

The Attractiveness of the Work Is Affected When Production of Hand-crafted Log Houses Moves Indoors

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Viewed from a historical perspective, a shift has occurred within the forestry and wood sector towards indoor work. In Sweden, the production of handcrafted log houses has now also begun to move indoors. With a point of departure in development processes within the log house sector involving working indoors, education, work attractiveness, between 2001–2005, the aim of this study was to compare indoor work with outdoor work, based on log house builders' experience of working on handcrafted log houses. Methods used in the interactive development project involving apprentices, experienced log house builders and researchers, were participation with continuous documentation of experiences and opinions; questions; interviews; and measurement of the work environment. The Attractive Work Model has been used in order to analyse perceptions and values. The changes, 15 out of 22 areas, were perceived both negatively and positively. Therefore, it can not be said that working on traditional, handcrafted log houses becomes more attractive if it is moved indoors. The majority wanted to work both outdoors and indoors, while most of the others only wanted to work outdoors. The results indicate that there is scope for developing more attractive work indoors by utilising experiences from log house builders and closely related activities such as the forestry and wood sector. Changes made within one area of work attractiveness affect other areas. Further research is needed both with regard to comparisons between indoor and outdoor work and regarding the interaction between the areas that are identified in the Attractive Work Model.

Keywords log house building, attractive work, indoor, outdoor, work environment

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1 Introduction

Many tasks within forestry have been mechanised, especially as far as logging is concerned (Driscoll et al. 1995). Swedish forestry underwent extensive rationalisation between the 1950s and 1990s with the introduction of machines (Attebrant et al. 1997). Difficulties recruiting skilled workers were one reason for introduction of harvesters in steep and difficult terrain in Norway (Nitteberg 2003). Mechanised harvesting of hardwood in France is expected to lead to more attractive work for young people (Bigot and Cuchet 2003). Mechanisation resulted in a large proportion of forestry workers leaving outdoor work and they are now sitting in operators' cabs instead of being outdoors.

At Swedish sawmills, the amount of the sawyer's working time spent inside the sawmill building rose from 50% to almost 100% during the second half of the 19th century (Johansson 1988). Heated production facilities began to be built during the 20th century (Grönlund 1992) and one of the consequences of the sociotechnical organisational ideas introduced during the 1970s, '80s and '90s was the concentration of personnel in control rooms inside the sawmill buildings (Ager 1993).

The shift towards indoor work is not unique to the forestry and wood sector; indeed, most people spend 90% or more of their time indoors (Seltzer 1995). For example, such typical outdoor occupations as construction work have experimented with the production of wall sections under cover in on-site workshops directly adjoining construction sites (Sundelin 1994). In Sweden, the production of prefabricated sections for houses and whole houses inside factories is widespread (Chiang and Tang 2003, Richard 2005).

Even within the production of handcrafted log houses, a tradition that dates back over 1000 years (Håkansson 1993), a few companies in Sweden have begun to move their operations indoors and that is the focus of this paper.

The chain-saw operator's heavy physical work changed with the mechanisation of forestry to monotonous, repetitive, static workload when becoming machine operator (Axelsson 1997). Similar changes are seen when the industrialisation moved work indoors. Prefabrication and mechanisation made the work of the labour easier and with automation the tools took over the tasks

from the labour (Richard 2005). Positive correlations have been observed between work satisfaction and satisfaction with the indoor environment (Haghighat and Donnini 1999).

In order to create a good indoor environment, attention is paid to thermal environment, air quality, noise, dampness and lighting (Leinster 1992), but good relations between the occupants of a building are also needed if we are to feel good (Samuelson 2003). On entering a room we experience a feeling of enclosure that is hard to define (Silfverhielm 2003).

People have a desire to be outdoors and outdoor environments incorporating natural elements can offer psychological benefits (Krenichyn 2006). The use of the natural environment for recreation has become increasingly important (Kangas and Markkanen 2001) and for urban dwellers parks are important places for regular physical activity (Krenichyn 2006). Outdoor environments in the form of healing gardens have effects of rehabilitation on people who are stressed and urban green spaces help to maintain good health (Stigsdotter 2005). Spending time in daylight promotes a good frame of mind (Espiritu et al. 1994).

