Construction Workers' Perceptions of Project Sacrifice and Safety Compliance

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Abstract

Many prior studies focused on construction workers' perceptions of safety compliance, but little or no research has been undertaken to investigate the relationship between construction project sacrifice and safety compliance. Construction project sacrifice – known as '*tumbal proyek*' in the Indonesian Language is a socio-cultural phenomenon that still exists in Indonesian society. This research examines the perceptions of construction workers regarding project sacrifice and their relationship to workers' compliance with construction safety management. A mixed-method approach was employed, which consisted of integrative literature review and questionnaire surveys. In total, there were 102 valid survey responses, which were analyzed using Structural Equation Modelling-Generalized Structured Component Analysis (SEM-GSCA). The analysis demonstrates a positive relationship between workers' perceptions of project sacrifice and safety compliance. This study adds by offering empirical data on the phenomenon of project sacrifice and how workers' perceptions of it can influence the construction safety compliance in Indonesia. Although this is a context-specific study, the findings can serve as a reference for future research to enhance the safety climate in construction projects.

Keywords: construction, project sacrifice, safety

1. Introduction

Construction projects are full of risks, one of which is the risk of work accidents. Given the high incidence of work accidents in Indonesia, the construction industry's performance in preventing work accidents is still considered unsatisfactory [1]. For example, the construction sector is the leading contributor to work accident cases in Indonesia, accounting for 32% each year [2]. Various work accidents were also recorded on strategic projects, such as the fall of a 70-ton Palembang LRT crane which hit two residents' houses [3], the fall of a box girder on the Jakarta LRT project [4], and the collapse of the Cibitung-Cilincing toll road project due to human error [5].

The number of construction workers killed in work accidents has given rise to a social phenomenon known as construction project sacrifice ('*tumbal proyek*'). According to the Indonesian Online Dictionary, '*tumbal*' is a sacrifice (offering and so on) to obtain something better. Thus, '*tumbal proyek*' or project sacrifice is an action carried out by offering something to a deity, whether in the form of a human or an animal sacrifice, to ensure the smooth operation of the project. Project sacrifice is believed to be a way to avoid calamity [6]. The phenomenon of project sacrifice has been prevalent in Indonesia for a considerable time. Apart from that, the practice of construction sacrifice is also known in several other civilisations, including

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Japan, China, South Korea, and Greece.

Aside from project sacrifices made intentionally at the start of a project, there has been a growing belief within the community that work-related accidents on construction projects are considered project sacrifices. In this context, when a worker is injured or killed in a work accident, it is overlooked or considered a '*tumbal*' for the sake of the project's success. Various news reports of construction project work accidents are often presented in project sacrifice narratives, such as what happened in the apartment project work accident in Taman Pulo Indah, East Jakarta [7], the Chize Tower Setia Budi project work accident [8], and the Jagorawi toll road project work accident [9]. This shows a shift in the paradigm of project sacrifice from a ritual to seek safety in carrying out work to a work accident that causes loss of life.

This research aims to investigate the relationship between perceptions of project sacrifice and construction safety compliance in Indonesia. Although much research has been conducted on Occupational Safety and Health in Indonesian construction projects, research that focuses on the phenomenon of project sacrifice and its relationship to construction safety compliance has never been conducted. In fact, the phenomenon of project sacrifice exists in Indonesian society; thus, efforts are needed to understand this phenomenon better to enhance the construction safety compliance and prevent the neglect of work accidents, which are seen as project sacrifice.

2. Literature Review

2.1 Construction sacrifice

The practice of project sacrifice has existed since time immemorial. Several ancient cultures have documented a history of using humans as sacrifices in the construction of buildings. In Indonesia, this practice is called *'tumbal proyek'* (project sacrifice). This social phenomenon that lives in Indonesian society has also become the research object of many scholars [6], [10-16]. On the island of Kalimantan, during the last 90 years, there has been a phenomenon of kidnappings aimed at sacrificing humans to place them under the foundations of bridges or other buildings, in the belief that this will provide additional strength to the building foundations and prevent collapse [12]. Endriyani [15] examines the phenomenon of project sacrifice based on the legend of Ronggeng Nyi Sadea, which reveals the sacrifice of Nyi Sadea the Dancer as a prerequisite for the construction of the Lampegan tunnel in Cianjur.

