. Its products for agriculture—mostly timber wheels, a regional speciality—were growing increasingly obsolete in the post-war era of rapid industrialisation and new sophisticated machines. At the same time, rationalisation, productivity and modernisation were high on the national agenda in all spheres of life. An array of experts and institutions—from a Norwegian Productivity Institute to private rationalisation consultancies—were ready to implement the most recent international managerial models and bring Norwegian businesses up-to-date [2]. Thus, to revamp its production, Moelven turned to IRAS—an Industrial Union's Bureau of Rationalisation—that throughout the 1950s evaluated the company's processes several times and suggested new accounting and managerial systems [3]. At last, another significant aspect awaited modernisation—Moelven workforce. By 1949, the company employed around 50 people—mostly carpenters and professional wood-workers, and it held no records of 'productivity' studies [4]. However, as Moelven started to produce prefabricated buildings that were of higher complexity and required an industrial scale of output, the company's workforce had to be modernised to meet the demands of mass-production. (Fig.1)

Figure 1: Moelven workers in 1959. From M. Antonsen, 75 år med Moelven-klubben i medgang og motgang: 1913-1988, Moelv: Bedriftsklubben Moelven, 1988.

Between December 5-14 1956 and January 10-19 1957 Moelven held two sets of productivity studies in its mechanical workshops following what seemed a nearly-unanimous decision of the production committee [5]. IRAS engineer R. Westby-Eriksen conducted the studies, assisted by Moelven foreman Torbjørn Kårhus. Each study was comprised of ten participants from the mechanical workshop and volunteers from other departments, compensated with 4,25 NOK per hour [6]. Essentially implementing one of the main techniques of scientific management, time-motion studies, IRAS engineers observed and recorded five major work operations from start to finish and several smaller tasks, with an overall observation time tallying to 80 hours. Among major operations observed were, 'assembly welding in a team of two men,' 'welding by one person', 'reinforcement of beams', 'assembly of elements with two men' and studies in a painting workshop [7]. The studies focused on different factors that influenced productivity, accounting for 'lost' and productive time, workers' movements and work methods, quality of tools and workplace arrangement.

Spatial relations between workers' bodies and machines were closely investigated and evaluated with regards to efficiency, distance travelled and time required to perform a certain action. For example, report no.1 detailed 'lost time' in an assembly welding carried out by two men. There, IRAS specialists identified a range of actions that contributed to 'lost time': from 'a conversation with a colleague,' 'getting materials,' 'getting tools' and 'clearing the work place' to 'waiting for a colleague,' 'going around the work station' and 'correcting mistakes.' Put together, they corresponded to 45,60% of overall production time, effectively rationalizing away one worker [8]. In other operations, for example, welding by a single person, 'lost time' accounted for only 11 or 15% and could hardly be reduced further. Besides lost time, IRAS engineers also suggested new arrangements of workshop furniture and tools that would condition more efficient movement of workers' bodies and thus higher productivity—for example, following a study of assembly of two timber elements "Bukk" and "Geit." [9].

Observing these operations, IRAS engineers decomposed work processes into series of discrete actions and movements, codified and recorded them in standardised process schemes and diagrams [10]. These standardised forms left little space

for nuance: each action was classified according to predefined categories and fell either under ‘operation’, ‘transport’, ‘control’, ‘stay’ and ‘storage,’ traced together in a process flow. (Fig. 2) Time to perform each action was recorded in cmin—decimal fractions of time, as well as distance travelled and precise amount of materials used measured in cubic centimetres. According to technology historian James Beniger, such recording of work processes through standardised forms brought “destruction or ignoring of information in order to facilitate its processing” [11]. Standardised forms, a means of information pre-processing, facilitated governance of socio-technological systems and ushered what Saint-Simon described as a shift from “the government of men to the administration of things” [12]. However, this seemingly impartial government through standardised forms based on the principles of scientific management erased the value of tacit knowledge. Instead of a complex craft with a variety of nuances, work at the factory was now comprised of series of discrete steps, each action measured, rationalized and standardised. However, these forms also recorded and rationalised areas previously uncontrolled: in the words of IRAS engineer Hellern, “to stabilise the human factor” [13]. IRAS engineers were conductors of a new culture of expertise, that, when applied to Moelven production, profoundly transformed ways in which work was performed.

