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College of Engineering
QATAR UNIVERSITY جامعة قطر

Construction Safety Performance Measurement and International Applications

Dr. Murat Gunduz
Qatar University



Effective Safety Management means **Success**





Construction Safety Management

- Construction projects have complex organizational structures
- With this presentation:
 - Some international studies on construction safety performance measurement will be introduced



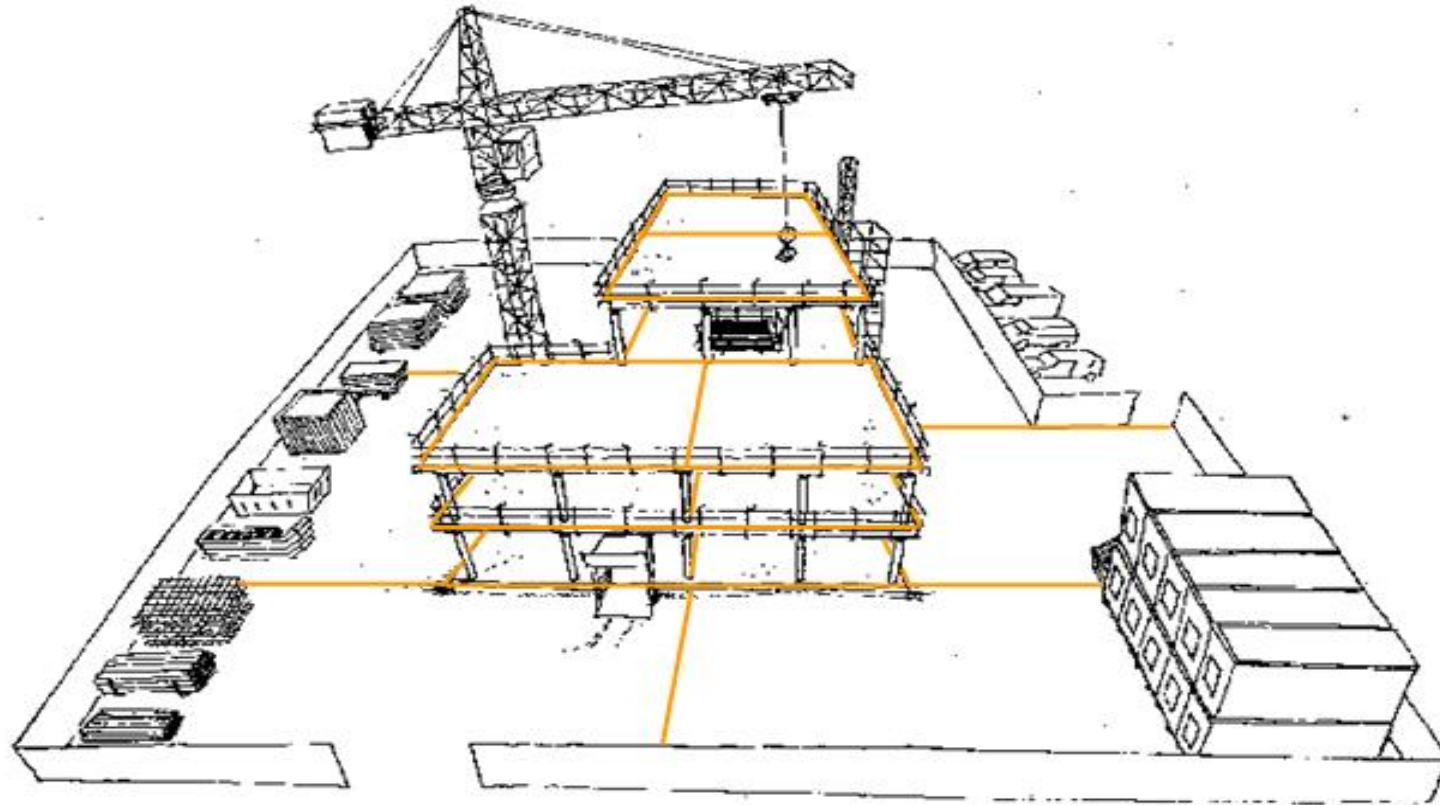
Gunduz, M. and Laitinen, H. “Observation based safety performance indexing method for construction industry – Validation with Turkish SMEs”, KSCE, Volume 22, Issue 2, February 2018, pages 1-7



