

Developing a safety culture maturity tool for the construction sector

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ABSTRACT

This paper details exploratory work to develop and assess a tool for evaluating safety culture maturity within Project Delivery Organisations, taking an existing safety culture maturity model and making adaptations for a multi-stakeholder organisation. Safety culture research tends to treat organisations as a single body, with less focus on the complexities of a multi stakeholder environment. One such example is a construction project, where several companies co-ordinated via contractual obligations, for a determined period of time. Existing safety culture maturity tools have not been thoroughly tested for Project Delivery Organisations. This paper establishes the relevance of existing safety culture maturity models for a multi-stakeholder organisation through the development of an updated maturity matrix tool. This tool has been trialled amongst a sample of construction projects to evaluate the impact of safety-related interventions on the project safety culture. Recommendations are made regarding the next steps for the practical implementation of this tool.

KEYWORDS

Safety Culture, Multi-stakeholder, Construction

1. Introduction

In the UK, construction is worth over £100bn and employs over 2.4million people (Rhodes, 2019). Delivering safety in construction is a complex activity. The nature of the work is inherently often hazardous (Haslam et al., 2005). It is a sector where safety has reached a plateau that still accounts for a significant number of injuries, lost working days and a fatality injury rate in Great Britain (1.31 per 100,000 workers) that is three times the all industry rate (HSE, 2019).

The Construction Industry is complex with many different organisations working together for limited periods of time to deliver projects, a multi-stakeholder environment. By definition a project is '*a temporary endeavour with a defined beginning and end undertaken to meet unique goals and objectives*' (Oxford Brookes, 2011). A common project organisation structure is developed, referred to as a 'Project Delivery Organisation' (shortened to PDO) for the remainder of this paper, as illustrated in Figure 1. A Project Delivery Organisation is established with a number of companies, co-ordinated via contractual obligations, for a determined period of time (Rowlinson 2004); key duty holders including the Client, Principal Contractors and Supply Chain.

A Principal Contractor manages the work, with the rest of the PDO comprised of a supply chain to perform general or specialist work, the majority of whom are small to medium sized enterprises (SMEs). Each member company within the PDO may have varying levels of impact on the safety culture maturity of the project dependent on the size of their organisation, prevailing safety culture, the level of significance given to a project by their company in proportion to their overall turnover and workload, and their respective position in the project social structure.