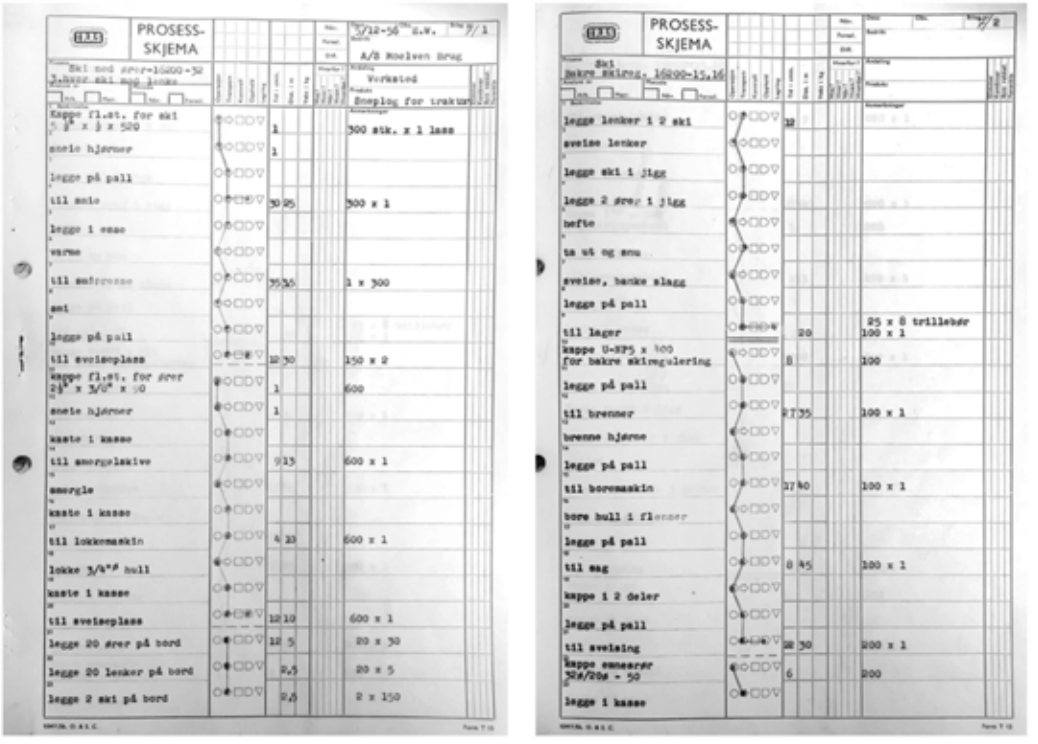

Figure 2: IRAS process diagrams. ARK-287-01/N, State archive in Hamar, Oslo, Norway.

From Craft to Machines

IRAS rationalisation of Moelven Brug in the late 1950s is important, as it can be considered what technology historian Andrew Feenberg calls an ‘anti-program’ to the former craft-based tradition of Moelven Brug, which allowed the whole system to be re-codified and opened a range of previously impossible potentialities [14]. The decade following IRAS work-studies was a time of rapid expansion: in 1958 Moelven started to produce prefabricated schools, averaging to 12.000 m^2 of educational space per year; a factory for glued-laminated timber was inaugurated in 1959 and from the early

1960s two new factories delivered prefabricated housing based on two different structural systems. Many Moelven long-term workers experienced this rapid expansion first-hand: when Johannes Karlsen started at Moelven in 1936, there were 80 people and by the 1970s there were nearly 2000 [15]. As the company moved to scaled serial production, the nature of work had also significantly changed. New machinery, in particular, conveyor belt assembly introduced in 1963, simplified work, making it more mechanical and repetitive. (Fig. 3)