The opportunity to be outdoors (at least for part of the working day) is perceived as a health determinant (Fjaestad and Wolvén 2005) and people who work indoors feel better if they have a view of a green environment than if they have no room with a view (Stigsdotter 2003). "To be outdoors" ranked second among the reasons given by machine operators as to why they were happy in their work (Bostrand 1984).

Within the forestry and wood sector, problems with high vibration levels have been noted both in outdoor and indoor work – i.e. chainsaw work (Axelsson 1997), in operators' cabs (Bostrand 1984, Lidén 1989) and in sawmills (Ager et al. 1995). At sawmills and joineries there are air-quality problems such as wood dust and fungal spores (Andersson and Rosén 1995, Roponen et al. 2002, Liukkonen et al. 2004). The incidence of mould at sawmills is higher indoors than outdoors (Simeray et al. 1997).

Both for machine operators and at sawmills, for example, problems have been identified with temperature, noise and lighting (Bostrand 1984, Lidén 1989, Ager et al. 1995). For forestry workers, noise is one of the biggest work-environment

problems (Apud et al. 1989) and noise exposure is also commonly encountered within the wood industry and the construction sector (Bornberger-Dankvardt et al. 2005). Forestry workers also have problems with workload injuries (Pontén 2000).

Outdoors, forestry and construction workers are affected by weather and climate. They are exposed both to heat (Apud et al. 1989, Wästerlund 1998) and cold (Yränheikki and Savolainen 2000, Hildebrandt et al. 2002, Gavhed 2003). In summer, outdoor work leads to a greater risk of sun damage (Purdue et al. 2001). Depending on the ground surface, terrain and weather, forestry and construction workers are also subject to slip and fall accidents (Gao and Abeysekera 2004, Lipscomb et al. 2006). Uneven surfaces and manual lifting work impose greater strains on muscles and disks than work on even surfaces (Jiang et al. 2005). The use of power woodworking tools entails many risks (Whitehead 1994) and the frequency of accidents and occupational illness within the construction, forestry and wood sectors is high (Yränheikki and Savolainen 2000).

The criteria applied when comparing indoor and outdoor work are often not the same. It has not been possible to find comparisons between the same type of work indoors and outdoors. Outdoor work is described as physical and active, whereas indoor work is sedentary (Schaubroeck et al. 1998). Hildebrandt et al. (2002) cite studies in which outdoor work is often associated with heavier and less controlled musculoskeletal loads. Bearing in mind the employment situation, where many sectors are having (and are expected to continue to have) difficulties recruiting personnel (Fürth et al. 2002, Bigot and Cuchet 2003, Niteberg 2003), the question of where people want to work is an important one.

Against the background of the research and development work in this study, the aim was to utilise log house builders' viewpoints and opinions in the planning of indoor work. There were similar ambitions within the sawmill industry in Sweden during the 1980s. It was considered necessary to try a production-engineering philosophy that was predicated on a more positive view of humanity than the earlier objective view of man at work, whereby considerably greater use would be made of people's knowledge, experiences and inner motivation, with a view to achieving high

productivity and quality (Ager et al. 1981).

By studying the production of handcrafted log houses, the change between working indoors and outdoors has been identified. The work involved in both indoor and outdoor production consisted of the same elements. The question as to whether work is to take place indoors or outdoors is of particular interest to the log-house sector in Sweden, which has seen woodworking indoors or under cover as a fundamental prerequisite for the creation of attractive work and workplaces, especially for young people (Föreningen Svenska Timmerhus 2001).

Attractive work is needed in order to engage, retain and recruit personnel. Whether or not a job is attractive depends on how the individual perceives the work and values its various aspects. This study relates mainly to the relativity of the notion of something being more or less attractive (Åtegg et al. 2004). Åtegg et al.'s (2004) Attractive Work Model had not yet been published when the majority of this study was conducted and it has therefore only been possible to use it as an analytical tool.

Experienced log house builders and apprentice log house builders took part in the study. The log house builders chose to work indoors during a period when a prospective major customer was stipulating as a quality requirement that the timber must not be allowed to become blue-stained. The work was due to take place during the autumn/early winter and blue staining occurs easily in rainy autumn weather. In addition, time was short and the log house builders were concerned about losing a lot of working time on account of snow, rain and cold. Training of the apprentices was located indoors for two reasons: partly because the organisers of the training believed that the apprentices were able to absorb the training better if the activities were not disrupted by the weather conditions and partly because production of log houses was expected to take place indoors in future.