Currently in Indonesia, the use of humans as project sacrifices has been replaced by using buffalo heads or other animal sacrifices that are stuck at the construction site. This animal sacrifice is believed to be an alternative form of protection for workers and building users in the future [6]. The hope is that the project will run smooth by carrying out animal sacrifices, it is hoped that the project will run smoothly [16].

Construction sacrifice is not unique to Indonesia. In Japan, there is a cultural phenomenon of human sacrifice known as '*hitobashira'* (human pillar). In this practice, a person is buried alive under or around structures such as dams, bridges, and castles. This action is carried out as a form of prayer to the Shinto gods who are believed to protect buildings from natural disasters such as floods or enemy attacks [17]. Several buildings in Japan are believed to involve human sacrifice, including Maruoka Castle [18], Matsue Ohashi Bridge [19], and Matsue Castle [20].

In China, there is a similar phenomenon called *'da sheng zhuang'*. The first archaeological evidence of this practice was uncovered at the Dongzhao excavation in Henan Province, where the remains of a child used in the foundation of the Erlitou culture city were unearthed [21]. In Chinese civilisation itself, the practice of human sacrifice not only served for erecting new buildings, but also for curing disease, celebrating war victories, praying for good harvests and rain, and worshipping nature to avoid calamity [22].

Apart from that, a similar phenomenon also occurred in Korea, especially at Wolseong Fortress. There, they believed that

human sacrifice was necessary to protect the structure. Several pairs of skull skeletons were found at the location. It is suspected that their deaths were not accidents, but the result of deliberate killings carried out in rituals to protect the building [23]. Many Southeastern European peoples' mythology refers to immurement as the way of death for a person sacrificed during the completion of a construction project, such as a bridge or castle. Some examples include stories about the construction of the Castle of Shkodra/Rozafa in Albania [24, 25], the Building of Skadar in Serbia [26], and the Cathedral of Curtea de Argeș in Romania [27].

People use rituals to reduce anxiety or as a form of gratitude [16]. Gratitude is a type of emotion or feeling that evolves into an attitude, character, habit, moral and response, influencing individuals to respond favourably to life experiences [28]. Holding a Thanksgiving ritual in a community is one way to express gratitude. Thanksgiving is an activity that the Indonesian people have believed in since the archipelago's original beliefs emerged [16]. The Indonesian people have frequently performed safety rituals throughout time. The term *'selamatan'* is derived from the word *'selamat',* meaning being safe. Hence, this practice aims to obtain safety in all human activities, including construction works. The essence of *'selamatan'* is to be grateful, to obtain blessings, and to avoid various difficult trials. More broadly, it serves as a communal effort to pray for a safe and harmonious social existence [29].

In Indonesia, sacrificial offerings for certain rituals have long been believed to be intended to protect the population from disaster and bestow prosperity. Since human sacrifices may no longer be relevant at this time, people substitute them with animal sacrifices. The *'tumbal'* tradition with the ritual of slaughtering a chicken is carried out in the *'ruwatan bumi'* (cleansing the earth) ceremony in the Banceuy-Subang Village [30]. Similarly, during the construction of the Sasaksaat railway tunnel in West Bandung, lambs and chickens were used in *'tumbal'* ritual [16]. The rite was carried out on August 15, 2020, at 7 a.m. It is carried out in six stages: (1) *'sanduk-sanduk'* (asking permission or apologizing to the supernatural beings who inhabit the Sasaksaat tunnel), (2) *'meuncit domba'* (the activity of slaughtering a lamb as a sacrifice for the project), (3) *'meuncit hayam'* (the activity slaughtering chickens), (4) *'ngahurip'* (a symbol of a prosperous and safe life), (5) *'ngumbu getih'* and *'rajah pamunah'* (burying chicken heads and other offerings), (6) *'ngugus tumpeng'* (reciting prayers while burning incense) [16].