Study 1



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Example of observation areas



The TR Form

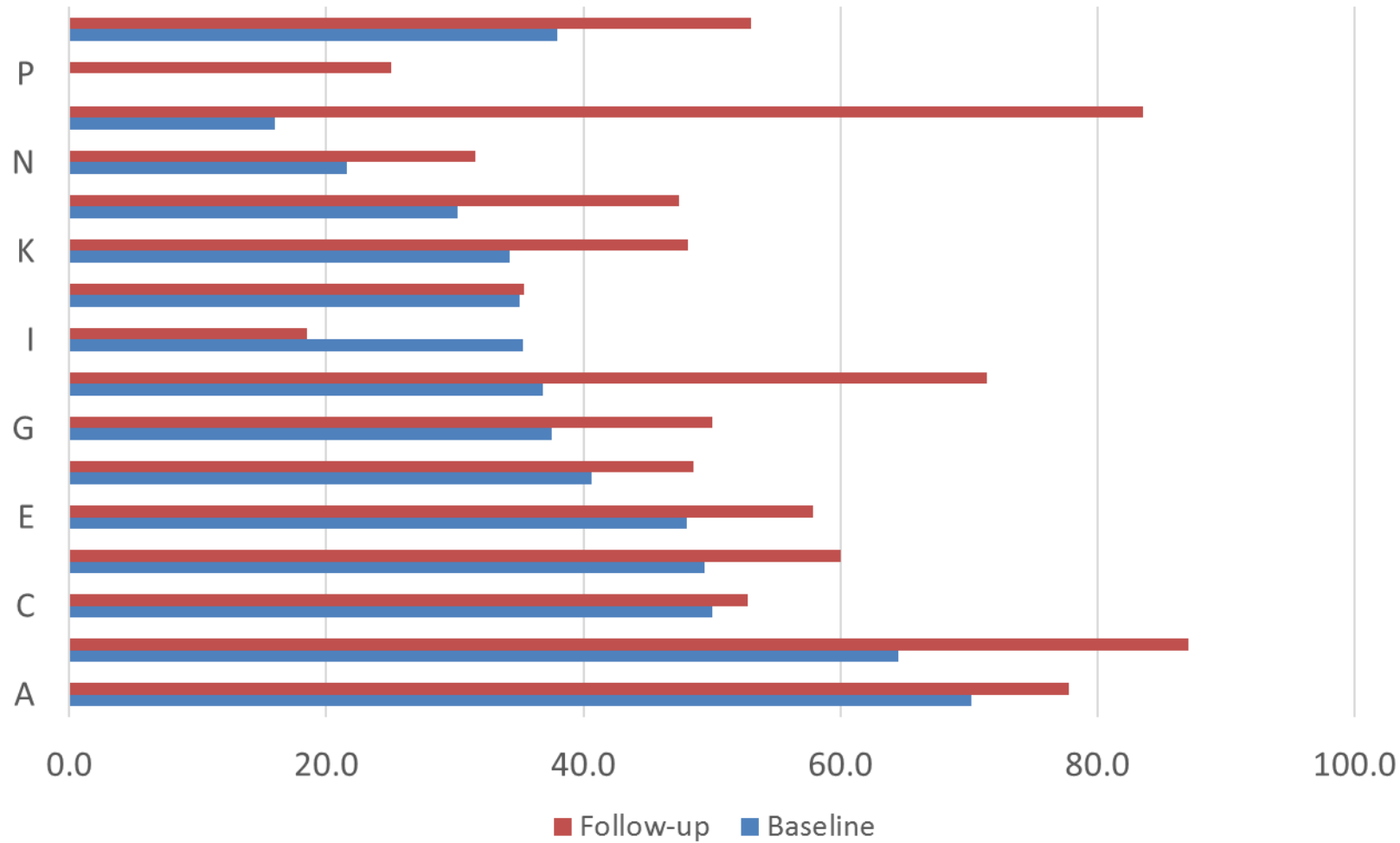
BUILDING COMPANY _____

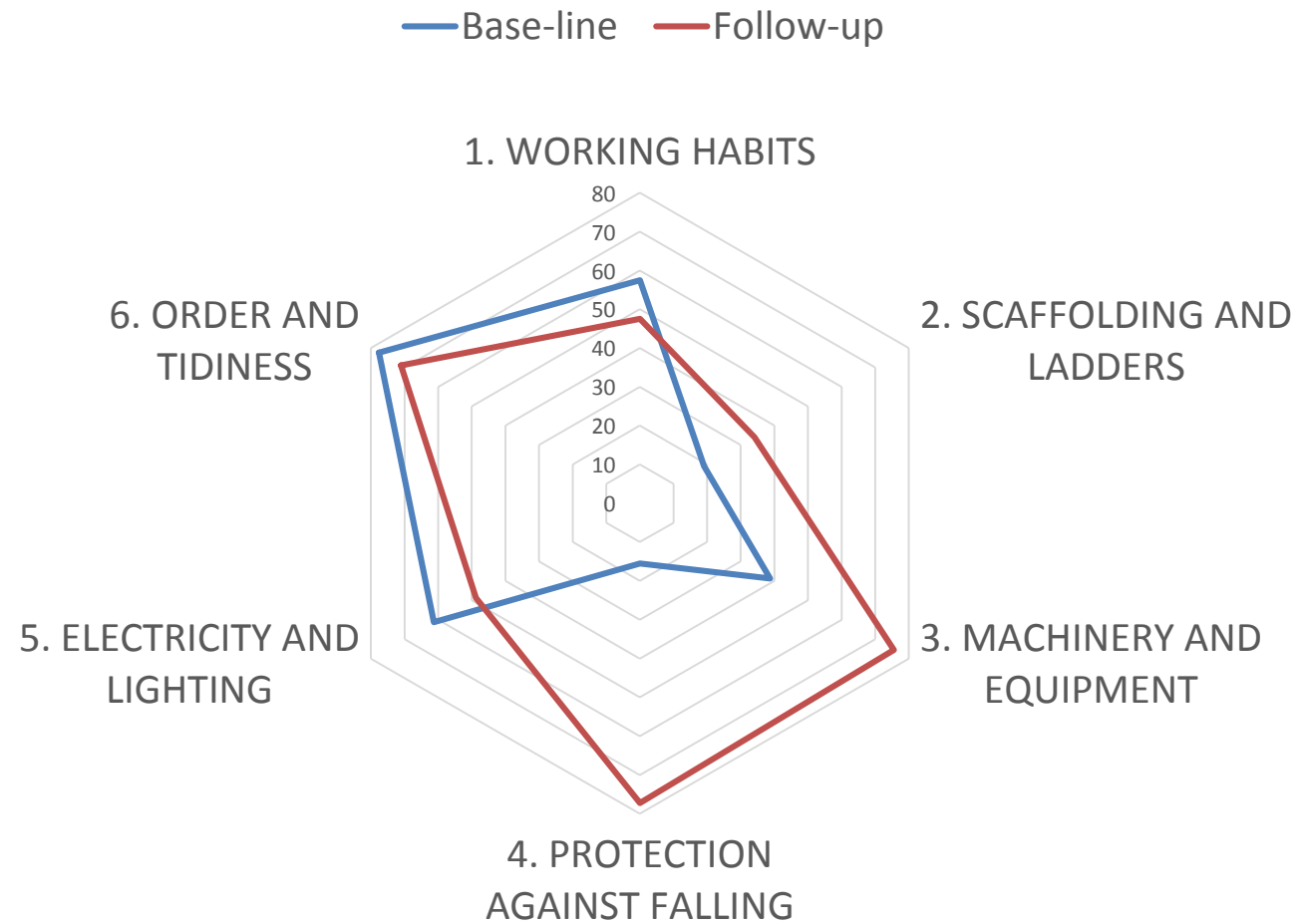
TR

SITE ADDRESS		DATE		
ITEM	CORRECT	TOT.	INCORRECT	TOT.
1. WORKING HABITS				
2. SCAFFOLDING AND LADDERS				
3. MACHINERY AND EQUIPMENT				
4. PROTECTION AGAINST FALLING				
5. ELECTRICITY AND LIGHTING				
6. ORDER AND TIDINESS				
CORRECT, TOTAL			INCORRECT, TOTAL	
TR LEVEL = $\frac{\text{CORRECT (NUMBER)}}{\text{CORR. + INCORR. (NUMBER)}} \times 100 =$		$\frac{\quad}{\quad} \times 100 = \quad \%$		
COMMENTS	OFFICER	CORRECTION DATE		

EMPLOYER'S REPRESENTATIVE _____

EMPLOYEES' REPRESENTATIVE _____







Gunduz, M., Talat Birgonul, M., Ozdemir, M. Development of a safety performance index assessment tool by using a fuzzy structural equation model for construction sites. (2018) *Automation in Construction*, 85, pp. 124-134.

Study 2