The aim of this paper is to compare indoor work with outdoor work based on log house builders' experience of work on the production of handcrafted log houses. The focus is mainly on the following three questions:

- Is the log house builders' experience of the attractiveness of working on the production of handcrafted log houses affected when the work takes place indoors as opposed to outdoors?

- Do log house builders prefer to work on the production of handcrafted log houses indoors or outdoors?
- According to log house builders, what are the key criteria that need to be applied in order to make work on the production of handcrafted log houses indoors more attractive?

2 Materials and Methods

This is a descriptive study based on an interactive development project within the log house sector involving working indoors, education, attractiveness etc. The interactive development project was conducted from 2001–2005 in Dalecarlia, Sweden, whereby apprentices, experienced log house builders and researchers jointly identified different aspects of the work that varied between indoors and outdoors and also sought solutions that would create attractive indoor environments. In addition, input was received from instructors, the Swedish Log house Association and people connected with the training programme. Data was collected by participation with continuous documentation of experiences and opinions.

Activities in the project were for example measuring of noise, dust, vibrations and lightning as a base for discussions, as well as mounting boards for noise reduction and overhead travelling cranes. Noise was measured with a Brüel and Kjaer Noise Dose Meter (Type 4436) in accordance with Swedish Work Environment Authority requirements (Arbetsmiljöverket 2005a) and filter dust sampling on a full-time test basis (Criteria Group for Occupational Standards 2000, Levin 2000) was performed in the apprentices' workplace in December 2001.

The study was conducted with two groups of interacting respondents: apprentices and log house builders. These are apprentices from the first four years (N=47) of the one-year post-secondary training programme entitled "Production of log houses", which started in 2001. The apprentices were men aged from 19–53 years (median: 28 years) and the majority were aiming to become professional log house builders. During the training programme, the apprentices worked mainly indoors but also outdoors, especially during their

practical weeks. All apprentices took part in the study during their period of study. All of the first two years' intakes had worked with log house building two years after completing the training, 15 as employed and the remaining 6 at their leisure time. The log house builders belonged to an association consisting of five log-house companies which ranged from one-man companies to firms with five employees not including the owners (N=15). The majority of the log house builders were in their 50s or older, with many years' experience of log-house production outdoors. The experiences of log house building indoors are based mainly on the association's production activities during the period from October 2002 until March 2003. Before, after, and also – in some cases – during this period they also worked outdoors.

The apprentices answered alone in writing some structured questions about work with log house production. The topics were; where they wanted to work (at the end of the training (N=29)), and how much and where they had worked (after 6 (N=20) and 12 months (N=19)). Semi structured interviews about experiences and being indoors/outdoors relating attractiveness of log house production were conducted with the apprentices (N=21) two years after the training. In March/April 2003 semi structured interviews were conducted with log house builders (N=6). The topics were reasons for being indoors/outdoors; advantages, needs and obstacles to be indoors; and advantages and disadvantages outdoors. All interviews were conducted by the author and lasted in average for about 1 hour.

Åtegg et al.'s Attractive Work Model (2004) has been used as a basis for analysing how the work on the production of log houses was affected. The Attractive Work Model is based on people's opinions about what makes a work attractive. It is constituted by the parameters work content, work satisfaction and work conditions (see Fig. 1). Work content is what the employee does when carrying out the work (and how he does it); work satisfaction is what the employee feels he gets out of performing the work; and work conditions are things that are common to all of a company's employees, i.e. they are not dependent upon the specific tasks or on what the employees feel they get out of performing the work (Åtegg et al. 2004).

