

# THE VALUE OF ‘NON-VALUE ADDING’ ACTIVITY

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Lean Construction seeks to make construction more efficient through the elimination of so called ‘non-value adding’ activity. The act of labelling activity and time as ‘non-value adding’ is a value judgement which to date has been largely unexamined. Stuart Green challenged the concept of lean construction and examined the human cost of lean production in the 1990s and 2000s but did not specifically focus on non-value adding activity. This study aims to start to fill this gap in knowledge through a review of the literature and analysis of three long, unstructured interviews - extended conversations - with construction site managers to explore the activity that has been described as ‘non-value adding’. The findings indicate that during ‘non-value adding’ time (for instance driving to and from site, taking breaks, walking around site to pick up material) the interviewees plan upcoming tasks and evaluate completed work. In addition, ‘non-value adding’ time allows for team building and friendship formation which helps to build mental resilience, which is of genuine value when we consider the mental health crisis amongst construction workers. There is clearly room for improvement in the site efficiency of construction workers; however, the impact on those workers of efficiency measures should be clearly understood before being imposed to avoid unforeseen adverse consequences. This paper contends that ‘non-value adding’ activity is not without value, and that a more appropriate term should be found.

Keywords: Lean Construction, mental health, productivity, resilience

## INTRODUCTION

Womack *et al.* (1990) in their book “The machine that changed the world” first coined the term ‘lean thinking.’ Widely recognised as the ‘midwives of lean production,’ they prescribed the ‘systematic elimination of waste by all members of an organisation from all areas of the value stream’ as a means of improving the efficiency of industry. Advocates of lean construction suggest that these lean processes should be adopted in the construction industry, thus non-value adding activity and waste should be eliminated, positioning this as “a way to accomplish more with less and less - less human resources, fewer tools, less time and less physical space” (Avelar *et al.*, 2020:365). Green (1999) was the first to raise concerns about the lean construction approach in terms of the observation and control of workers and the lack of consideration of the impact of such ‘modernisation’ measures on the construction workforce. This was well before the construction industry’s issue with poor mental health came to prominence. In the UK, construction workers experience mental ill health at twice the national average rate (Alderson 2017). Construction workers are subject to stress due to long working hours and tight deadlines (Chan *et al.*, 2020),

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which can contribute to mental and physical health problems (Wang *et al.*, 2018). When construction labour efficiency is prioritised, when schedules are compressed, the opportunity for teambuilding and social support on site may be reduced. This paper therefore examines what non-value adding activity might be, and to whom does the activity not add value? It tries to establish if activity can be categorised thus, and if there is a shared understanding of these terms. It looks at how socially supportive relationships are developed on site and how the definition, and reduction, of 'non-value adding' activity might impact construction workers.

### **Lean Construction and Non-Value Adding Activity**

Glenn Ballard and Greg Howell founded the International Lean Construction institute in 1997 to disseminate lean construction principles. However, it was the Egan report in 1998 that elevated lean construction to the status of construction 'best practice' (Green and May 2005). 'Rethinking construction' (Egan 1998:22) recommended lean construction as a "powerful and coherent synthesis of the most effective techniques for eliminating waste and delivering significant sustained improvements in efficiency and quality." To implement lean construction, Avelar and Meiriño (2019:366) advise a "rigorous and systematic approach focused on waste reduction." Ohno (1988), the author of 'The Toyota production system', identified seven sources of waste: defects in products, overproduction of goods, excess inventories, unnecessary processing, unnecessary movement of people, unnecessary transport of goods and waiting time. This categorisation of waste was largely adopted by lean construction adherents; Kadarova and Demecko (2016) added 'non-utilized talents' to the list; whereas Womack and Jones (2003) include the 'design of goods and services that fail to meet the user's needs,' using client requirements to determine what adds value. One way to conceptualise non-value adding activity (process waste) in construction is to use the terms 'conversion' and 'flow.' Koskela (1992) described the activity of turning one thing into another as 'conversion.' The time spent planning, waiting, moving material about he describes as 'flow.' Conversion activity is value adding, whereas flow is non-value adding. Some flow is necessary; project planning, health and safety, environmental and quality control are all flow but are required for optimal project delivery; however non-value adding flow activity (which uses resource but does not add value to a process) should be reduced to a minimum. Womack and Jones (2003) suggested that good flow has the minimum possible non-value adding actions.

