

# CONSTRUCTION SAFETY THROUGH HOUSEKEEPING: THE HAWTHORNE EFFECT

Author<sup>1</sup>

Address

Clean and tidy sites have often been associated with positive safety cultures in construction. Poor housekeeping can result in the creation of additional hazards and dangers in the form of protruding objects which may also be sharp, and increase in situations that can lead to slips, trips and falls on sites. They also lead to uneven ground, debris, and muddy conditions, which can all lead to an increase in accidents. Housekeeping also contributes to projects being finished in a timely manner due to the fewer distractions created by the chaos. However, maintaining good housekeeping practices on site have been known to be challenging due to the rapid and complex nature of construction projects. In a research that was initiated to explore the question of 'why is housekeeping a continuing challenge in Lesotho construction?', the final outcome of site visits and observations revealed the classic phenomenon of the Hawthorne effect. Without deliberate or intentional 'interventionary' measures or demand for regulatory adherence, subsequent visits revealed a transformation in site practices specifically on housekeeping. The Hawthorne effect refers to the alteration of behaviour by the subjects of a study due to their awareness of being observed. This effect does not necessarily refer to positive or negative outcome. In this paper, the transformation that occurred with regard to the workers' practices is discussed critically in the context of this phenomenon. A key outcome of this discussion is whether housekeeping can be encouraged or improved using the notion of being observed. Finally, the ethical stance of carrying out overt or covert observations is deliberated.

Keywords: Hawthorne Effect, housekeeping, Lesotho, overt research.

## INTRODUCTION

The construction industry has many challenges worldwide. One of the major issues that continuously receives attention is safety. Safety matters vary considerably and for this reason, it is one of the difficult areas to investigate. Practitioners, policymakers and academic researchers alike share a keen interest in improving construction project safety. Safety of construction projects extends to several stakeholders e.g. site operatives, clients and the general public. People less familiar of construction project practices may find it difficult to move around on sites. For example, a client visiting a site will need clear guidance on where and how to move on site (even after a safety induction). Moving around on site is further complicated when the environment is not kept tidy e.g. obstructed walkways, toolboxes left lying around and waste materials not carefully disposed. Following up on the premise of untidy sites leading to unsafe conditions, a research project was carried out to investigate housekeeping practices and their effects on overall site safety in Maseru, Lesotho (see Emuze et al, 2016). Observations and interviews were carried out on various sites to study the proposed

---

<sup>1</sup>email

aim. However, housekeeping practices of site workers were observed to steadily transform during continuous site visits for observations. The change in behaviour was not as a result of any 'interventionary' measures. Thus this phenomenon was attributed to the Hawthorne effects. This paper explores the behavioural changes that were witnessed while conducting the described research project. This paper does not measure the level of transformation of housekeeping practices that occurred during the site visits but instead works on the premise that indeed behavioural change did occur during the observations. Additionally, this research proposes the possibilities of using the Hawthorne effect to positively influence site safety with respect to housekeeping.

### **HOUSEKEEPING AND SITE SAFETY**

Housekeeping is defined as the day-to-day cleaning and keeping tidy of a construction site (Lingard and Rowlinson, 1994). This is crucial in the prevention of accidents and injuries on site (ibid). Poor housekeeping was found to have contributed to almost half of accidents that occurred in Great Britain (Haslam et al, 2005). Untidy sites and poor housekeeping practices can lead to many types of hazards e.g. trip hazards, falling objects, and sharp objects that can cause cuts. Haslam et al (2005: 410) explain that *"from the perspective of those familiar with safety in a wide range of other industries, poor site conditions found in construction appear to be a symptom of the weak safety and risk management culture in the industry"*. Thus, good site conditions are symptomatic of a positive safety culture.