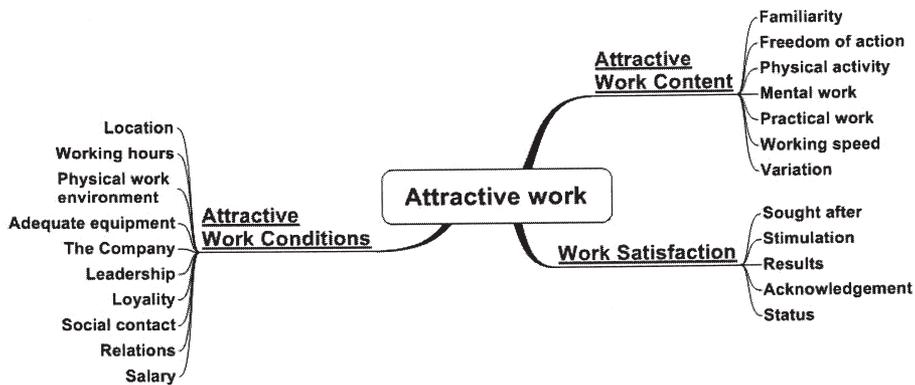


Fig. 1. Attractive Work Model (Åteg et al. 2004).

All the collected data involving log house builders' and apprentices' perceptions of changes in factors pertaining to the work and also on whether the changes were perceived to be positive or negative have been structured in the Attractive Work Model. When analysing the data to answer the three aim questions, the results have been structured separately for each group, apprentices and log house builders.

3 Results

The reported results for the three aim questions (3.1, 3.2 and 3.3) apply both to apprentices and log house builders. When differences between the groups were discovered, they are highlighted in the report.

3.1 Attractiveness of Work Is Affected

The changes that the log house builders and the apprentices perceived when working indoors as opposed to outdoors are reported below, structured into various areas within work conditions, work content and work satisfaction.

3.1.1 Work Conditions

Location – With one exception, all of the compa-

nies' woodworking facilities were located out of town, surrounded by forest and with few visitors, whereas the indoor facility was sited on an industrial estate where the disruptions from visitors were perceived to be larger. However, visits were regarded as positive if they led to orders for log houses. One perceived advantage of the industrial estate was that it avoided having to drive on gravel tracks during thaws.

Working hours – The log house builders thought that they worked more when they felt it necessary to be at the workshop from 7 am until 4 pm, something which was perceived negatively. Outdoors, they adapted the working days to the daylight during the winter and therefore felt that they were able to follow the natural rhythm of the seasons by working less during the dark times of the year when they were feeling more tired. The contractors felt obliged to attend to book-keeping and paperwork, etc., after the working day at the workshop, whereas in the case of outdoor work this was done during days with poorer weather.

Physical work environment – There was perceived to be a major change in the physical work environment when the work was done indoors as opposed to outdoors. Indoors, the possibility of maintaining a constant and appropriate temperature was recognised. Positive effects were perceived from not being exposed to precipitation and wind, and also cold in winter and heat in summer. On the other hand, problems with draughts and cooling were envisaged when timber needs to be brought in from outside. Indoors, exposure to

wood dust and noise was considered to be more problematic, and likewise there was concern about the occurrence of mould. During a practical day spent woodworking indoors, three apprentices were respectively exposed, in the space of barely 5 hours of actual work, to 1.2, 2.1 and 3.0 mg/m³ of inhalable wood dust¹ and noise levels of 89.4, 91.2 and 93.0 dB(A) Leq². Indoors, the space was seen to be more limited both as regards floor area and height. Views on the light conditions were mixed. Although daylight outdoors was preferred and the artificial lighting indoors was not considered to be ideal, it was better than the floodlights that were used outdoors in dark conditions. When the frame is built, the working areas are moved upwards owing to the need for spot lighting and, at the same time, the frame may block the light sources. From an efficiency standpoint, level floors were preferred, while there was a fear of dropping tools, especially the broad axe, on concrete floors and thereby damaging the edge. Many thought it was nice to work outdoors, but some people thought it was nice to be indoors in winter-time. Whether walls, roofs and floors were finished and painted also influenced their perception of the environment. Reduced risks of slipping compared with outdoors, where snow, ice and rain made scaffolding, logs and the ground slippery, were perceived positively.

Adequate equipment – Indoors, chainsaws, which could not be used on account of exhaust gases, were exchanged for electric chainsaws with less power. This was perceived as deterioration. The opinions were divided as to whether an outdoor crane was better than an indoor overhead travelling crane. It was felt that several logs could be lifted simultaneously when there were several overhead travelling cranes, whereas only one log could be lifted with a single outdoor crane. Moving timber from a storage yard outdoors to the indoor production facility was perceived as more problematic than the corresponding operation outdoors.