Initially, lean construction literature allocated activity according to a binary definition of value adding or non-value adding. Love and Gunsakeraran (1997:160) defined non-value adding as "any activity that does not contribute to the common organisational goal of reducing costs." Ismail and Yusof (2016:15) find that "Non-value-adding activities are pure waste during the construction process," adding that most construction activity adds no value, including waiting, delay, unnecessary movement and non-utilised talent. Han *et al.* (2012) describe non-value adding effort as that which could have been avoided with better project planning and control. They include fatigue and loss of morale as factors that contribute to productivity loss. Over time other categories of activity have developed. Some lean advocates have introduced an additional activity category: necessary, but non-value adding. Avelar and Meiriño (2019) use the example of moving materials around a site for this term. Mao and Zhang (2008) do not use value adding and non-value adding, but instead main and supportive activity. They argue that activity, such as inspection, transportation, waiting and motion, are necessary and therefore add value. On occasion, the categorisation of non-value adding activity can seem unhinged from the

reality of the construction site. Hannah (2010) includes morning start-up / discussion, restroom visits, morning coffee break, and travelling to and from lunch in the 'non-value adding' category. Green (1999) stated that Lean construction techniques were being advocated by a group of proselytisers who had not considered its drawbacks. Although lean construction is often dressed as a 'sustainable' initiative in that it reduces construction waste, it does not address the concerns of social and economic sustainability for the construction industry (Green, 2011). Green and May (2005:501) contend that the language of lean construction lacks coherence - it shifts and adopts different meaning, according to who is using it. They suggest "language is ... mobilised as a source of power" and find amongst interviewees, a disparity of interpretations and implementation of lean construction. Green has taken issue with the techniques and tools to measure and control construction workers in the pursuit of lean construction. This study focuses specifically on the categorisation of 'non - value adding' activity and the impact that this might have on the mental resilience of construction workers.

Organisational concepts have drifted away from their original conception as they are adopted and diffused; greater clarity could be established on what is implied by the terms 'lean construction' and 'customer value' (Jorgensen and Emmitt, 2008). Chan (2013) cautions against complacency in the use of language, using taken for granted terms in construction research without first examining whether they are still accurate or relevant, and whether there is a common understanding of what they mean. Johanssen and Osterman (2017:6903) find a "lack of conceptual consistency" amongst proponents of lean construction, suggesting that the intention of Lean manufacturing systems may be very different from the implementation of these systems in operation. They compared lean trainers' conceptions of 'value' and 'waste' in four case study locations. Some trainers interviewed took a reflective view of waste and value, classifying some work as 'non-value adding but important,' interpreting these terms according to context and operation. Some trainers adopted a mechanistic, rule-based interpretation, which was found to be appropriate only for repetitive, simple tasks. The terms 'waste' and 'non-value adding' can mean different things, depending on their interpretation. The concepts of 'waste' and 'value' do not have an agreed, shared definition amongst Lean Construction practitioners or researchers, leaving a lot of power in the hands of those who decide the meaning of these terms and how they are used to implement lean processes.

### **Construction and Mental Health**

Construction workers in the UK experience mental ill health at twice the national average rate (Alderson 2017). In recent years, there has been more of an industry focus on mental health promotion, with a number of high-profile awareness campaigns (Kelly, 2019) and mental health first aid becoming more common on construction sites. Construction commonly uses a transient workforce, with constantly changing sites and teams, which has a higher turnover of colleagues than most industries and consequently less opportunity to form close bonds. This can lead to feelings of isolation and a lack of belonging amongst the workforce (Geter, 2019). Construction News' 2019 mind matters survey found that working long hours, job uncertainty, tight deadlines, financial pressures and working away from home were among the top factors that adversely affected mental wellbeing (Kelly, 2019). Travelling distances can lead to time away from families and support networks (Lingard and Turner, 2015) rendering the support available from colleagues and co-workers even more crucial. Lingard and Turner (2015:30) found that long working

hours hindered the adoption of a healthy lifestyle for construction workers in Australia. They suggest “health promotion programmes should...address physical and psychosocial risk factors in the construction work environment.”

Love *et al.* (2010:654) observed that poor mental health was more prevalent amongst contractors than consultants, with contractors significantly more likely to believe that “the people where I work do not care about me”. They found that support in the workplace was very important to the mental health of those working for contractors. Chan *et al.* (2020) examine the risk factors for poor mental health in construction through a systematic review. They identify risk factors including hours worked per day (excess of 60 h per week), work overload/quantity of work, and increased work speed/pressure, little social support from colleagues/immediate supervisors, little relationship with colleagues/co-workers and little opportunity/ability to participate in decision making. These factors can be summarised as increased work pressure, a lack of social support, and a lack of autonomy. Poor work life balance in construction with a long working hours culture is a major contributor to mental ill health (Kotera *et al.*, 2020). Kotera *et al.*, suggest that psychological safety can be enhanced by fostering trust and facilitating communication on site. Chan *et al.* (2020) identified the factors which can help protect against mental ill health to include caring, appreciation, encouraging, building teamwork, and communication skills; creating a sense of involvement among employees; and encouraging quality relationships among colleagues; Love *et al.* (2010) characterised these type of mechanisms as ‘work support.’ Marital status was cited by Kamardeen and Sunindijo (2017) as a protective factor to mental ill health - they suggest that the need for scheduled coffee breaks and casual gatherings is greater amongst unmarried operatives.