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- A safety performance index assessment software tool for construction sites was proposed by developing a site safety performance (SSP) application for mobile devices based on Structural Equation Model



Mobile Application

The screenshot displays a mobile application interface. On the left, a dashboard titled 'Uygulmlr' and 'Widget'lar' features several widgets: 'Kardiyograf', 'Çocuk Modu', 'AveaSIMservi s', 'OK Screenshot', 'QR Code Reader', and 'Site Safety Performance'. The 'Site Safety Performance' widget is selected, leading to a detailed view titled 'Full Model Area - ...'. This view includes a 'Home' button and a 'Full Model Page' button. The main content area is titled '1) SCAFFOLDINGS AND WORKING PLATFORMS' and contains three numbered items:

- 1.1 Guard rails, intermediate rails, toe boards, screens and plankings comply with the standards. A progress bar shows a value of 90, with a 'NA' checkbox below it.
- 1.2 Installation, operation and disassembly plan for the scaffolding are present. A progress bar shows a value of 80, with a 'NA' checkbox below it.
- 1.3 Fastening and supporting against horizontal and vertical forces are performed properly. A progress bar shows a value of 100, with a 'NA' checkbox below it.

Below the list, a summary box displays the 'Safety Performance Index: 51.5%'. A second section, also titled '1) SCAFFOLDINGS AND WORKING PLATFORMS', shows a 'Safety performance level of dimension: 75.5%' and a list item: '1.1 Installation, operation and disassembly plan for the scaffolding are present. Your answer: 80'.



McCabe, B.Y., Alderman, E., Chen, Y., Hyatt, D.E., Shahi, A. Safety Performance in the Construction Industry: Quasi-Longitudinal Study (2017) Journal of Construction Engineering and Management, 143 (4), art. no. 04016113



Study 3

- Accidents in Canada, Ontario between (2004-2006) and (2014-2015) are analyzed.
- These two periods are before and after statewide safety improvement strategy applications