The Company – One aspect of being indoors that was highlighted as negative by employees and contractors alike was the cost of the premises. The cost of an outdoor workplace was considered to be lower than if one were to rent or build premises. It was felt that one would need to have the certainty of work all year round in order to justify the risk of investing in an indoor workplace.

The investment is considered economically viable for companies with many employees and where activities can continue regardless of the weather. It was felt to be too costly to have a workplace both outdoors and indoors.

Social contact and Relations – In the case of indoor work, the noise level was constantly so high that the log house builders used ear protection the whole time. They therefore found it difficult to communicate and felt isolated.

3.1.2 Work Content

Familiarity – To a larger extent, the fact that the log house builders are not affected indoors by weather and wind meant that they felt they knew what to expect during the day. The reduced risk of interruptions was perceived to result in more reliable time scheduling.

Freedom of action – For the log house builders in the association, working indoors meant that they experienced less freedom of action. It was not possible for all projects to take place simultaneously indoors, since the space was limited. Furthermore, it was felt necessary for the whole working day to be spent in the workshop, and paperwork, etc., was done in the evenings and at weekends.

Physical activity – Drier timber was felt to be easier to work with and is not as heavy as moist timber.

Practical work – It was felt to be easier to work with unfrozen than frozen timber. Not only was the timber unfrozen indoors but it was also dry and therefore easier to draw on.

Working speed – Pressure of time was experienced less indoors since there were fewer unwanted interruptions on account of weather and work was more efficient. In part, the efficiency was due to the fact that the floor was level and consequently it was not necessary to conduct the levelling procedures that are required on uneven surfaces and if the ground moves on account of frost. The timber did not need to be covered every day to protect against precipitation. Tools did not need to be collected up and there was less snow-clearing. As has been described under “Working hours”, it was believed that too much log house building would be carried out during the winter when working indoors. As far as outdoor work

is concerned, self-employed contractors looked positively on the fact that they were able to go home on the days when they were prevented from working by snow, rain and cold.

3.1.3 Work Satisfaction

Results – Use of dry timber indoors was considered to result in high-quality products.

Acknowledgement – The log house builders experienced an increased feeling of acknowledgement since they could work with increased efficiency and achieve higher quality standards.

Status – Pride and enhanced professional identity were experienced when the indoor work meant that it was possible to supply the customer with the demanded higher-quality product.

3.1.4 The Overall Picture

To sum up, 15 out of 22 areas were found to be affected when the production of handcrafted log houses took place indoors rather than outdoors. The impact on six areas was perceived as being positive, while four were influenced both positively and negatively, and five negatively (see Table 1). The changes within work content and work satisfaction were to a higher degree

perceived positive, and within work conditions negative.

There was an interaction between the areas. Perceived change with regard to location, physical work environment and adequate equipment was considered to affect the efficiency of the work. The perceived increased efficiency in turn had a positive impact on working speed and acknowledgement. The positive change in results was cited as a reason for increased acknowledgement and status. Freedom of action was perceived negatively as a result of the working time spent in the workshop.

3.2 Desire to Work Both Indoors and Outdoors

Few respondents had a definite view that they wanted to work either indoors or outdoors. On consideration, both of the alternatives were seen to have advantages and disadvantages.

3.2.1 Log House Builders

Aside from the quality considerations, the log house builders' principal motivation for working indoors was the fact that the work can be carried out regardless of the weather. Temperatures below

Table 1. Perceived change in various areas of work when the production of handcrafted log houses moves indoors.

Perceived change	Work conditions	Work content	Work satisfaction
Positive		Familiarity Physical activity Practical work	Results Acknowledgement Status
Both positive and negative	Location Physical work environment Adequate equipment	Working speed	
Negative	Working hours The company Social contact Relations	Freedom of action	
No change	Leadership Salary Loyalty	Mental work Variation	Sought after Stimulation

minus 15–20 °C were seen as a threshold for outdoor log house building because of cold fingers, difficulty with precision and poorly functioning tools. Indoors, the work becomes more efficient and the risk of interruptions decreases. This is an advantage mainly for companies that have employees, since self-employed contractors do other tasks when they are prevented from log house building by snow, rain and cold. By building log house indoors, it is possible to gain 2–4 weeks' work over the course of a winter.