2.2 Perception and safety compliance

Perception has a strong influence on behaviour because how a person perceives and interprets a stimulus in the environment determines how the person reacts [31]. Individual perceptions influence organisational behaviour and, as a result, both individual and organisational success [32]. Similarly, in the case of construction work. Workers' perceptions of project sacrifices can influence their performance, which in turn affects the overall project success.

On the other hand, social support in construction projects plays a vital role in building a healthy social environment [33]. Humans are social creatures and need social support in their workplaces. Previous studies have found that the more social support employees receive or perceive, the better they participate in their work and the more work dedication they demonstrate, resulting in increased job performance and satisfaction [34-37]. A study shows the influence of social support on worker safety in construction projects [38].

The phenomenon that work accidents are considered as project sacrifices can have an impact on the construction safety climate [39]. The causes of work accidents in construction work are still dominated by a lack of understanding of information, low levels of knowledge and low worker perceptions regarding occupational health and safety [1]. Therefore, OHS training is needed to increase knowledge related to safe behaviour by construction workers [40]. However, a lack of proper OHS training has remained a key concern in construction safety management.

Safety compliance refers to engaging workers in essential safety activities. Safety compliance aims to foster a safety mindset in construction projects, thereby reducing the risk of workplace accidents, including fatalities [41]. Actively

monitoring work and evaluating safety compliance is one technique to ensure safety compliance. Effective monitoring and safety evaluation are critical to reducing accidents in projects and increasing workers' confidence in the workplace, which leads to increased efficiency and productivity [42].

Apart from that, construction workers often work in risky, unhealthy and unsafe environmental conditions (Hansen, 2022). Exposure to dust, noise, and toxic substances, coupled with unsafe operations and psychological stress, is positively correlated with worker behaviour and work accidents in construction projects [43]. Workers' perceptions and attitudes are extremely important factors in workplace safety because many work accidents occur due to insecure actions, which are human behaviour combinations as a result of such perceptions [44].

Safety compliance through safety management practices plays an important role in managing construction worker safety and reducing workplace accidents. Safety management refers to the systematic activity of safety-driven management to safeguard personnel and control dangers connected to health and safety [45]. Safety-management practices (including worker participation, safety communication and feedback, management commitment, safety policies, and safety procedures) were found to be strongly connected with workplace accidents [46]. Thus, poor safety management practices can affect workers' safety compliance, which ultimately increases workplace accidents.

3. Method

This research applies a mixed-method approach, which consists of two data collection sequences, namely an integrative literature review and questionnaire surveys. An integrative literature review was carried out to identify various indicators used to develop a research framework, which is presented in a structural model as seen in Fig. 1. Based on Fig. 1, this study raises a hypothesis, H1: project sacrifice has a positive effect on safety compliance.