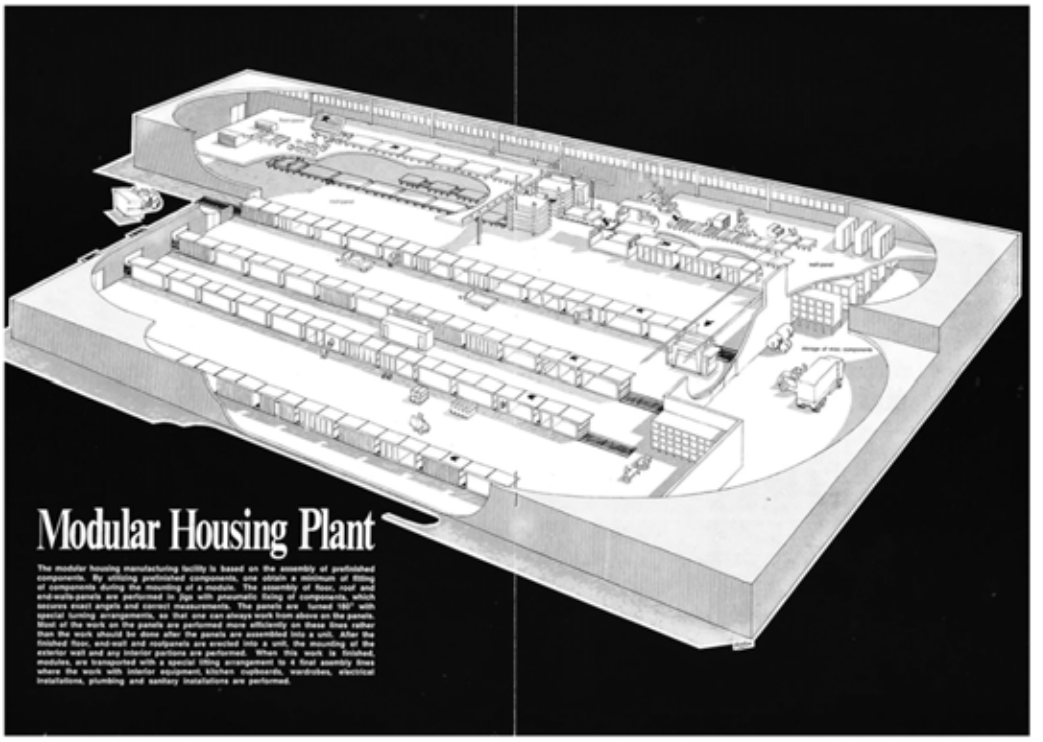

Figure 3: Moelven conveyor belt assembly. Moelven Industrier A/S, 1973.

Syver Smikkerud, a carpenter who started working for Moelven in 1925, in a 1975 interview emphasized, that with increased scale of production workers were put in a position where little could be improved about a particular assigned action and where one had nearly no influence on the final product [16]. Smikkerud thought that in the long term, this parcelling of work that brought industrial alienation would neither do service for the workers nor the company. Similarly, Kåre Kirkevold and Sverre Olsen who had both worked for Moelven since 1925 reminisced about the time, "one had a feeling for making things themselves" [17]. With the new organisation of work, this was hardly possible, work became too monotonous and there was little job satisfaction based on what one produced [18]. Kristian Johannessen, Moelven employee since 1925, also complained about the increased monotony. He noted, that compared to the previous generation of workers, the new one was not interested in learning a specific craft, and instead was happy just fulfilling mechanical tasks required of them [19]. These stories testify to an inescapable social transformation that happened with increased mechanisation: work became simplified, specialised and more monotonous. Instead of being proud of something one produced this sense shifted to a pride of belonging to a large enterprise that delivered complex mechanical products and collective effort put into this process.

As Moelven turned to prefabrication, the company strove to transfer as much construction work from site to factory as possible. However, unlike the British post-war construction industry that saw prefabrication as an opportunity to mitigate

a shortage of skilled workers, Moelven was far less concerned with the absence of skilled labour. On the contrary, new production process that relied on conveyor-belt assembly simplified work and thus largely benefited from surplus of unskilled workers as forestry and agriculture industries were modernised. Prior to rapid industrialisation of the 1960s, most of Moelven workers were professionally educated fagarbeidere, who went through a traditional system of apprenticeship. With transition towards prefabrication and work that did not require command of a specific craft, the majority of new Moelven hires specifically in the housing factories were non-professionals. A part of the post-war Norwegian 'solidarity politics' aiming to even out social differences between different classes, the pay gap between professional and non-professional workers' salaries was also significantly reduced, diminishing the importance of specific craft-based education.

New employees went through a couple of weeks of learning through practice and supervision; in a course of just over eight weeks one was thought to have enough knowledge and skills to take nearly any production job [20]. While the 'old crew' lamented diminished autonomy and the fact that new generation did not want to learn a craft, by the end of the 1960s, long-term employees were outnumbered on a scale of 1 to 10. New Moelven hires first and foremost wanted secure work places and the majority of them actually learned new skills [21].

