Institution: Glasgow Caledonian University

Unit of Assessment: 16

Title of case study: Reducing construction accidents: saving lives.

1. Summary of the impact (indicative maximum 100 words)

The researchers have delivered 10 funded studies (£700,000), 50+ peer-reviewed publications and five knowledge transfer conferences (750+ delegates). The samples presented led to materials being delivered to 100,000+ industry practitioners. Further, the international reach of UK OSH guidance is substantial, influencing Australia, Hong Kong, South Africa, and North America.
The research helped improve Occupational Safety & Health (OSH) practices in major construction companies, with global reach, e.g. MACE (3,700 employees, over 69 countries, turnover £1bn), who implemented developed practices, resulting in 30% drop in accident rates. Our 'OSH communication images' are used in CITB training, delivered to over 100,000 workers.

2. Underpinning research (indicative maximum 500 words)

Worldwide, the construction sector is one of the most dangerous. In the UK, it accounts for 5% of employees but 27% of fatal workplace injuries and 9% of reported major injuries (HSE 2010/11 figures). The resulting human and economic costs of accidents/injuries etc. are substantial.
Our researchers (three full-time academics and two international collaborators) focus on managing OSH in construction, including work specific to the UK's Construction Design and Management (CDM) Regulations, which set the regulatory framework for **OSH planning**, **worker participation** and **communication of OSH** information. A selection of projects / high quality outputs are given that have had significant impact on industry guidance / practice regarding these three OSH duties. It is difficult to make direct causal links between management activities and accident rates: however, testimony from OSH Directors (listed separately) helps confirm that the outputs of our research have contributed to the reduction in accidents.

Gateways (allied to project planning)

Funded by the UK's HSE (£97,000) in 2002 (RR263 http://www.hse.gov.uk/research/rrhtm/rr263.htm), this 18 months long project collected qualitative data via three expert focus groups and 30 in-depth individual interviews. This resulted in the development of a 'Gateway' process model and associated tools for integrating the management of OSH with construction project planning [1, 2]. Gateway process models existed before this research, but the OSH aspect was superficial. Our findings provided the first substantive description of how to integrate OSH planning with general construction project planning - as opposed to treating it as a separate safety function.

Worker Engagement (allied to participation)

Funded by EPSRC (£14,000) in 2003, 6 months (GR/S25494/01 http://gow.epsrc.ac.uk/NGBOViewGrant.aspx?GrantRef=GR/S25494/01) and HSE (£98,000) in 2006,12 months (RR516 http://www.hse.gov.uk/research/rrhtm/rr516.htm), these studies arose from recommendations in the 'Gateways' research, to link planning with participation, a step not taken by other academics developing construction process models. The ESPRC project was jointly completed with the University of Kentucky. This resulted in identification of Critical Success Factors of effective worker engagement, with recommendations for best practice. Theoretical constructs were developed, which included the need for 'motivators' and 'trust' [3] and practical strategies tested - face to face talks, informal communication and the use of a 'feedback' board - were identified as most effective [4].

Communication with Migrant Workers (allied to communication)

Funded by CITB/Construction Skills, (£79,000) in 2008 for 9 months, this project developed a specialist methodology for validating images which communicate OSH knowledge effectively, especially for those whom English is not their first language. This work was borne out of the 'Worker Engagement' research, as migrant workers were identified as a group consistently missed by OSH 'engagement' initiatives.

Before this research was published, the use of images to communicate OSH information was restricted to safety signs and posters. The use of images to communicate OSH information to a multi-cultural workforce is now becoming more common on construction projects e.g. the London Olympics. We have been commissioned to undertake further research for the Institution of Occupational Safety & Health (IOSH) and the work is on-going.

3. References to the research (indicative maximum of six references)

Gateways research Outputs:

[1] Hare, Cameron, Duff, (2006) Exploring the integration of health and safety with pre-construction planning, Engineering, Construction and Architectural Management, Volume 13, Number 5, 2006, pp. 438-450(13) (**RAE 2008 Submission**)

[2] Cameron & Hare (2008) Planning tools for integrating health and safety in construction, Construction Management and Economics, Volume 26, Number 9, 2008 , pp. 899-909(11)

Worker Engagement research Outputs:

[3] Maloney, Cameron, Hare (2006) Tradesmen Involvement in Health and Safety. Journal of Construction Engineering and Management 133, pp297-305 (**RAE 2008 Submission**)

[4] Cameron, Hare, Duff, Maloney "Improving Consultation and Worker Engagement in the Construction Industry", HSE Contract Research Report 516, published December 2006; http://www.hse.gov.uk/research/rrpdf/rr516.pdf

Communication with Migrant Workers research Outputs:

[5] Hare & Cameron (2009) Pictorial aids for communicating health and safety, Proceedings of the CIB W099 International Conference 'Working together: Planning, Designing and Building a Healthy and Safe Industry, Melbourne, Australia, ISBN 9781921426469 pp. 13 (620)-22 (629)

4. Details of the impact (indicative maximum 750 words)

These projects have contributed to improved OSH practices leading to reduced accidents in the UK construction sector and internationally. The development from 'research to practice' is catalogued below, followed by the specific impacts.

Chronology from publication to adoption in industry

Publication of the '**Gateways'** research coincided with a knowledge transfer conference with HSE and GCU at their Glasgow Campus on 24th June 2004, and joint press release. In 2005, the research team were invited to make a presentation to the then head of HS&E at the global construction firm SKANSKA's Head Offices [3]. This resulted in SKANSKA adopting the Gateway Model for OSH on all PFI and major contracts.