Application

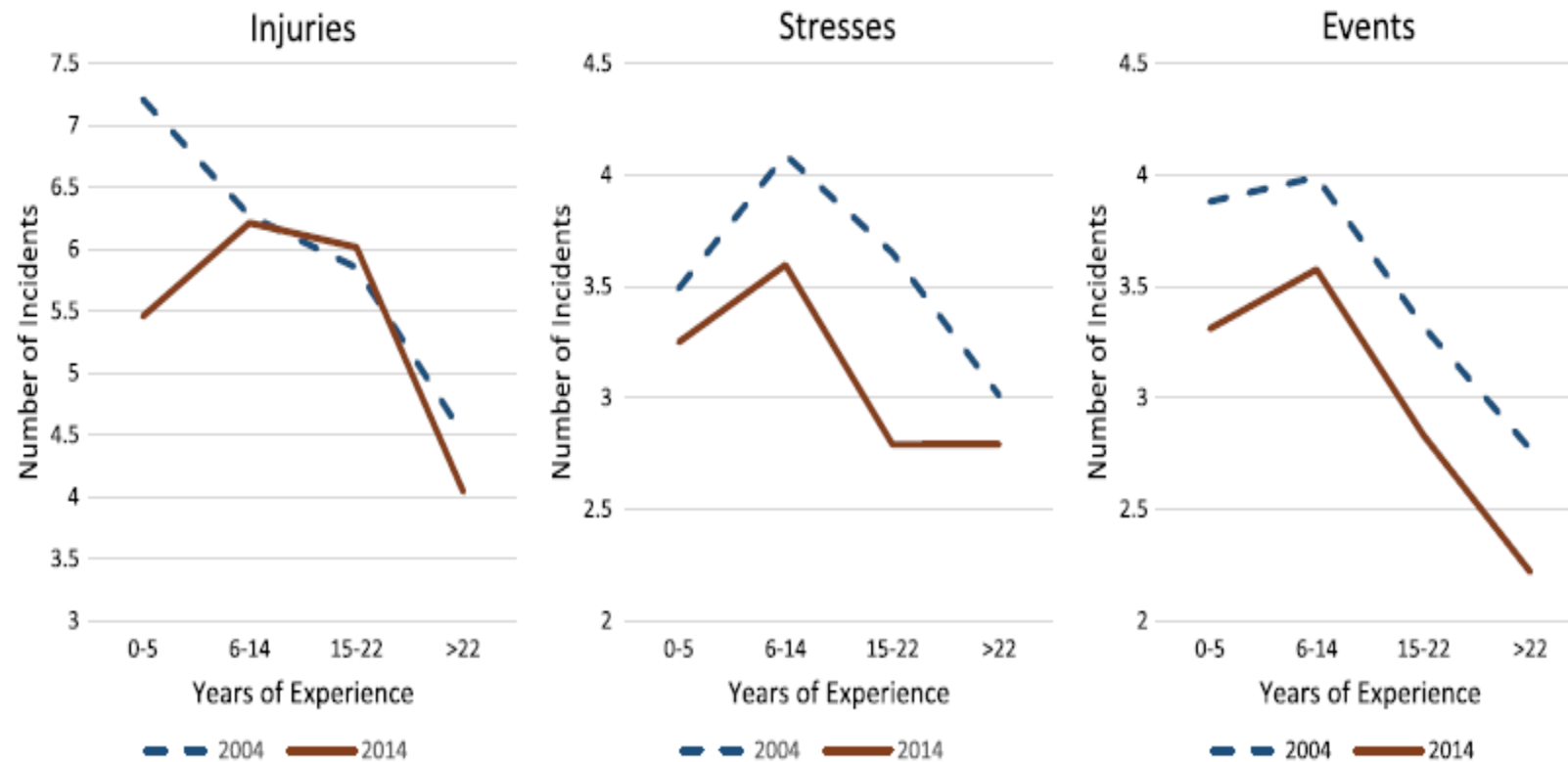


Fig. 2. Safety outcomes by experience quartiles



Lu, M., Cheung, C.M., Li, H., Hsu, S.-C. Understanding the relationship between safety investment and safety performance of construction projects through agent-based modeling. (2016) Accident Analysis and Prevention, 94, pp. 8-17.

Study 4



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- Construction site was modelled for proactive safety management



Application

M. Lu et al. / Accident Analysis and Prevention 94 (2016) 8–17



Fig. 2. Research framework of this ABM model.