Figure 4: New Moelven workers. Newspaper clipping, Hamar Arbeiderblad, 1965.

New Workers, New Skills

IRAS method studies provided the backbone for this transition to a different labour pool. Prior to 1957, Moelven workers got paid per item of work produced within a set time, a piece-work system, essentially trading their skills [22]. With IRAS method studies that established a benchmark for productivity within a set time interval, Moelven shifted to payment per hour during which a certain amount of work had to be completed: now, Moelven employees traded their time, instead of skill [23]. Architecture and labour historian Christine Wall drawing from Richard Biernacki argues, that these different

payment systems, the former characteristic of British industries and the latter of German, when transposed onto construction industry influenced both the perception of labour and the final built product. The German system based on productivity during a fixed period of time essentially appropriated labour power through time, and thus, according to Wall, was more conducive to the success of building process rationalisation [24]. As employer benefits were directly proportional to employees' skills and command of craft, this model encouraged better vocational training and technical education provided by the employer [25]. Since Moelven adapted this time-based payment system, the company was directly interested in improving workers' skills to increase productivity. Thus, it offered ample educational opportunities for its employees.

The first Moelven educational fund was established in 1942 but was significantly updated in 1960, just two years after IRAS studies, and in 1964 with a yearly budget of 35000 NOK [26]. The fund provided interest-free loans that were supposed to be paid over the course of five years, covering expenses for pursuing either professional*, yrkesopplæring*, or higher education programs in "the areas of importance for the company" [27]. In order to qualify, one had to work for Moelven for at least two years and commit to another three after completing the studies. Many have pursued this opportunity: in 1965, for example, Magne Olav Skullerud applied for a loan to support his studies at the Norwegian Technical University (NTH) for three years. He was offered funding on a condition that upon return he would "undertake an appropriate position at Moelven Brug for at least two years" and work at the company throughout summer vacations [28]. In addition to higher education, scholarships were also granted for pursuing a mid-level technical education. For example, in 1967, Jan Pedersen received a loan for his studies at Oslo Elementærtekniske Skole, and Ole Gunnar Larsen for study at the Göteborg's Technical Institute [29]. Another applicant, Kåre Karlsen, pursued a 2 year study course at the professional school in Dovre [30]. For more specialised work, for example element assembly, Moelven employees followed specific courses arranged by the company and external specialists. These efforts, in fact, positively contributed to workers' professionalisation: although starting out with a largely unprofessional workforce, by the late 1970s most Moelven employees at both housing factories had one to three years of professional schooling [31].

For Moelven, workers' education was crucial to meet the specific demands of prefabrication industry, 'a child of its time' and to match the pace of accelerated technological development [32]. Industrial production required workers to have stronger technical knowledge and skills and that were previously not necessary [33]. To fill these gaps, in addition to more formal external educational courses, from the 1960s Moelven started to arrange a number of internal short-term professional courses: for example, TWI an American-style 'training within industry' program, a course on reading technical drawings, lectures on company's organisation and work safety [34]. In 1971, series of courses were held by Hartmark-IRAS, a successor to Moelven's 1950s rationalization agency, on process management and product development, as well as a course on network planning [35]. As these offers were quickly booked out and shortage of places complained about, it is possible to conclude that Moelven employees were actively interested in improving their professional skills [36]. In practice, better education indeed advanced one towards higher engineering and managerial positions—which was the case, for example, with Magne Skullerud [37]. As Moelven employees gained new technical skills, the complexity of technological process increased, and they were requalified from 'workers' to 'operators' [38]. (Fig. 5)

Specialists of the New Machine Age

Moelven products were highly prefabricated, up to 95%, and most construction work usually carried out on site was moved to the factory, heralding a transformation from building to assembly. Serial production and conveyor-belt assembly demanded more managerial work: well-oiled supply and procurement systems, efficient management of contractors and materials, planned transport and storage. While before 1950 Moelven did not have a single engineer on staff, by the 1960s a new class of professionals emerged: constructors, engineers, economists, process planers, product and technical development managers, salesmen, rationalisation specialists, accountants and data managers numbered as

many as blacksmiths and carpenters in the inter-war years [39]. Their numbers increased faster than workers on the shop-floor, and the two groups often did not share the same professional identity [40].