Karasek and Theorell (1990:69) state, “Social support at work refers to overall levels of helpful social interaction available on the job from both co-workers and supervisors,” and suggest that physiological demands at work can be mediated by coping mechanisms. Few studies that specifically look at the contribution of social support to good mental health in construction could be found, however Hansson *et al.* (2016) examined this factor in relation to Swedish police officers. They found that high levels of psychological strain were correlated to low levels of workplace social support, and that low levels of social support were more likely to be found amongst male than female officers. They suggest that social support can help buffer between sources of stress at work and poor psychological outcomes. When examining resilience amongst nurses, Cusack *et al.* (2016) found that relational factors were important, including fostering collaborative relationships, open lines of communication with opportunities to feedback to line managers and an input to decision making. Wang *et al.*'s (2018) systematic review of loneliness and social support as a factor for mental ill health found a significant relationship, although this review was in the context of mental health in general, not specific to the workplace or construction in particular. Bovier *et al.*'s 2004 study suggests three ways that social support might help mediate stress - as a direct positive effect on mental health, as an indirect effect, promoting coping strategies, and as a buffer effect, reducing the negative effects of stress on mental health. They find that “social support exerts its beneficial effect by strengthening internal resources and/or diminishing perceived stress” (2004:169).

Construction workers spend a lot of time in each other's company (Geter 2019) - sometimes more time than they get to spend with their families. This combined with the industry's emphasis on teamwork can lead to a feeling of ‘brotherhood’ and

connectedness. Geter also cites the ‘informal support and communication systems’ on site as a key protective factor to poor mental health in construction. Construction News’ 2019 mind matters survey found that more respondents (32.6%) felt comfortable talking about their mental health with co-workers on site than with any other source of support (Kelly, 2019). Ajayi *et al.* (2019) find that improving teamwork and collaboration is an effective strategy to alleviate stress in construction. In 2006, Lingard and Francis examined the role of social support - from supervisors and colleagues - as a moderating force on burnout and stress in construction. They found that employees with supervisory and co-worker emotional support were less prone to emotional exhaustion. They concluded “Interventions designed to alleviate or prevent employee burnout in the construction industry should focus, at least in part, on the creation of a supportive work environment” (Lingard and Francis 2006:194).

## RESEARCH METHOD

A desk based narrative review of recent peer reviewed research into lean construction, construction efficiency measures, mental health in construction and the importance of social support to good mental health was undertaken. This established a gap in knowledge and identified themes that are explored in the following investigation. Lean Construction research tends to take a rationalist perspective, missing much of the unique, lived experiences of individuals who work in construction. In contrast, this study adopts an interpretivist perspective, examining the meaning of terms held by site managers in the context of their experience of working on a construction site. In common with the approach adopted by Green and May (2005) and Johanssen and Osterman (2017), the study holds that concepts emerge over time and take on a different meaning according to an individual’s experience and environment. Site managers are interviewed; as Chan (2013) suggests, lay people are “probably much more knowledgeable (aware) about what [is] going on around them than the experts (including policy-makers and academics)”. As a preliminary sample of convenience, three site managers were chosen for interview, and long unstructured conversations based around their typical working day were recorded, transcribed and analysed. In the analysis that follows, patterns were identified, and themes actively generated by the researchers using thematic analysis as described by Braun and Clarke (2006). Direct quotations are used where possible to illustrate themes and allow the respondents to speak for themselves.

## FINDINGS

### *Traveling to and from Work*

All three interviewees have to travel some distance from home to work, leaving home early (5:30 am for interviewee 1, 6:10am for Interviewee 2 and 5:50 for interviewee 3); and getting home late (leaving site at 4pm and getting home for between 6 and 7pm). This long working day means that there is less time to socialise, see family and engage in activities outside work. By the time he gets home, interviewee 1 is “wrecked and starved.” Two of the interviewees gave others lifts to and from the site. They both agreed that there was less talking in the morning - “its pitch-black dark there so there wouldn't be a pile of chatter in the van”, but “there's a bit of banter on the way home now; there'd be a bit more chat.” On the way into work, interviewee 3 plans his working day. “When I've been driving, I've been thinking right I have such and such a person to meet, I have such a thing to order... You know... you kind of mentally get yourself ready for the day. You're thinking ... what's ahead of you.”