Publication of the '**Worker Engagement'** research coincided with a knowledge transfer conference with HSE and GCU at HSE's Head Office (Rose Court, London) on 20th September 2006, in which the then Head of HSE Construction Division spoke [7]. This was followed by a joint press release. The international Construction Project Management firm MACE collaborated with the research

team on this work and subsequently implemented the 'Feedback Board' (developed by the research team) on all sites to show how worker suggestions and requests were dealt with [6]. In 2008 the work led to guidance for HSE and CITB on worker engagement (Part of CDM 2007 Regulation guidance), available for download on the CITB website [4].

Dissemination of the '**Communication with Migrant Workers'** took the form of two pieces of CITB training material. 'Critical Safety Communication' (Module F5; CITB OSH publication 'GE700' Construction Site Safety Manual) was published 2009 [10], and delivered to 100,000+ of construction managers, supervisors and professionals as part of standard industry training. This was supplemented by a suite of pictorial tool-box-talks (GT701).

Details of subsequent impact

Health and Welfare

MACE, a company employing over 3,700 people, operating in 69 countries and with a turnover in the region of £1bn, collaborated on the **Worker Engagement** project in 2006/07. Since 2008 they used the 'Feedback Board' system in all of their sites. This has become a critical motivator, increasing buy-in from site workers and contributing to reduced accident rates; the REF period from 2008 to 2013 has seen accident incident rates (AIR) fall to 3.5, which is roughly half the industry average and about 30% of MACE's 2006 figures [6].

Skanska, another leading global player, with 56,700 employees and EUR15bn turnover have adopted the Gateway Model to plan for OSH. Their Lost Time Accident Rate for 2012 has dropped by 50% compared to 2005 [3].

General uptake of GCU research in industry is further demonstrated by **Lend Lease** and **Morgan Sindall** [9] who now have 'Feedback Boards' on all sites.

Public policy and services

The research has led to legal changes, with the **UK Construction Design and Management Regulations 2007** being modified to reflect the good practice developed. Specifically, the HSE and CITB (Government appointed bodies) and other organisations have incorporated the recommendations from the research in a number of industry guidance publications including:

CDM 2007 Industry Guidance; Annex H (involving the workforce); published 2008 (Note GCU acknowledgment at foot of last page) [4].

Construction (Design & Management) Regulations 2007: Industry Guidance for Designers (CITB-Construction Skills) with use of Gateways [1].

SaferDesign.Org: STAGE (Safety Targeted Assessment via Gateway Evaluation) [2].

Critical Safety Communication (Module F5); CITB-Construction Skills GE700 (Construction Site Safety Manual); published 2009 [10] and part of the 'Site Managers Safety Training Scheme' (SMSTS) cited in HSE competence criteria (CDM Approved Code of Practice) for construction professionals (http://www.hse.gov.uk/pubns/priced/l144.pdf).

Practitioners and services

The Critical Safety Communication (Module 5) in the Construction Site Safety Manual referenced above is now used by over 100,000 construction managers, supervisors and professionals every year, since 2009, as part of standard industry training [8]. The method has influenced the use of images to communicate OSH information to a multi-cultural workforce as common practice on construction projects e.g. the Olympics construction programme [7].

Since publication (2009), the percentage of migrant workers killed or injured in the UK construction industry has reduced from 16% to 4% [7].

International

The companies adopting the practices recommended in the research have international operations and have applied these in all of the countries in which they operate [3, 6, 9], thereby introducing the benefits of improved accident rates in construction in these communities also.

The international reach of UK OSH guidance is substantial due to the country's standing in OSH performance, e.g. influencing Australia ('Gateways' guidance), Hong Kong (worker engagement practices), South Africa (Gateways), and North America (worker engagement).

5. Sources to corroborate the impact (indicative maximum of 10 references)

Gateways

Construction (Design & Management) Regulations 2007: Industry Guidance for Designers (Construction Skills) http://www.cskills.org/uploads/CDM_Designers4web_07_tcm17-4643.pdf (makes use of the 'Gateway' approach and other concepts from the HSE Research Report 263)

STAGE (Safety Targeted Assessment via Gateway Evaluation) http://www.saferdesign.org/Pages/Research.aspx International organisation promoting safety in design with specific emphasis on the use of 'Gateways' (including the GCU model)
Benjamin Legg, Head of EHS Carillion Middle East (Formerly Head of SH&E, SKANSKA)

Worker Engagement

Effective worker engagement for health and safety; CDM 2007 Industry Guidance; Annex H (involving the workforce); published 2008 http://www.cskills.org/uploads/Annex-H-Involving-the-workforce_tcm17-10101.pdf industry guidance, written by Dr Billy Hare
Strategic Forum for Construction
http://www.strategicforum.org.uk/pdf/SFfCWorkerInvolvementbooklet0709.pdf Worker Involvement Guidance, Based on the HSE Report RR516
John Hanley Director for H&S, MACE

Communication with Migrant Workers

Kevin Fear, Head of SH&E, CITB/Construction Skills
Ian Cresswell, Director for HSE, Durkan Limited
Critical Safety Communication (Module F5); Construction Skills GE700 (Construction Site Safety Manual); published 2009; ISBN 9781857513370