M. Lu et al. / Accident Analysis and Prevention 94 (2016) 8–17

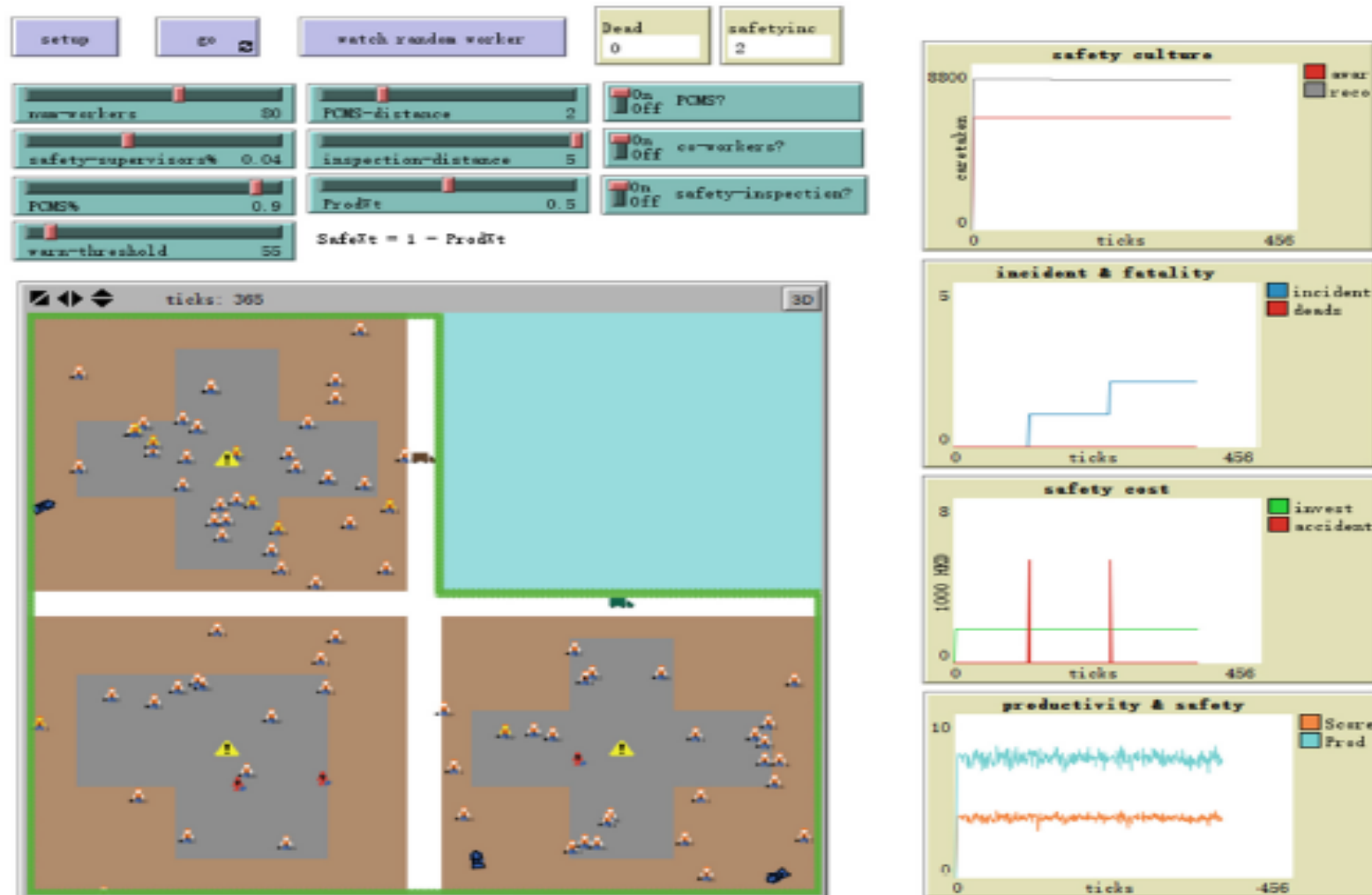


Fig. 3. World display of construction site.