### *Clocking in and Out of Site*

Once on site, two of the interviewees used new face recognition clock in / clock out machines for themselves and their workforce. They report that most of the operatives didn't mind using this new technology (once initial teething problems had been fixed), although some of the operatives either forget to, or deliberately don't, clock out at the end of the day. Interviewee 1 thought that "In the future...everybody is going to be biometrically tracked and traced, you know, it's going that way." Interviewee 2 referred to some subcontracted workers who had criminal records, who were reluctant to give their fingerprints to use the system. The site manager knew about their criminal records but observed that these workers in particular distrusted the system.

### *Morning Tea Break and Lunch*

After starting work on site at 7am, the first break of the day for all interviewees is a morning tea break at 10am, lasting 20 minutes. Interviewee 3 found it hard to switch off in this break, finding himself instead catching up with paperwork most days. When asked if this break could be eliminated, to shorten the working day, interviewee 1 replied "the men are on their feet all day...You couldn't take it away, for you leave the house at half five in the morning, and you get nothing to eat until ten o'clock here. You couldn't lose that tea break...you're gunning for food." This illustrates the importance of food in the day; as interviewee 3 says, "it gives you that wee bit of a boost of energy you know getting a wee bit of sitting down time - keeps you going for the rest of the day." Lunch on all the sites is between 1:00 and 1:30. During the tea and lunch breaks, the operatives sit in their welfare units, eat, and talk. The site managers agreed that on their sites the operatives got on well. All three site managers found themselves planning tasks, catching up with emails and planning the next stage of work during their tea and lunch breaks. This can create distance between the site manager and operatives. One of the site managers makes a point of bringing hot food for the operatives on a Friday and sitting to eat with them, he thought it is important to engage with the men on his site, and sees getting to know and socialise with his crew on site as a key element of team building. This site manager is also a mental health first aider and he sees this as a key part of his role.

At the end of the lunch and tea breaks, some of the men take 5 minutes more than others getting back to work; others go for a smoke break. According to interviewee 1, smokers did get more breaks than non-smokers - "after tea, he's standing down the smoking area for another 10 minutes or so - you get more productivity out of the men that doesn't smoke." All interviewees took the same approach to this - they felt that it was better to indulge five minutes or so of extra time as that way "you'd get more out of the men" than "go down and shout and gulder." They all felt that "you have to try to get the best out of people" rather than being "constantly on their backs"; if the men were antagonised needlessly, "they would be pulling against you."

### *Non-Value-Added Activity*

Interviewee 2 said that waiting for information from the design team could be disruptive to the 'flow' of work on site and could be stressful. Asking for information from the designers and being 'drip fed' was one of the more frustrating aspects of managing his current site. The importance of setting the right levels on site to avoid excessive excavations, a site setup where materials were stored securely, but close to the work area, and appropriate use of plant on site were cited by interviewee 3 as a way to avoid non-value adding activity - he summarised this as having "a well-managed site." Interviewees 2 and 3 referred to defects and correcting mistakes as the most regularly occurring non-value-added activity in their experience. They both said

that attention to detail, and regular supervision was important to reduce defects, and to catch mistakes and poor workmanship before they had a chance to get out of hand on site. Although it doesn't physically contribute to the completed building, every interviewee emphasised the importance of oversight, of getting out of the office, walking round the site and briefing the operatives, to maintaining a good flow of work, and the successful running of their sites.

#### *Characteristics of Productive People*

It can be difficult to tell from a single visit to site who is being productive.

Interviewee 2 illustrated this by saying, "I've come from a carpentry background, and I worked very hard. And - we used to laugh about it - but the moment you would stop for a minute to have a chat about something or whatever - most of the time you were chatting about what you're actually doing - the boss would walk round and you're standing there doing nothing." However, all the site managers said that they were able to build up a good picture of who were the most productive members of their team over time. When asked to describe characteristics that the more productive people on site share, Interviewee 1 said non-smokers tended to be able to work to a higher rate and take less breaks. Interviewee 2 said that people who played sport were fitter and had more "zest...and probably a better mental outlook as well."