Specially educated 'calculators', for example, quantified work, material and product expenses sourced from a multitude of subcontractors and performed complex calculations on work pricing [41]. In turn, constructors, technical engineers, managers and work-studies specialists deconstructed each product into composite parts and work tasks, divided across different teams of workers along a conveyor line [42]. The planning office comprised production technologists implementing new network systems, where cyclical production followed the most detailed time scheduling schemes [43].

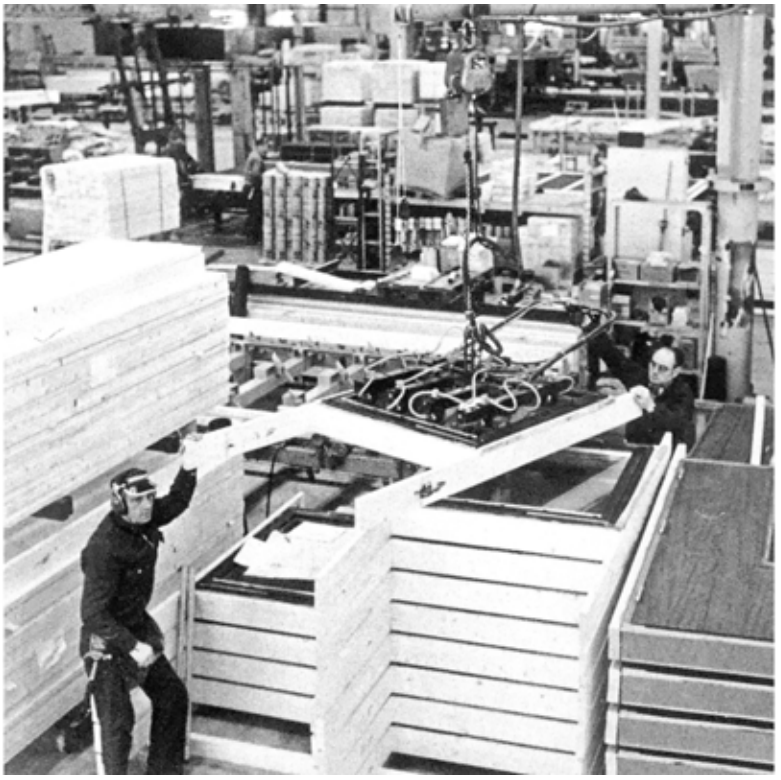

Figure 5: Moelven operators. Moelven Industrier A/S, 1973.

Pert-chart and network diagrams visualised flows of materials and exact order of work operations, where all intermediate-stage elements had then to fit together into one final product [44]. Moelven engineers and managers travelled to study similar enterprises abroad, particularly in the United States, simultaneously advancing their own expertise and bringing back technological and organisational know-how.

With the advent of new computers used for accounting and process management, new specialists made their way into the construction industry: programmers, data managers, and computer engineers. In 1969, Moelven hired a civil engineer and data specialist Ove Atle Hagestande who would develop the Moelven data management sector [45]. For more effective calculations, Moelven engineers had to design and run their own programs based on specific aspects of Moelven prefabrication process, leading to a subsequent merger between data and accounting departments by the mid-1970s [46].

Thus, increasing complexity of production had to be matched by a continuous access to high-class specialists, brought up either within the company or hired externally. As Moelven production was comprised of a wide range of products and

departments, segmented and specialised construction work had to be streamlined and tightly managed by a new class of process planners and logisticians. Unlike conventional construction firms, these specialists, from production planners, engineers and assembly workers to managers, architects, sales and advertisement professionals, all inhabited the same factory space. (Fig. 6)

Figure 6: White-collar specialists, representation of Moelven process from advertisement booklet. Moelven Industrier A/S, 1974.