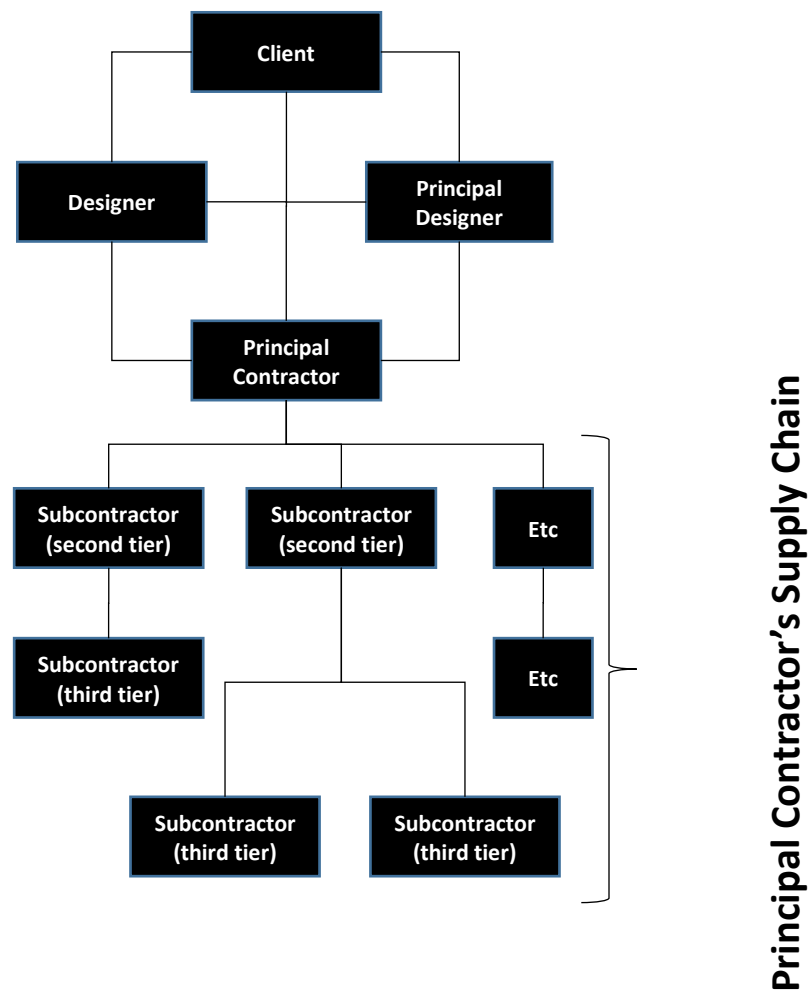


Figure 1: Typical structure of a Project Delivery Organisation

A safety culture is described as the values and beliefs of the organisation which govern how people should work and behave (Schein 1992) or '*how safety is placed as a priority within an organisation*' (Farrington-Darby et al., 1997). According to Parker et al., (2006) and Fleming (2001) the existence and effectiveness of an organisation's safety culture can be measured by its safety culture maturity.

Existing research by Cooper (2001) and Fleming (2001) has recognised that in order to have a mature safety culture an organisation needs to have a number of characteristics, which do not align with those of a PDO (Briscoe et al 2001, Briscoe and Dainty 2005, Arditi and Chotibhongs 2005). There is an unbalanced power relationship within the Project Delivery Organisation (Akintoye et al., 2000, Cox and Ireland 2002, Briscoe et al., 2001, Hinze and Gambatese 2003, Briscoe and Dainty 2005). Existing safety culture maturity models do not adequately cover the complex factors and relationships that exist within a PDO, nor evaluate the impact these have on safety culture maturity. Stiles et al., (2018a) identified the need for development of safety culture maturity models that are more appropriate for PDOs due to the complex socio-technical nature of these organisations.

The lack of guidance for a multi-stakeholder environment has been recognised by some industry representatives. A number of Senior Managers have made contact with the author seeking improved

guidance on how to measure safety culture for a PDO, which would help inform prioritisation of resources and attention moving forwards. Therefore, this paper describes development work to prepare an updated maturity matrix tool that can be used to evaluate safety culture within a PDO.

2. Approach

The overall approach taken is in a number of stages: the development of the tool (steps 1 and 2), the trial of the tool (step 3) and the evaluation of the effectiveness of the tool (step 4) as shown within Figure 2.