Site safety is important to all stakeholders and not only site operatives. For starters, where there is a poor safety atmosphere on site, there can be several implications ranging from the loss of a few man-hours to fatal incidents. The term safety culture is loosely used to describe the atmosphere or culture in which safety is considered and accepted to be of topmost priority (Cullen, 1990). Cooper (2000: 114) defines safety culture as the product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of an organisation's health and safety management. Furthermore, organisations with positive safety culture are characterised by communications founded on mutual trust by shared perceptions of the importance of safety and by confidence in the efficacy of preventive measures (ibid: 114).

Safety culture can be improved by empowering workers and delegating safety activities (Torner and Pousette, 2009). Key components that may be present in a positive safety culture include clear policies, goals, objectives, procedures, manuals, records and audits that are used as tools to aid continual improvement of performance (Emuze et al, 2016). The above components represent the visible (explicit) aspects of cultures. However, individual attitudes and personal beliefs of safety cultures are not visible or explicitly captured (see manifestations of culture at different levels of depth Hofstede and Hofstede, 2005: 7).

One effective method of improving the non-explicit aspects of safety cultures e.g. individual attitudes and personal beliefs, is through motivation. The motivation of workers is necessary as poorly motivated workers could make a workplace untidy, apart from the manifestation of rework, poor craftsmanship, fatigue, and poor technical supervision (Loushine et al., 2006). By teaching and empowering new workers to practice safely (including good housekeeping methods), overall safety cultures can improve considerably. Becker (2001) adds that good housekeeping eliminates many safety problems, improve morale, and increases productivity because

workers generally appreciate a clean and orderly workplace where tasks could be completed unhindered.

As discussed in the introductory section, this study aims to explore the behavioural changes that occurred during a research project which investigated housekeeping practices. To further contextualise this study, the origins of the Hawthorne effect is presented next.

## **BACKGROUND OF THE HAWTHORNE STUDIES**

The Hawthorne studies were originated in 1924 by the management of the Hawthorne plant of the Western Electric Company in Chicago, Illinois, USA (Ivancevich et al, 1997). The study was set up to investigate the relationship between illumination and productivity while the main studies, conducted between 1927 and 1933 in cooperation with the Massachusetts Institute of Technology (MIT) and Harvard University, were concerned with the effects of changes in rest pauses and workhours on productivity (Wickstrom and Bendix 2000: 363). Elton Mayo was the main instigator of the study that focused on factors affecting productivity. This concept was inspired by the work of Durkheim who espoused a conflict-free group consciousness that challenged the concept of class conflict (ibid: 363). In the investigation, the illumination was decreased step by step for the experimental subjects, the controls received constant illumination (Roethlisberger and Dickson, 1939). Both sets of participants were observed to slowly but steadily increase their performance of inspecting parts, assembling relays or winding coils (Wickstrom and Bendix 2000, 364). Once the illumination in the experimental room was reduced to a level corresponding to moonlight, the participants began to complain that they could hardly see what they were doing and thus productivity finally started to decline (Adair, 1984). Overall, the experiment revealed that lighting did not significantly affect productivity of the workers as long as it was kept at a reasonable level (Wickstrom and Bendix, 2000). On the contrary, factor(s) other than lighting were found to be more important (Ivancevich et al, 1997) and this subsequently led to later studies.

Roethlisberger and Dickson (1939) summarised the findings as follows: the factors that were considered included physical factors causing fatigue and monotony and then continued by means of four extensive experiments (first relay assembly, second relay assembly, mica splitting and bank wiring). The other factors seemed to be responsible for most of the observed change was the improved personal relations between workers and management. This conclusion was based on the annotations of the informally expressed opinions of the workers participating in the experiment, as well as on the general impressions of the investigators (Wickstrom and Bendix 2000, 364). This led to the concept of the Hawthorne effect.

