

IMPACT OF SUPPLIER EVALUATION ON PRODUCT QUALITY

Thais da C. L. Alves¹, Panthil Desai², Kim LaScola Needy³, Ashleigh Hegwood⁴, and Sean Musick⁵

1. BACKGROUND

Despite having formal systems to evaluate suppliers, a recent study by CII RT308 revealed that contractors are evenly split (54.4% yes vs. 45.6% no) when it comes to the use of prior supplier evaluation to make decisions about future purchases. Owners who participated in the same study were even less likely to use prior performance evaluations to base their decisions to award purchase orders (POs) (Alves et al. 2016b). This current practice goes against Lean principles that promote the use of indicators and information to support a transparent management of value streams and working with suppliers to promote continuous improvement. Supplier ratings are collected but, unfortunately, not much is done with them.

2. OBJECTIVE

This paper discusses results of a recent survey with construction companies in the Engineering Procurement and Construction (EPC) industry. Hypotheses are developed and tested to verify the relationship between supplier ratings, inspection hours, and final product quality.

3. RESEARCH METHOD

The PO instrument was developed based on RT308's previous work (Walsh et al. 2015) and adapted to address one single material: shop fabricated piping. The PO instrument, fully available at Alves et al. (2016b), contained 28 questions organized into four main parts: contact data from the respondent and project demographics; basic data about the single PO being used in each survey (e.g., number of spools, dollar value of the PO, inspection hours budgeted, location of suppliers); pre-award evaluation (level of inspection assigned, existence of supplier evaluation/reasons for doing or not doing so, pre-award supplier evaluation using criteria); and post-execution evaluation (e.g., inspection hours utilized, existence of subcontracting, final level of inspection, number of unplanned quality events).

Data entries submitted through Qualtrics (an online survey platform) were reviewed and questions were reviewed by respondents. The analysis was developed using IBM SPSS and data was organized and analyzed using Field's (2012) recommendation. Data came from 10 companies representing 37 different projects. Owner companies submitted 10 POs (24%) and contractors 31 (76%). One contractor submitted 15 POs, thereby limiting the data set. PO dollar values ranged from \$255,000 to \$50,660,888.

¹ Associate Professor, J.R. Filanc Construction Engineering and Management Program, Dept. of Civil, Constr., and Env. Engineering, San Diego State University, USA, talves@mail.sdsu.edu

² Graduate Research Assistant, Dept. of Civil, Constr., and Env. Engineering, San Diego State University, USA, panthildesai@gmail.com

³ Dean, Graduate School and International Education, University of Arkansas, Fayetteville, AR, USA, kneedy@uark.edu

⁴ Industrial Engineer, Former University of Arkansas student, Fayetteville, USA, ashleigh.hegwood@gmail.com

⁵ Director, Performance Excellence, MEI Technologies, Inc. (MEIT), Houston, TX, USA seanmusick@gmail.com



4. HYPOTHESES TESTING - RESULTS

Five hypotheses related to the relationship between supplier evaluations and product quality were tested, and the results obtained indicated the following:

Hypothesis 2 (a supplier with a higher rating will have a higher P_{fab} (fabrication capability) and fewer inspection hours budgeted) indicated that more inspection hours are budgeted when supplier ratings are low, that is lower than 4 ($p=0.001$, highly significant).

Hypothesis 4 (more sub-suppliers associated with a PO leads to lower P_{fab} and more inspection hours) was also confirmed ($p=0.01$, significant) as more inspection hours are used when portions of a PO are subcontracted.

Hypothesis 6 (higher supplier ratings should result in lower number of non-conformances (NCs) at the shop) was confirmed ($p=0.000$, highly significant) as more NCs are found at the shop when the supplier rating, as measured using the criteria presented above, is low (below 4).

Hypothesis 8 (the number of inspection hours will be higher on POs for which the supplier was not evaluated) was confirmed ($p=0.018$) in that more inspection hours are budgeted when the supplier is not evaluated.

Hypothesis 9 (more inspection hours are spent when the supplier's rating is low) was confirmed ($p=0.000$) as the analysis revealed that more inspection hours are spent when the supplier's rating is low (below 4).

4. SUMMARY OF FINDINGS

Table 1: Findings and practical implications

Description	Does it make a difference?	How? Why? When?
Suppliers with low ratings in evaluations.	Yes	More inspection hours budgeted and more NCs are found at the shop. This suggests that additional money ends up being spent to assure quality when these suppliers are selected.
Subcontracting, even for portions of a commodity like shop fabricated piping, result in more hours of inspection budgeted.	Yes	During the pre-award evaluations, subcontracting should be factored in as something that will increase the costs of surveillance and quality assurance.
Pre-award evaluation of suppliers.	Yes	More <u>budgeted</u> inspection hours are used when the supplier is NOT evaluated. This finding adds to RT308's previous findings in that both pre-award and post-award evaluation matter and should be used in continuous improvement efforts.