#### *Pressure*

All three interviewees felt the pressure of their role, and all admitted that, at times they would feel stressed about work when not at site. Interviewee 1 has recently been promoted to the site manager role and admits that he struggled at the start. He says, "that was stressful ... getting my head round it all ...doing new tasks where you're kind of thrown in at the deep end." He continues "for a couple of weeks to start I found myself waking up in the middle of the night you know, thinking about things that you should do - what you're going to do the next day." The more experienced site managers have got better at dealing with stress over time, but still worry about work. They try not to bring worries about work home with them, as interviewee 2 puts it "I can usually go home and forget about the job unless there's something really, really negative on my neck, but there would still be the odd time when you would." All three interviewees felt the responsibility of their role as site manager.

#### *Mental Health First Aid*

The companies that the interviewees work for have all introduced mental health awareness campaigns, and all the companies have trained mental health first aiders. Interviewee 2, a mental health first aider, sees "chatting to everybody" and "getting personal with people" as an important part of this job. All three site managers claim to have noticed a difference in their companies in response to the campaigns, although two of the respondents still themselves find it difficult to admit when they are stressed or say that they are 'too proud' to ask for help. As interviewee 3 put it: "I suppose being proud you wouldn't be saying you're worried about [a problem on site] ... I probably wouldn't let them know that I'm worried about it."

Interviewee 2 does martial arts and suggested that the men on site would benefit from breathing and stretching exercises at the start of the working day. "Literally 5 or 10 minutes in the morning, and you're just getting everybody to loosen up their necks their shoulders their arms, you know. I don't know how it would be received. I might start that just myself; you know, it could be part of the considerate constructors as well." He thought this would prepare the men for the day, physically and mentally.

### *Importance of Relationships on Site*

Good working relationships, between the site managers and the operatives on site, and between the site managers and the contract managers and company directors, were emphasised repeatedly as the best way to buffer against stress. Each of the interviewees explained how they relied on another person or group of people to help them resolve issues and deal with the daily stress of their jobs - "the only thing that could lift the stress on you is having a good team." Interviewee 1 says of his contracts manager, "he is a friend. Yeah, definitely. We get on the best from the same frame of mind you know and everything. It makes a big difference, yes. When you're in a job like this... If I hadn't got AB as a contract manager, I wouldn't be sleeping any night, that would stress me out, now." Interviewee 3 also said that he would confide in and talk problems on site through with his Contracts Manager. Interviewee 2 has a team of two labourers that have been with him over a number of jobs, and who he has come to rely on. One in particular has become a friend and confidante, "oh yeah it's a friendship there ...if he would ever say he was leaving me you know, I'd be really at a loss." Interviewee 1 said, "I have CD here - we started four or five weeks ago and then his friend request came on Facebook...and we've been chatting about football and stuff like that there..." Interviewee 3 said that these friendships have developed "just with working with each other for over a period...just like, chatting during breaks, that kind of thing." Time spent on site, during breaks, and travelling to and from site, is where friendships can be formed, and team bonds built.

## **CONCLUSION**

'Successful' lean implementation threatens to remove opportunities for building relationships - swapping stories and talking about football - and forming occasions where struggling operatives can ask workmates for help. The 'water cooler moment' in the office environment has become shorthand for a place to undertake informal learning, swap gossip and build relationships. The welfare unit, the walk across site to pick up materials, or the van on the way to work, fulfils the same function for construction workers. If all activity that does not directly contribute to the construction process is eliminated, where is the 'down time' for the operatives? This study has shown that resting, breaks and interstitial time on site may seem non-value adding using mechanistic project planning, but this is not the case from the perspective of the operatives; these activities are hugely valuable.

Without thoughtful consideration of what constitutes so called 'non-value adding' activity, and to whom the activity adds value, lean construction runs the risk of exacerbating the mental health problems that are prevalent in the construction industry. It is easy to sit at a keyboard and make a judgement as to what adds value or what does not add value to a process. To analyse statistics, to look at movement tracking of operatives and write up time and motion studies. To divide a working day into pie charts and put labels onto activity. For academics to argue about the most efficient way to complete a task. In order to be able to allocate value to a person's activity, the authors hold that first you must have some understanding of the person and their daily routine, at a personal level, not as a movement, or resource, or statistic. Not as an instrument of policy or process. Clearly, this is only a preliminary study into this area; however, it has demonstrated a need for more research into work pressure, social support, and the mental health resilience of site operatives. However, in a world where language is power, the conferred legitimacy of the lean construction label can enable unscrupulous, or unthinking, adoption of waste reduction policies that make the working day more 'efficient,' reducing breaks and downtime for operatives,



and eroding their resilience. Non-value adding activity is often not without value to construction workers, this term should be retired.

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