### **The phenomenon of Hawthorne effect**

The initial conclusion drawn from the Hawthorne studies indicated that the increase in output was partly caused by the experimental setup and the experimenters themselves (Bryman and Bell, 2003). Hawthorne effect has now become a household concept in relation to observational research. The term is mostly used to refer to behaviour modifying effects on the part of subjects of participant observations (Wickstrom and Bendix 2000: 363). Although this concept emerged from the Hawthorne plant, its modern implications go beyond this context and as such is used in various fields of investigation (Marshall, 1994). What is considered Hawthorne effect is also referred to as 'a nonspecific effect caused by participation in a study' rather than specific

intervention measures taken (Shepard et al, 1981; Wegman and Fine, 1990) in the field of occupational health. In pharmacology, the Hawthorne effect is often compared with the 'placebo effect' (Wickstrom and Bendix, 2000). Fundamentally, most studies that have considered the observational effects on subjects believe there are changes in participant behaviour (ibid).

As stated in the introduction, this research aimed to explore the behavioural changes that occurred during observations of site practices on housekeeping and site safety. The next section discusses the method of data collection and its subsequent analysis.

## **RESEARCH METHODS**

The initial research project adopted a multiple case study approach using field observations that were supported with follow-up focus group interviews (see Emuze et al, 2016). All the project sites were located in Maseru, Lesotho. A total of four projects were considered under this study. The research was designed to capture complexity of housekeeping on the multiple project sites and also to attend to contextual conditions. The observations were specifically conducted to understand human activities and the physical settings in which these housekeeping and other safety activities occur. The observations took a structured format i.e. specific practices such as equipment arrangement and schedule of site cleaning were studied. The structure of the observation was informed by the reviewed literature on housekeeping and site safety. Although the observations undertaken had a structured format, the observers made allowances for 'unexpected occurrences'. Many existing construction management research (e.g. Rubrich, 2012; Forbes and Ahmed, 2011) and non-construction management research (Yin, 2013; Thomas, 2015) were considered when developing the data collection instrument.

As part of the studied literature, the '5-Why' analysis was used as a tool that aided the compilation of the discussion section of the initial research project (see Emuze et al (2016) for data collection and data analysis details of initial study). Site managers and other operatives were interviewed after the site observations. This paper does not focus on subsequent interviews and analysis of that data. The paper specifically focuses on the 'Hawthorne effects' during the observations of housekeeping activities. This is because the observed behaviour modifications occurred before the interviews took place, hence the decision to exclude the interviews.

Data collection was conducted by students who had undergone research and data gathering training. An 'overt' approach was used during fieldwork. Site visits were regularly conducted for a few weeks as the researchers intended to capture general practices of the workers with respect to housekeeping. The site operatives were briefed about the purpose of the study i.e. to explore site safety practices. Furthermore, it was clarified that the study was for academic purposes and hence the outcome would be used to teach up-and-coming construction professionals.

## **FINDINGS**

Many similarities were observed during the initial observations especially with respect to poor housekeeping practices. These are presented in this section. The changes that ensued during the subsequent visits are discussed later.

### **Site A**

Excess materials including construction waste was observed in many areas of the site. Notable issues that were observed on the site included:

- Poor waste segregation
- Poor storage of materials
- Blockage of the walkways by reinforcement bars from demolished walls
- Lack of proper working methods that had created trip hazards
- Poor tidying up practices that had led to electrical cables coming into close contact with flammable liquids
- Wasteful use of materials due to defects, rework and poor workmanship.

Following the initial visit, workers' practices in relation to housekeeping began to show improvement. Workers began sorting their waste into different categories. Trip hazards were observed to be considerably less and workers were showing signs of reducing waste. More importantly, the observers noted that a waste disposal which was initially situated along the walkway to the site and excess materials had been eliminated.



Figure 1: Site A images

Formatted: French (France)

### Site B

On this site, there were similar poor practices with respect to housekeeping. Some of the recorded observations are as follows:

- Obstruction of walkways due to construction waste
- Lack of appropriate cleaning instructions from site foreman
- Poor signage to alert workers and other stakeholders of potential hazards
- External authorities (municipality) in charge of intervening were ignoring poor site conditions.
- Interchanging scheduled work sequences which led to confusion and increased risks
- Construction materials not stored properly e.g. storing valuable materials yet to be used in the same location as waste materials.

The site went through a transformation as site visits continued. For example, proper signage indicating the potential hazards automatically appeared on the site.