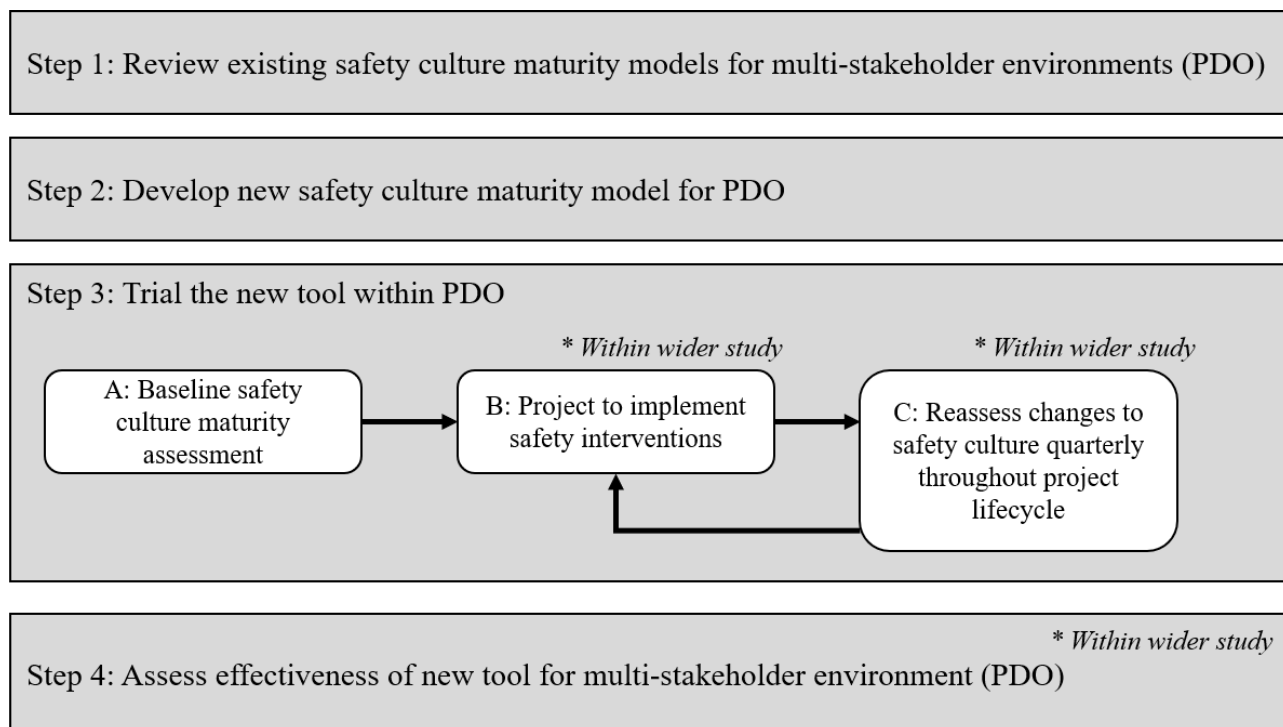


Figure 2: Overall approach taken to assess the effectiveness of the tool

This paper details steps 1, 2 and step 3A baseline assessment of safety culture maturity. As several projects have some months ahead prior to project completion, data collection relating to safety interventions and ongoing maturity assessments is ongoing. Based on ratings against specific criteria, the use of the tool will also support each of the projects in having a project-specific safety culture intervention plan (Step 3, part B as indicated within Figure 2), with the tool being used on an ongoing basis to assess progress.

2.1 Methods within Step 1 and Step 2

A maturity assessment tool specifically aimed at PDOs has been developed based on the work of Parker et al., (2006). Similar to other maturity models (Reason 1997, Fleming 2001), Parker et al., (2006) identified five levels of safety culture maturity. Each of the five levels were described against 18 of different organisational safety management arrangements. Column 1 within Table 1 identifies all 18 criteria.

The development of the tool within this exploratory work, involved reducing the 18-point criteria from Parker et al (2006) into 11 aspects. This selection was based on criteria which would be managed by a PDO and not managed by a parent company away from the project. Those criteria

managed by the PDO would remain. These are listed within column 2 of Table 1. The criteria for each of these aspects were based on the principles of previous maturity models with descriptions adapted to suit safety management arrangements within the construction sector. For example, hazard and unsafe act reporting was renamed near miss, close call and unsafe act reporting.

Table 1: Comparison of criteria retained within new tool for assessing maturity with PDO