Wehbe, F., Hattab, M.A., Hamzeh, F. Exploring associations between resilience and construction safety performance in safety networks. (2016) Safety Science, 82, pp. 338-351.

Study 5



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- Construction site was modelled by Social Network Analysis



Project 1

F. Webb et al. / Safety Science 82 (2016) 338–351

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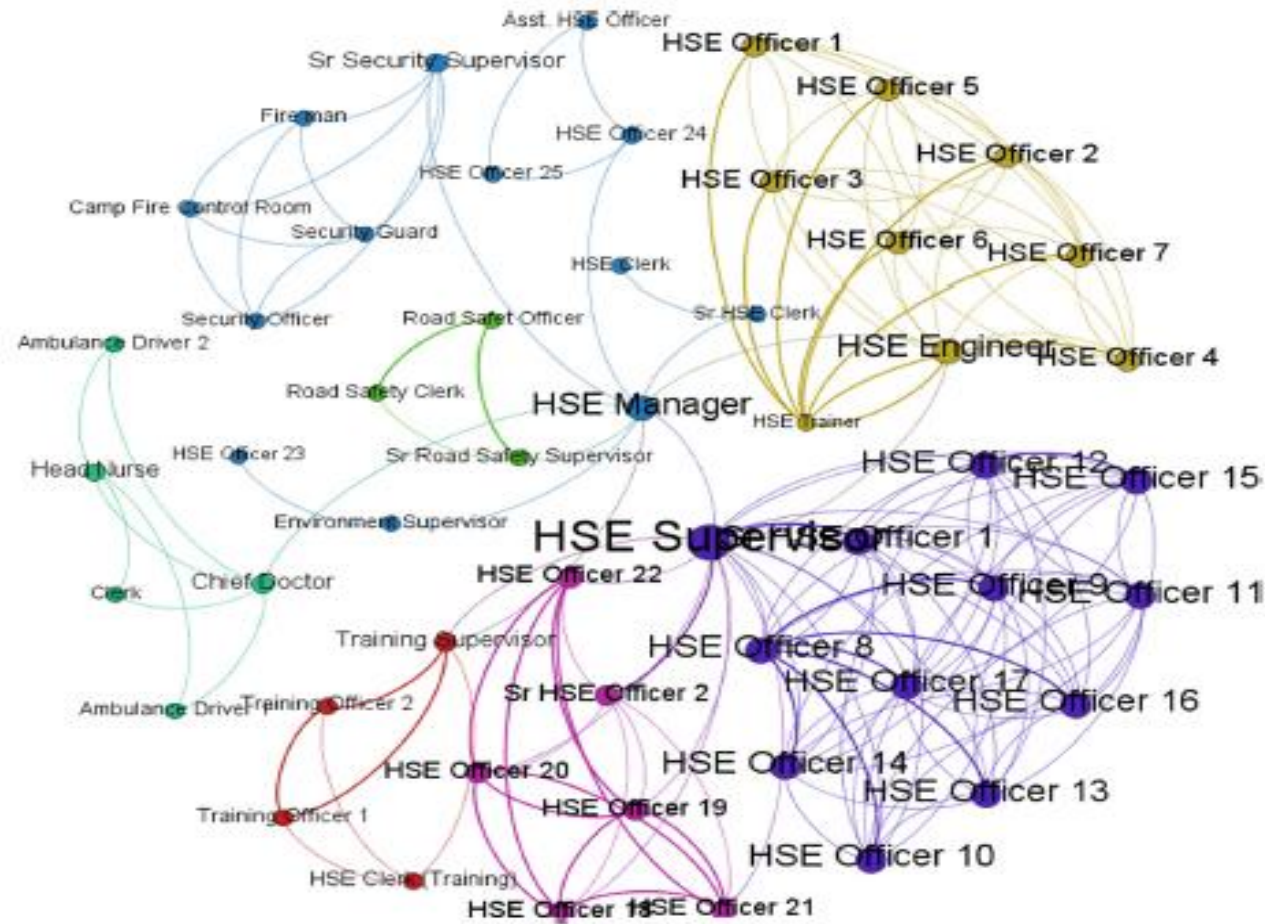


Fig. 3. Project 1 social network structure.