The log house builders had varying opinions over the extent to which they wanted to work indoors. One wanted to be indoors all year round in functional premises while another only wanted to have additional activities indoors in poorer weather. Some people regarded working indoors during the winter months (from October to March) as ideal. The indoor work had gone better than expected and the market dictated whether they were to continue indoors or not. The combination of suitable premises and suitable rent was considered to be crucial. Some contractors adopted a "wait and see" approach, whereas others were more proactive and geared themselves towards coming indoors for parts of the year.

3.2.2 Apprentices

The majority of the apprentices wanted to work both indoors and outdoors both at the end of their training programme and one year later (see Table 2), indoors during the winter and outdoors during the summer. The opinions changed for some, and more of them wanted to work outdoors two years after their training program. The motives varied and in many cases respondents mentioned an overall positive feeling with regard to the work

situation, which they could not specify.

At the interviews barely half of the apprentices (42%) felt that indoors or outdoors had a direct bearing on the attractiveness of the log house building. The majority of these apprentices (62%) wanted to work outdoors. They stated that "it feels good to be outdoors" and "there is nothing finer than to be outdoors". The rest of the apprentices did not consider the question of whether one is indoors or outdoors to be so important, but felt that the most important thing was actually being able to work as a log house builder. However, these apprentices had a definite view as to where they wanted to be working and most of them (73%) wanted to alternate depending on the season and the weather.

3.3 Equipment and Premises Design Important for Attractive Indoor Log House Building

The respondents opinions are that it is necessary to have job the whole year round, in order to make being indoors economically viable. Hitherto, there has often been little production during the winter. The rent needs to be low and it was regarded as too costly for the same company to incur costs both for indoor premises and an outdoor facility.

Regardless of scale, drier timber was needed indoors than outdoors. The companies either dried the timber themselves or bought pre-dried timber.

3.3.1 Premises Design

Based on the development work undertaken with the log house builders and apprentices and their

Table 2. The apprentices' desires about where to work with production of log houses.

Desire to work	End of training N=29	One year after training N=19	Two years after training N=21
Both indoors and outdoors	62%	63%	42%
Only outdoors	17%	21%	42%
Under cover	17%	16%	16%
Only indoors	4%		

experiences of indoor workplaces, the following wishes emerged with regard to the design of suitable premises for the production of handcrafted log houses. A floor area of around 25 m × 40 m would accommodate both the log houses and the timber. A ceiling height of 5–7 m and large doors (approx. 5 m × 5 m) mean that a lorry can drive in and unload the timber with a crane, and 1.5-storey houses can be built. If timber is stored outdoors, it should be under cover and air locks are required so as to prevent the creation of draughts in connection with frequent intake of timber. The lighting is located high in the ceiling so that it does not restrict the lifting and construction height. There must be several windows and also proper roofs and walls which are painted and clean.

Since the work is physically demanding, a temperature of between 5 and 15 °C is preferred. The waste wood that is produced can advantageously be used to heat the premises, e.g. with hot-air systems.

Some felt that the floor ought to be concrete or asphalt, whereas others preferred wooden floors. One advantage of wooden floors is that if tools are dropped on the floor, their edge is not damaged.

To facilitate the removal of waste wood, somebody came up with the idea of "manure gutters". The thinking was to make recessed channels in the floor which are covered with gratings, just like in cowsheds. When the workshop is to be cleaned, the gratings are removed; shavings and small pieces of wood are pushed down into the gutters and removed with a "manure transporter".

Extractors for wood dust (especially from circular saws) were desirable. Finding a practical solution to this problem was regarded as difficult, since the log house builders move around and use circular saws at several different locations within the workshop.

3.3.2 *Equipment*

Lifting devices are to cover the entire area of the premises and must be positioned high enough to allow for the construction of 1.5-storey houses. Each house requires an overhead travelling crane and the number of cranes is dependent upon the size of the premises and also on how many houses are being constructed simultaneously. The

overhead travelling cranes must be positioned so that they do not collide. Various existing lifting frames, clamp hoists and securing straps can be used as lifting aids to attach to the overhead travelling cranes.

The noise level was perceived as problematic and varied between different types of tools. The vibration levels also varied³ (for example, the noise level was higher for circular saws and the vibration level was higher with electric chain-saws, both of which could be used for the same operation). Before selecting tools, the apprentices felt that the use of ear protection reduces the noise exposure, but that they cannot protect the wearer against vibrations. In addition, the respondents noted the importance of tool maintenance, which not only affects exposure to noise and vibrations but also dust.