Furthermore, a specific storage area for construction waste emerged on the site.

Before



After



Figure 2: Site B images

Formatted: French (France)

### Site C

This site possessed the least poor housekeeping practices during the initial visit. However, this site also had its challenges;

- Lack of storage facilities
- Workers' toolboxes 'littered' all over the site unattended creating trip hazards
- 'Overcrowding' of workers due to lack of adequate working space

Due to the small site space, the bulk of the project materials were stored off site. Although this was considered as good practice, the logistics of transportation and delivery of the materials stored offsite were improperly handled. The site workers seemed unprepared each time deliveries were made thereby increasing the risk of accidents.

Before



After



Figure 3: Site C images

Formatted: French (France)

### Site D

Similar to Site C, this site was relatively small and this increased the problems of creating and maintaining a tidy site. Some of the observed issues are as follows:

- Lack of adequate storage facilities
- Workers appeared incompetent e.g. forgetting to install service ducts and having to amend the mistakes thereby leading to 'double work'
- Extra (waste) materials 'littered' the site e.g. the above service ducts

- Overcrowding of workers in limited space leading to activity incompleteness
- Dangerous locations of electric cables and water pipes leading to trip hazards.

Initial improvements observed during follow-up visits included no overcrowding issues due to efficiency in worker numbers. Other issues relating to space management seemed to have been handled effectively during the follow-up visits.

Before

After



Figure 4: Site D images

## DISCUSSION

The improvements on the sites were very significant and this forms the basis for this paper. It is important to note that the focus of this paper is not to quantify the extent of change or safety improvements that occurred on the sites but only to acknowledge the change had occurred during the time of observation. From the findings, it is evident that behavioural changes did occur in housekeeping and site safety practices (see images).

Since the study was overt, it is assumed that most workers knew they were being observed. Consent for the observation was sought from site managers. Two observers visited the sites. The observers did not appear as individuals in 'imposing' positions e.g. local authority or safety inspectors. This was part of the research design in order to have workers feel at ease and not become distracted or feel intimidated about the possibility of being reprimanded for any wrongdoings that would be observed.

### Benefiting from the Hawthorne Effect

For this particular research, the behaviour modification observed was definitely positive as far as housekeeping and tidying up is concerned. This change possibly brought about a safer site. Choudhry (2014) highlights one of the main classifications of safety controls as good housekeeping practices i.e. the day-to-day cleaning and keeping tidy of all parts of the site. The proper use of personal protective equipment (PPE) is considered to go hand-in-hand with good housekeeping (ibid) but this was not a behavioural change observed on any of the sites described in this paper. This is because PPE usage was not found to be problematic on the sites visited.

As highlighted in the methods section, intervention of housekeeping practices was not part of the research objectives even though changes became apparent during subsequent site visits. Furthermore, there were no records of regulatory authority interventions or any issues in relation to housekeeping practices on all the sites. The only common denominator present on all four sites is the presence of the observers and hence it can be concluded that their presence played a role in the improvement in housekeeping and safety practices.

### **Attack of conscience**

Site managers, foremen and operatives were all aware of the presence of the researchers. The change in practices could be argued to have occurred as a result of fear of being reported for poor practices but this has been ruled out based on the empirical approach adopted i.e. using research students that did not bear any resemblance to figures of authority. Furthermore there was a clear explanation of the potential research outcome, i.e. an academic work that would lead to learning and promoting site safety practices.

Experienced workers are often knowledgeable in good safety practices as they have learnt and practiced for many years (Nicolini et al., 2013). They have 'learnt by doing' and this is the same approach they use to transfer knowledge to workers of less experience (Aboagye-Nimo et al., 2015). This type of safety knowledge is mainly tacit and as such workers may not be conscious of learning or teaching it (Kamoche and Maguire, 2011). This would lead to improving personal beliefs and individual attitudes i.e. the aspects of the safety culture that are not explicit.