Project 2

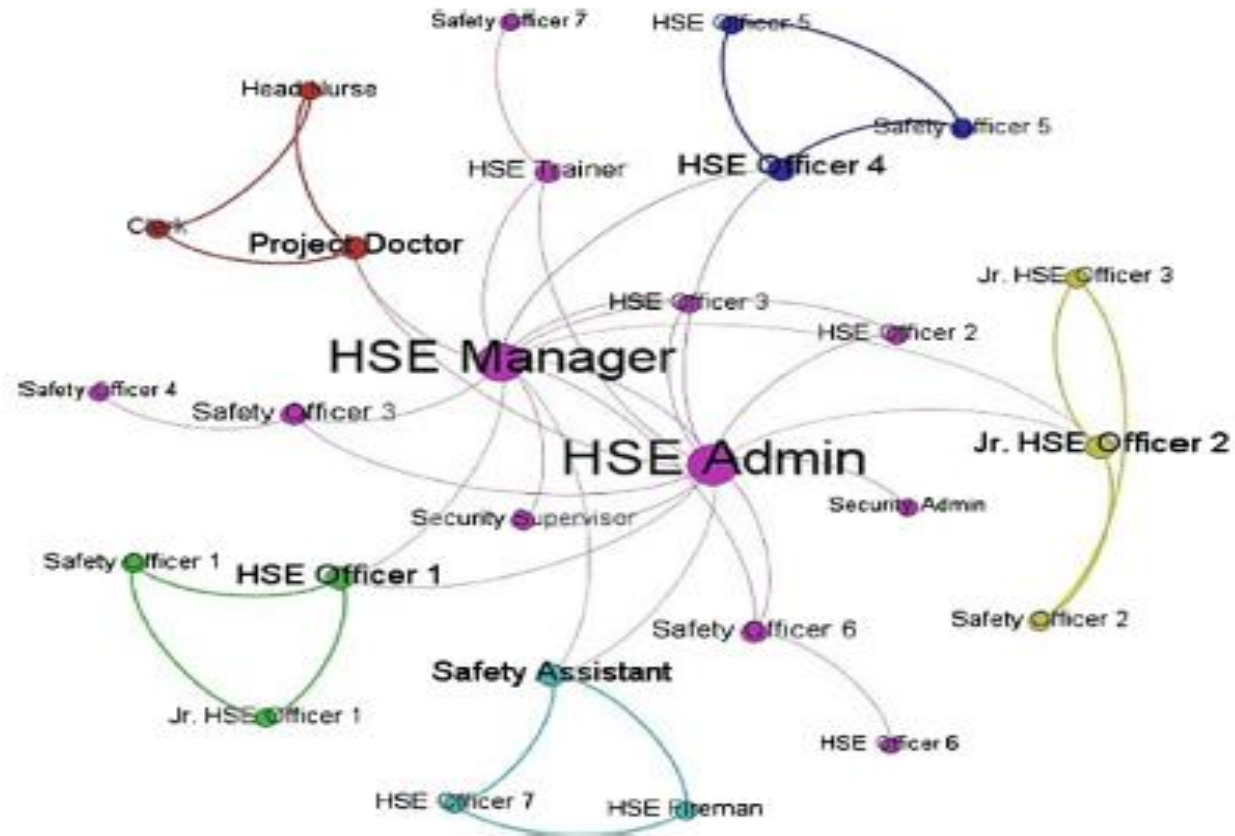


Fig. 4. Project 2 social network structure.



Results

- Construction safety performance can be measured.
- These models could be used periodically on construction sites to assess safety performance
- Safety performance targets could be used by construction sites.



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Thank you.