The circular saws were found to be the tools that produced the most dust. Blades with fewer, larger teeth were recommended in order to reduce the amount of dust and instead produce larger particles of wood. Better and more powerful electric chainsaws were also sought.

4 Discussion

The objective in studying work on the production of handcrafted log houses was to explore the specific comparison between indoor and outdoor work. The objective is considered to have been achieved based on the results, which show that organisation of the work and elements of the work have, to a large extent, remained unchanged. It should be noted that the comparison is being made with a form of work that evolved outdoors over a period of around 1000 years (Håkansson 1993). The task of adapting the work to the conditions that existed indoors – and, not least, the conditions that may arise – is therefore far from complete.

Participation in an interactive development project and the use of questions, interviews, and measurement of the work environment has provided a large body of knowledge about the phenomenon that is being studied and has also contributed to the understanding of the concept and the Attractive Work Model. The collected

empirical data is mainly of a qualitative nature, albeit with quantitative elements.

The results show that people's experience of the attractiveness of work is affected when the production of handcrafted log houses is moved indoors. Positively perceived changes were mainly founded on the fact that the weather did not affect the work, something which is reinforced by previously reported research about weather and the adverse impact of the wind on outdoor work. Many aspects of the physical work environment were perceived differently. Perceived problem areas, e.g. wood dust, noise, mould, draughts and light, are earlier known from the wood, forestry and construction sector, e.g. (Ager et al. 1995). Working with dry and unfrozen timber led to several positive experiences with regard to work content and work satisfaction. These results reinforce Åteg et al.'s (2004) assumption that a change in any factor has repercussions on the perception of other aspects of the work and on the overall picture.

Changes in working hours, working speed and freedom of action were perceived negatively due to the fact that the log house builders felt that they were more tired and needed shorter days in winter, book-keeping and paperwork were done outside working hours, and also too much log house building. Similar disadvantages with working speed and less freedom of action have been stated when working in a forest machine (Pontén 2000). It was noted when the log house building was moved indoors, but does not mean that it is a marked or permanent cause-effect relationship. One interpretation is that the production that had occurred outdoors was moved indoors without any major deliberated changes with regard to organisation. Outdoors, paperwork was saved up for times when the weather was poorer, whereupon the body was given a much-needed rest. Such alternative tasks, together with ancillary jobs, introduced variety into the log house building. Indoors, these elements disappeared and the log house building continued at the same pace, virtually without any time to recover. These and other observations show that even if the change is only considered to be a switch from an outdoor to an indoor environment, many changes in the work have been experienced and therefore need to be addressed.

Comparisons can be drawn with the mechanisation of the sawmill industry during the 1950s and '60s, when mass production systems were introduced, which initially led to restricted, monotonous and isolated sawmill work in a poor physical environment. Intensive efforts made during the 1970s to create a better work environment and new organisational forms led to substantial improvements in the physical environment and the workplaces (Ager 1994). Also the forest sector has learnt to have an overall picture and manage work-life issues at the same time as the operation changes and develops (Pontén 2000).

The log house builders' assertions that it is nice to be outdoors are supported by the desire to be outdoors (Krenichyn 2006) and the "well-being factor" of being outdoors (Bostrand 1984). Earlier studies – e.g. Stigsdotter (2005) – show that we feel better through being outdoors, which supports the statement that "it feels good to be outdoors". This assertion, together with "there is nothing finer than being outdoors", suggests that people are seeking a feeling based on the experience of one's surroundings such as air, sunshine, view, etc., as opposed to the feeling of enclosure in a room (Silfverhielm 2003). These feelings affect people's views of work indoors and outdoors, and are bolstered by assessments of other aspects.

Being indoors and being outdoors both have their advantages, which were also recognised by the log house builders and the apprentices. The majority wanted to work outdoors and indoors, while many of the apprentices only wanted to work outdoors and outdoor log house building was considered to have a direct, positive bearing on the attractiveness of the work. These results indicate that many newly trained log house builders will find the work less attractive if activities are moved indoors, as envisaged by the log house sector (Föreningen Svenska Timmerhus 2001). The result would then be the opposite of what was expected.