Since the workers knew that the observers were on site to learn about good safety practices (which obviously includes good housekeeping), they could have been compelled to work safely. Psychologists explain that one's conscience will compel them to draw lines around what is right and wrong, proper and improper (Hitlin 2008: 1). In this case, there were already experienced workers on all the sites and hence it can be argued that they were encouraged to work safely as a result of the presence of the observers. Knowing that the observers on site were there to learn, the workers would have had to use good practices. Rowlinson et al. (1993) explain that experienced workers take father-figure roles when they are teaching less experienced workers on site. In addition, they tend to ensure that these newcomers (who possess less experience) are protected when working in this high risk environment. For this reason, the workers on site may have unconsciously led by example by using good housekeeping practices.

### **New approach to effective housekeeping?**

Involving underlings or students who are on site to study could be a useful way to have workers improve their practices. One key factor is to let the experienced workers know that they are being observed by learners. By showing the workers that the observers are not on site to report or reprimand them, they may be more inclined to work comfortably and safely without pressure.

From this study, it was acknowledged that workers worked generally safer when they were being observed by less experienced workers. Furthermore, by teaching or transferring safety knowledge, the experienced workers continually transform and review their existing knowledge. Gherardi and Nicolini (2000) explain that safety (in this case housekeeping practices) is a situated practice and as such site operatives will always have to reassess their safety practices with respect to new situations in order to be able to teach less experienced workers.

If less experienced workers or learners are included in projects, the more experienced workers would thus be compelled to use safer methods overall. Although formal setting knowledge (explicit) transfer is important in construction safety, 'on-the-job' training has been described to be more effective in many situations, especially when workers have to identify risks and dangers on site (Bartholomew, 2008). Learning this type of practical and invaluable knowledge may be taken for granted as it is mainly



implicit. On-the-job learning as a method of safety knowledge transfer offers a learner an opportunity to acquire practical wisdom that would have been missed in many other situations (Gherardi and Nicolini, 2002).

Placing a learner on site in order to compel workers to work safely is not the only factor that needs to be considered to ensure safer practices. There are several factors that need to be considered when ensuring site safety and this concept may need to be considered as part of a whole. Sawacha et al. (1999) suggest many areas that need to be considered to help improve site safety, such as eliminating time and financial constraints.

## **CONCLUSIONS**

This paper has focused on workers' behavioural changes that occurred during an exploratory study on construction site housekeeping in Lesotho. These behavioural changes, also known as Hawthorne effect were found to be as a result of workers being observed by academic researchers. Housekeeping on site improved considerably as the observers visited the sites over a given period. These behavioural changes were not propelled as a result of specific intervention measures. The workers were clearly informed of the presence of the observers as well as the aim and scope of the research.

The improvement in housekeeping practices as a result of workers being observed by individuals who are on site to learn about good practices could be used an approach to enhance site safety. The behavioural changes may be spur changes in thinking among the site operatives. Experienced workers are known to play father-figure roles on site and as such tend to teach less experienced workers how to stay safe at work.

As explored in literature, the behavioural changes when people are being observed do not necessarily have to be positive or negative. For this study, the changes observed on all four sites were positive with respect to housekeeping. In future, this method could be tested on different projects with the sole purpose of identifying whether the behavioural changes are always positive with respect to housekeeping and site safety.

## **REFERENCES**

- Aboagye-Nimo, E., Raiden, A., King, A. and Tietze, S. (2015) Using tacit knowledge in training and accident prevention. *Proceedings of Institution of Civil Engineers: Management, Procurement and Law*, 168(5), 232-240.
- Adair, J. (1984) The Hawthorne effect: A reconsideration of the methodological artifact. *Journal of Applied Psychology*, 69, 334-345.
- Bartholomew, D. (2008) *Building on knowledge: Developing expertise, creativity and intellectual capital in the construction professions*. Oxford: Blackwell Publishing Ltd.
- Becker, J. E. (2001) Implementing 5S: To promote safety and housekeeping. *Professional Safety*, 46(8), 29-31.
- Bryman, A. and Bell, E., (2003) *Business research methods*. Oxford University Press, USA.
- Choudhry, R.M., (2014) Behavior-based safety on construction sites: A case study. *Accident Analysis & Prevention*, 70, 14-23.
- Cooper, M. (2000) Towards a Model of Safety Culture. *Safety Science*, 36(2), 111-136.
- Cullen, W.D. (1990) *The public inquiry into the Piper Alpha disaster*. London: HMSO.
- Emuze, F., Linake, M. and Seboka, L. (2016) Construction Work and the Housekeeping Challenge in Lesotho. In: P W Chan and C J Neilson (Eds.) *Procs of the 32nd Annual ARCOM Conference*, 5-7 September, Manchester, UK, ARCOM, Vol 1, 497-506.