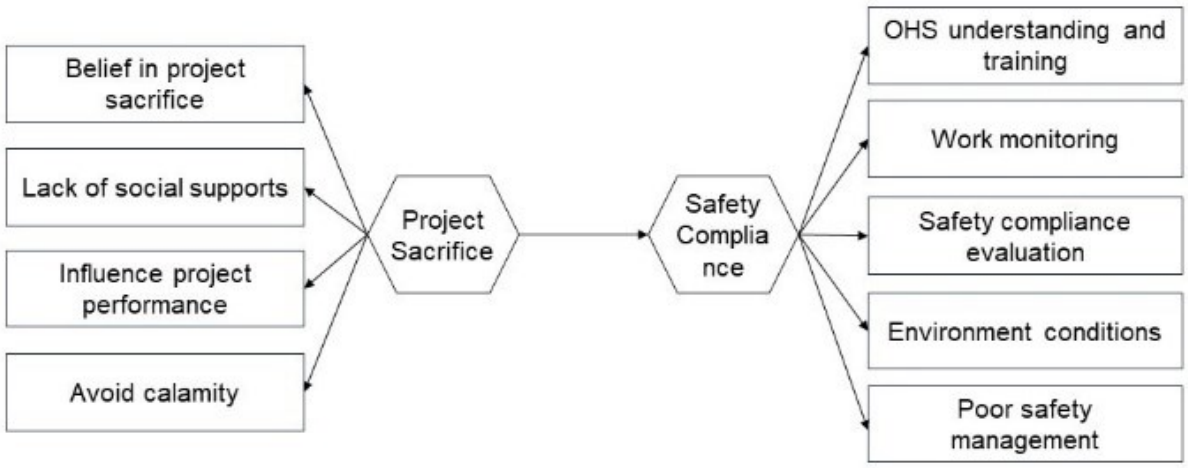

Fig. 1 Structural model of project sacrifice and safety compliance

The next stage is a questionnaire survey which aims to obtain the perceptions of construction workers regarding the relationship between the project sacrifice phenomenon and safety compliance. Direct survey distribution was carried out on three different construction projects on 9, 17 and 24 March 2023 with a total of 104 respondents, all of whom were construction workers. However, after the preliminary assessment, there were two invalid responses, so the total data analysed was 102 responses. Respondents' perceptions were measured using a Likert scale with 1 representing 'strongly disagree' to 5 representing 'strongly agree'.

The collected data were analysed using Structural Equation Modelling (SEM) – a statistical framework for identifying and investigating how such representations as factors relate to observed variables and to one another [47]. In this research, SEM Generalized Structured Component Analysis (GSCA) was applied since it can assess the adequacy of a model as a whole,

compare it to other specifications, and straightforwardly perform sophisticated analyses [48]. A standalone software package called GSCA Pro was utilised for analysing and developing SEM. It is accessible freely and has a graphical user interface that allows users to construct their model as a path diagram [47].

In GSCA, validity and reliability tests were performed. The validity test includes two aspects, namely by looking at the loading estimate and Average Variance Extracted (AVE) values. The factor loading estimate aims to test the convergent validity of a construct and is considered valid if each indicator has a value above 0.5 [49]. Meanwhile, AVE is used to see the discriminant validity of a construct and is required to be above 0.5 [50]. To ensure research reliability, the recommended alpha value must be above 0.7 [51].

4. Results and Discussion

This study examined the suitability of the model through predetermined indicators in GSCA Pro. The various model fit measures are shown in Table 1. The total variance of all variables explained by FIT. The values vary from 0 to 1, and the larger this value, the more variance in the variables. In this study, FIT = 0.522 indicates that 52.2% of the total variance is explained by the model. The AFIT value was 0.512, which is above 0.5. The GFI (goodness-of-fit index) value of 0.958 and the SRMR (standardised root mean squared residual) value of 0.099 meet the criteria set by [52]. Therefore, these values in this study are satisfactory.

Table 1 Model fit measures

FIT	AFIT	FITs	FITm	GFI	SRMR	OPE	OPEs	OPEm
0.522	0.512	0.062	0.625	0.958	0.099	0.501	0.968	0.397

Table 2 displays the estimates of component loadings of indicators per component. Each indicator's loading estimate value is greater than 0.5, indicating that each indicator in this study exhibits good convergent validity. Table 3 shows that the AVE value for each indicator exceeds 0.5, which indicates that the indicators in this study have good discriminant validity. Meanwhile, Table 4 presents the alpha value, which is above 0.7, ensuring that the constructs in this study are reliable. Table 5 shows the estimates of path coefficients and their bootstrap standard errors (SE) and 95% confidence intervals (95% CI). Based on this table, the path coefficient of project sacrifice to safety compliance was 0.352, meaning that perception of project sacrifice had a positive effect on safety compliance.