Organisational Safety Management criteria (Parker et al 2006)	Criteria relevant to PDO and adaption of key terms to suit PDO
A. Is management interested in communicating HSE issues with the workforce?	Management visibility and commitment
B. Commitment level of workforce and level of care for colleagues	Attitude of the workforce
C. What are the rewards of good HSE performance?	Rewards and recognition
D. Who causes accidents in the eyes of management?	Culpability for accidents
E. Balance between HSE and profitability	Prioritisation of safety
F. Contractor management.	Contractor selection and management
G. Competency/ training – are workers interested?	<i>Managed away from PDO</i>
H. What is the size/status of the HSE department?	<i>Managed away from PDO</i>
I. Work planning including Permit To Work, Journey Management	<i>Managed away from PDO</i>
J. Work-site job safety techniques	<i>Managed away from PDO</i>
K. What is the purpose of procedures?	<i>Managed away from PDO</i>
L. Incident/accident reporting, investigation and analysis	Accident and incident reporting
M. Hazard and Unsafe Act reports	Near miss, close call and unsafe act reporting
N. What happens after an accident? Is the feedback loop being closed?	Feedback and communication cascade
O. Who checks HSE on a day-to-day basis?	Monitoring of safety
P. How do HSE meetings feel?	Engagement in safety meetings and forums
Q. Audits and Reviews	<i>Managed away from PDO</i>
R. Benchmarking, Trends and Statistics	<i>Managed away from PDO</i>

The five levels of maturity within this tool are summarised below.

- **Level 1 Infancy** - Awareness of behavioural safety programme principles is still in its infancy. Lack of attention on behaviours and limited evidence of implementation. Some Supply Chain partners have little involvement in behavioural safety, their understanding and exposure is limited and mainly driven by the Principal Contractor.
- **Level 2 Developing** – Project specific behavioural safety plan developed and implementation is underway. Understanding from management on how their contribution impacts on achieving behavioural and cultural change. Employees have attended behavioural safety training. Workforce have received behavioural safety briefings and ad hoc near miss reporting and promoting safe behaviours is beginning to occur.
- **Level 3 Evident** - Active engagement of Directors, Managers and employees in behavioural safety programme is apparent. Leaders' commitment is unmistakable through development of relationships at every level. Working in a safe manner at all times is now becoming the norm. Issues from the workforce are dealt with and fed back to individuals following actions.
- **Level 4 Established** - The key characteristics of behavioural safety programme are present at all levels including parts of the supply chain. Leaders demonstrate role model behaviour to

safety. There is a strong rapport between all employees who genuinely want to protect each other from injury. Active behavioural safety approach is used by Supply Chain partners are engaged in behaviours at project and Leadership level.

- **Level 5 Excellence** – Behavioural safety programme is embedded within the day to day activities and there are high levels of engagement across the organisation. Working unsafely is not tolerated at any level. Supply chain partners are self-sufficient in their approach to behavioural safety. Recognised as a world class performer with regard to behaviour, culture and continuous improvement.

2.2 Methods within Step 3 and 4

An explanatory case study approach was undertaken across 24 live projects for one Principal Contractor Organisation.

Once the maturity assessment tool had been developed it was introduced to the 24 live construction projects. Each project was asked to review their project safety culture maturity using the tool within the first month of issue and determine a level of maturity that best describes their project – the baseline assessment (step 3A as identified within Figure 2).

The specific actions relating to the initial trial of the tool are listed below.

- I. The trial involved briefing representatives from each of the Project Management Team individually how to use the tool. For each Project the briefing included a general overview of safety culture, followed by details on the criteria describing each of the different five levels shared as a number of different descriptive statements.
- II. Project Managers from each PDO would select the statement(s) that described their project.
- III. These were then organised into corresponding maturity levels using the maturity matrix.

Each project will revisit their initial assessment 3 months later, repeated every 3 months for the duration of the project, to again determine their maturity level. These records were collated quarterly and used within the wider study (but excluded from the scope of this paper).

To evaluate the value of the tool, a question set for semi-structured interviews was prepared. 10 telephone interviews were undertaken with a purposive sample of Project Management representatives from the Principal Contractor. Each participant was provided a copy of the interview questions in advance of the interview which are listed below.

- What does safety culture mean to you?
- What are the main differences between project safety culture and company level safety culture?
- How do you usually measure your project's safety culture?
- What are the challenges in measuring your project's safety culture?
- With reference to the Project Maturity Matrix, does this help you to assess your project safety culture?

A telephone interview was carried out at an agreed time lasting 20-30 minutes duration. This was recorded with consent from the participant. Confidentiality and anonymity of information provided was maintained during this process. No findings from previous interviews were discussed with other participants.