One question is whether log house builders, having no economic responsibility for the business, want to be outdoors, whereas employers – both in their own interests and in those of their employees – want to have the opportunity to be indoors. The results of this study do not indicate that this is the case. Among the contractors there

were both those who proactively sought to move their activities indoors and those who felt that the market would dictate what happens. In addition, there were contractors who saw disadvantages in working indoors in winter from 7 am to 4 pm.

Another question is whether the apprentices' views manifest a more individual perspective than those of the log house builders, with the company's interests being disregarded. However this not seemed to be the case. The log house sector in Sweden consists to a large extent of either "one-man" or small businesses. Some apprentices should therefore have considered themselves as future self-employed workers, which was, indeed, what several of them became, whereas others saw a future as employees. Ambitions for the future aside, there appeared to be great awareness about the impact that their own work efforts have on the company's success. For example, the opportunity to work more efficiently and supply products of higher quality was viewed as positive, and premises costs as negative.

All things considered, the most appealing idea appears to be to create the necessary conditions for working indoors during the winter months, as a complement to outdoor work. One alternative may be to work outdoors under cover in order to utilise perceived advantages of being outdoors but still protect oneself against precipitation.

It was noted that in order to work indoors, one needed to have log house orders all year round. This prerequisite ought to apply if the previous reduction in activity during the winter was a consequence of not being properly geared towards outdoor log house building during this period and/or if there is an increased demand for traditionally handcrafted log houses.

As was noted previously, the incidence of noise, dust and vibrations is high in occupations of a similar nature to log house building. The log house builders and the apprentices in this study commented on the need to reduce these forms of exposure in order to increase the attractiveness of the work. On the other hand, they did not mention the risks of accidents (in fact they seemed more concerned about the edge on their tools than about themselves).

As with the idea of "manure gutters", it ought to be possible to apply experiences from other activities to indoor log house building. Problems

with wood dust are, for example, also encountered in the sawmill and other wood-related industries (Liukkonen et al. 2004) and there are solutions that utilise stationary extractors and collectors that can be directly connected to the tools. The log house builders felt that the problem was greater for them since they move around the premises. However, parallels can be drawn with the engineering industry, which carries out welding operations in different places and has extractors with movable extractor arms. By drawing on experiences of this type and appropriate organisation of the indoor work, the log house sector ought to be able to find workable solutions. Their success in moving log house production indoors depends on whether the log house builders want to work indoors and on the motivation to actively seek improvements.

Experiences that have been gathered concerning suitable designs of premises for the production of log houses must be regarded as guidelines. They may provide a platform for companies that plan to begin handcrafting log houses indoors. In order to create attractive work indoors, the log house sector, needs to take advantage of people's knowledge, experiences and inner motivation.

5 Conclusions

The overarching conclusion to be drawn is that it cannot be said that working on traditional production of handcrafted log houses becomes more attractive if it is moved indoors.

- Moving the same type of work, i.e. the production of handcrafted log houses, from its traditional outdoor setting to an indoor location affects the attractiveness of the work. The effects influence work conditions, work content and work satisfaction, and they are perceived both positively and negatively.
- The majority of the respondents want to work both outdoors and indoors. The indoor work will preferably take place during the winter months. There are, in addition, those who only want to work outdoors.
- By basing the design of premises on the activities themselves and taking advantage of experiences both from log house building and other activities

(e.g. the forestry and wood sector), there is scope for developing more attractive work indoors in connection with traditional production of hand-crafted log houses.

- As far as the attractiveness of the work is concerned changes in one area affect other areas. The fact that changes in one area affect other areas in the Attractive Work Model had previously been supposed and has here been demonstrated. Further research is required in order to gather general knowledge about interactions between the different areas. What effects give rise to changes within other areas and how is the comparison between indoor and outdoor work perceived within other occupations?

Notes

- 1 The threshold limit value for inhalable wood dust is 2 mg/m³ of exposure in the course of one working day (Arbetsmiljöverket 2005b).
- 2 The limit value and upper action value for daily noise exposure in the course of an eight-hour working day is 85 dB (Arbetsmiljöverket 2005a).
- 3 The vibration levels for the various models were obtained via <http://vibration.niwl.se/sv/havhem>, <http://utomhus.husqvarna.se>, and also e-mail contact with Anders J:son Cronander, Stihl on 23.05.2002.

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