Table 2 Loadings estimate

	Estimate	SE	95%CI	
Project Sacrifice				
X1	0.883	0.05	0.774	0.957
X2	0.794	0.059	0.656	0.887
Z1	0.95	0.011	0.93	0.97
Z2	0.923	0.019	0.888	0.96
Safety Compliance				
Y1	0.509	0.093	0.344	0.686
Y2	0.847	0.035	0.772	0.904
Y3	0.625	0.09	0.403	0.786
Y4	0.663	0.121	0.34	0.83
Y5	0.806	0.061	0.663	0.897

Table 3 Fornell-Larcker criterion values

	Project Sacrifice	Safety Compliance
Project Sacrifice	0.89	
Safety Compliance	0.352	0.701

Table 4 Construct quality measures

	Project Sacrifice	Safety Compliance
PVE	0.791	0.491
Alpha	0.911	0.729
Rho	0.938	0.824
Dimensionality	1.0	2.0

Table 5 Path coefficients

	Estimate	SE	95%CI	
Project Sacrifice→Safety Compliance	0.352	0.121	0.071	0.535

This research focuses on perceptions of project sacrifice and how these perceptions can influence safety compliance by construction workers. Project sacrifice, which is familiar to Indonesian people, is believed to be a ritual to expedite the construction process. In this ritual, the sacrifices can be animals or humans. The purpose of this ritual is to gain instant wealth and distance oneself from unwanted things by agreeing with supernatural beings [16]. However, the phenomenon of human sacrifice in construction projects has been replaced by animal sacrifice rituals, such as slaughtering the heads of buffalo, lambs, or chickens.

Nowadays, the term project sacrifice not only refers to sacrificial rituals in the construction context but is also used to describe work accidents that occur in construction projects. For example, in the Meruyung-Limo toll road construction project in West Java. A work accident occurred, which resulted in two workers being buried in the ground while carrying out work inspections [53]. Likewise, in many cases, work accidents that result in loss of life are narrated as project sacrifices [7-9]. In fact, work accidents that occur on projects are generally due to neglect of the fulfilment of safety aspects in construction projects [54]. A prior study found that unsafe behaviour and conditions contributed 63.7% to the frequency of construction accidents [55]. Due to the high number of work accidents in Indonesia, it is important to pay attention to safety management practices in construction projects. Safety management is part of the construction work implementation management system which aims to ensure safety in construction projects.

Workers' perceptions can have an impact on safety compliance by construction workers [56]. Likewise, workers' perceptions of project sacrifices can influence safety compliance. Workers' perceptions regarding project sacrifices include beliefs about the existence of project sacrifices, the belief that project sacrifices are necessary for the project to run smoothly and avoid disasters, and a lack of social support. Many cases of work accidents resulting in worker deaths are associated with project sacrifices in Indonesia. In fact, work accidents that occur are generally caused by failure to ensure safety compliance by construction workers [46, 57].

Considering work accidents as project sacrifices has negative implications for construction safety management because there are elements of submission and neglect, so that continuous improvement efforts are not made to increase OSH in the construction project environment. Therefore, paying sufficient attention to the phenomenon of project sacrifice through increasing worker awareness is very important to ensure worker safety compliance [58].

5. Conclusions

This research is motivated by a social phenomenon that is deeply rooted in Indonesian society regarding project sacrifices in the implementation of construction work. Based on a literature review, beliefs regarding this project sacrifice are not only found in Indonesia but are also shared by various communities from other traditional cultures in the world. Through SEM GSCA, this research found a positive correlation between workers' perceptions of project sacrifice and safety compliance by construction workers.

Perceived safety commitment is an important factor that determines safety outcomes in construction projects. Therefore, the findings of this research can be useful in lifting the veil regarding the perception of project victimisation felt by construction workers in Indonesia. It cannot be denied that some Indonesian workers still believe in the phenomenon of project sacrifice. It further encourages construction organisations to foster safety climates through fulfilling safety compliance. Finally, this study provides an opportunity for further research regarding how perceptions of project sacrifice can shape safety culture in construction projects.

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