Progress on steps 3B, 3C and step 4 are not included within this paper, due to the duration of the projects included within the sample. The data collection outlined within step 3 is continuing and a

detailed evaluation of the Project Maturity Matrix in comparison with the Project Intervention Plan will be undertaken as part of the next steps within study.

3. Initial Findings

Feedback from early trials of the new tool tailored to a PDO, found that a Project Maturity Matrix was reported to be useful for project management teams as a consistent measure of project level culture and help identify areas of improvement. Difficulties in measuring and improving safety culture within a PDO were consistent with the literature, recognising the challenges of PDOs including high reliance on contractisation (HSE 2003), leadership prioritisation of safety (Akintoye et al., 2000), leader and worker trust-based relationships (Cox and Ireland 2002, Hinze and Gambetese 2003), and the varied level of engagement with the workforce on a project by project basis (Briscoe et al., 2001, Briscoe and Dainty 2005).

The Project Management selected the relevant statements to describe their project maturity, taken from the 11 aspects covered within the Maturity Matrix (as outlined in Table 1). It was common for four of these areas not to be selected across the PDOs; contractor selection and management and their subsequent engagement in safety meetings and forums held by the Principal Contractor was often not chosen as a description of a project. Attitude of the workforce and prioritisation of safety were also not reported as being strong or commonplace across the projects.

The baseline data identified that half of the projects rated themselves around a level 2 maturity (12 out of 24 projects). These projects had an Intervention Plan which was starting to be implemented, with managers aware of their impact on behaviours on site. There had been some behavioural safety training, with encouragement of safe behaviours and near miss reporting starting to occur.

Individual projects were reported to be focused on the behaviours of those working on the site. At project level there was reliance on workers, not always directly employed, possibly on site for short duration, each taking ownership for their safety whilst on that site. Safety culture can vary significantly from project to project largely due to the supply chain present on each project.

At a company level the focus was reported to be on leadership and creating an environment for the right behaviours and attitudes. In practice the level of commitment and attention to achieving this can vary across any business due to the prioritisation of safety from individual leaders. This can have an impact on project level safety culture where if prioritisation of safety is low, there will be more focus on productivity.

Eight of the ten interviewees stated that Maturity Matrix would help them to provide a consistent measure of project level culture and help identify areas of improvement. One interviewee was undecided as the matrix was only recently introduced, and one interviewee identified a poor level of maturity amongst a specific project team who were resistant to any form of performance measurement.

4. Recommendations

As part of exploratory work, the development and deployment of a Project Maturity Matrix as a specific tool for use within a project-based environment was undertaken. The next stage of the work is to continue with steps 3 and 4 (contained within Figure 2) throughout the whole lifecycle of a PDO, taking quarterly assessments of safety culture maturity and maintaining an up to date Project Intervention Plan. Upon completion of the projects, it would then be appropriate for detailed comparative analysis of the level of safety culture maturity within each PDO; and relate any change (either positive improvements or deterioration) to the interventions being deployed on the project.

Further work could also look to trial the Project Culture Maturity Matrix on a wider scale across more PDOs for different Principal Contractors with the aim to determine whether a Maturity Matrix adapted for a multi-stakeholder environment is a valuable tool for Project Management within the Construction Industry.

Whilst case studies are useful in developing and refining concepts and can lead to generalisations across multiple case studies (Yin 1994), undertaking the study solely with participant solely from one Principal Contractor organisation could be a limitation. A further potential study limitation would include the small participant sample size. Both of these aspects may introduce bias into the study. For future research it is recommended to increase the sample size (both number of participants and number of PDOs) giving a broader view of whether project maturity matrices are a valuable tool for a PDO within the Construction Industry.

Consideration could also be given to how can we make sure safety culture maturity tools reflects the latest safety management arrangements further to adaptations COVID working given what we know (Stiles et al., 2020).

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