Conflicting Representation

Increasing specialisation and professionalisation of the workforce within what essentially was an assembly rather than a building industry, however, posed significant problems within the specific Norwegian system of union representation. In 1968, for example, Moelven prefabricated housing factory employed more than 100 men that worked as carpenters, wall-paperers, painters, plumbers and electricians, mechanics and storage workers. As all Moelven workers were unionised, any conflict situation with a group of workers up or down the assembly line would paralyze the entire production, a similar problem faced by the ship-building industry in Britain [47]. As workers' professional identification increased with time, particularly for electricians, plumbers and sanitary installation specialists, Moelven management constantly referred to the cautionary tale of Danish and British ship-building industries, that with increased specialisation quite literally drowned in union struggles [48]. A conveyor belt assembly of prefabricated products that joined several professionals along the line thus proved to be at odds with a Norwegian tradition of collective pay bargaining and professional representation.

Although Moelven worked generally with timber, most of its employees were a part of Jern og Metallarbeiderforbund, a union for the metal and iron industry, that had a strong local and national representation and powerful weight in

professional negotiations [49]. As prefabrication industry was new for Norway and Moelven production had few analogues, it was hard to define which work fell under the jurisdiction of which union and what guidelines were to be followed for professional representation [50]. For example, while union affiliation was easier to define for workers engaged solely with assembly of ready-made houses, the situation was more complex for employees that produced, for example, metal components that later went into ready-made products [51].

Negotiations on union membership, and reluctance of both the company and its workers to join the Bygningsindustriarbeiderforbund, the Construction Industry Workers Union, can be traced through a heated tri-partite exchange between the company and two unions in question [52]. The Construction Industry union righteously wanted to claim more members due to direct nature of their work, while those potential members were reluctant to leave one of the most powerful organisations in the country in favour of a much smaller union with fewer benefits. Eventually, it was suggested that workers that only deal with prefabricated products would join the construction industry, while those that work in other departments, even if their products end up in prefabricated houses, should remain with Jern- og Metall. However, by the 1970s under continuous pressure from the industry only 130 Moelven workers remained a part of the Iron and Metal union, while the rest, around 900 people, were a part of Construction Industry union [53].

Conclusion

Moelven transformation from a small local business reliant on hand-craft to a large building conglomerate with "the most advanced prefabrication technology in Europe" serves as an appropriate case study of professionalisation within a construction industry. Moelven's turn to prefabrication had a profound effect on the company workforce: on the one hand, a highly technological process required new technical knowledge and skills, driving professionalisation and specialisation. A new class of managerial and technical professionals who planned, streamlined and supervised all aspects of serial production and assembly emerged. On the other hand, new 'scientific' methods of work and conveyor-belt assembly simplified labour and diminished the role of craft. This, however, allowed Moelven to hire a broader pool of workers, driving regional development. In fact, new 'unprofessional' Moelven employees had gained professional education through ample educational opportunities offered by the company, evolving from 'workers' to 'operators'. The turn to prefabrication thus brought specialisation of both managerial and assembly work, which with time proved problematic within specific Norwegian context of strong union representation. The case of Moelven Brug thus has to be seen within a context of broader social transformation that happened under rapid Norwegian industrialisation of the 1960-70s that relied on imported and assimilated foreign models of management and work.

References

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[48] *Bedriftavis* (Note 16) no.4, 1968, pp.14-15.
[49] T. Bergh, *Storhetstid (1945-1965)*, Oslo: Tiden, 1987. pp.107–9. Also *Fra håndverk*, (Note 20) p.101.
[50] See a letter from Moelv Jern- og Metall to Norsk Jern of Metall, on the problems of representation for house-building workers, December 9, 1959. Folder 0006 "Moelven–Moelven Brug A/S" in AAB/ARK-1659/E/L0249, Arbeiderbevegelsens arkiv og bibliotek, Oslo, Norway (AAB).
[51] A letter from Moelv Jern og Metall to Norsk Jern- og Metall, December 9, 1959.
[52] See, for example a letter from Moelven to Mekaniske Verksteders Lansforening, May 8 1959; or a letter from Landsorganisasjonen in Norge (LO) to Norsk Arbeidsgiverforening on the transfer of workers; February 10 1959; or a letter from Norsk Bygningsindustriarbeiderforbund to Moelven Brug on May 18, 1961. All in "Teknologibedriftenes Landsforening TB" archive, RA/PA-1700/M/L0101/0001. A protocol on the workers transfer between unions on September 18 1961; also a letter from Moelv Jern- og Metall to Norsk Jern- og Metall on November 23 1961. All in Folder 0006 in AAB/ARK-1659/E/L0249.
[53] Antonsen, *75 år,* (Note 15) p.22.