- Forbes, L H and Ahmed, S M (2011) *Modern Construction: Lean Project Delivery and Integrated Practices*, Boca Raton: CRC Press.
- Gherardi, S. and Nicolini, D. (2000) To transfer is to transform: The circulation of safety knowledge. *Organization*, 7(2), 329-348.
- Gherardi, S. and Nicolini, D. (2002) Learning the trade: A culture of safety in practice. *Organization*, 9(2), 191-223.
- Haslam, R A, Hide, S A, Gibb, A G F, Gyi, D E, Pavitt, T, Atkinson, S and Duff, A R (2005) Contributing factors in construction accidents. *Applied Ergonomics*, 36(4), 401-415.
- Hitlin, S. (2008) *Moral selves, evil selves: The social psychology of conscience*. Springer.
- Hofstede, G. and Hofstede, G.J. (2005) *Cultures and organizations: Software of the mind* (2nd edn). McGraw-Hill USA.
- Ivancevich J, Olelans M. and Matterson M (1997) *Organizational Behavior and Management*. Sydney: Irwin
- Kamoche, K and Maguire, K (2011) Pit sense: Appropriation of practice-based knowledge in a UK coalmine. *Human Relations*, 64(5), 725-744.
- Lingard, H. and Rowlinson, S. (1994) Construction site safety in Hong Kong. *Construction Management and Economics*, 12(6), 501-510.
- Loushine, T W, Hoonakker, P L, Carayon, P and Smith, M J (2006) Quality and safety management in construction. *Total Quality Management and Business Excellence*, 17(9), 1171-1212.
- Marshall, G. (1994) *The concise Oxford dictionary of sociology*. Oxford: Oxford University Press.
- Nicolini, D., Gherardi, S. and Yanow, D., (2003) *Knowing in organizations: A practice-based approach*. ME Sharpe.
- Roethlisberger, F.J, and Dickson, W. (1939) *Management and the worker*. Cambridge (MA): Harvard University Press.
- Rowlinson, S., Ho, T.K. and Po-Hung, Y. (1993) Leadership style of construction managers in Hong Kong. *Construction Management and Economics*, 11(6), 455-465.
- Rubrich, L (2012) *An Introduction to Lean Construction: Applying Lean to Construction Organizations and Processes*. Fort Wayne, IN: WCM Associates LLC.
- Sawacha, E., Naoum, S. and Fong, D. (1999) Factors affecting safety performance on construction sites. *International Journal of Project Management*, 17 (5), 309-315.
- Shepard, R., Cox, M. and Corey, P. (1981) Fitness program participation: its effect on worker performance. *Journal of Occupational Medicine*, 23, 359- 363.
- Thomas, G (2015) *How To Do Your Case Study*. London: Sage Publications.
- Torner, M and Pousette, A (2009) Safety in construction: A comprehensive description of the characteristics of high safety standards in construction work, from the combined perspective of supervisors and experienced workers. *Journal of Safety Research*, 40(6), 399-409.
- Wegman D, and Fine L. (1990) Occupational health in the 1990's. *Annual Review Public Health*, 11, 89-103.
- Wickström, G., and Bendix, T. (2000) The "Hawthorne effect"—what did the original Hawthorne studies actually show?. *Scandinavian Journal of Work, Environment and Health*, 363-367.