Research Design: The Benefits Of Implementing Six Sigma Methodologies In Construction Industries

What are the perceived benefits of implementing six sigma methodologies in construction industries?

Describe an appropriate Research Design for your research topic/question. You should try and describe it in terms of the strategies presented in lectures. If you are using quantitative data, such a property database, describe the framework that will guide how you might achieve your research aim using the data.[E.g. A case study design investigating the changes in Melbourne house prices over the past decade, using time-series analysis…].If you are using qualitative data, such as documents, you should include the framework that will help you achieve your research aim [E.g. document analysis investigating buyer's decision-making frameworks, using an iterative interpretative approach…] [Chars 2,500]

In the context of the construction industry, they always strive for enhancing their overall productivity, minimise the wastes which are generated through their operations and maintaining profits. Raval and Kant (2017) have stated that, the research design for the study has aimed towards attaining the objective for the construction industries have pointed it out. This study has been intended to use quantitative approach for identifying the factors, which are critical for ensuring quality in construction and reducing the amount of wastes generated during the process. A survey will be conducted with the construction managers for uncovering the initiatives and methods for continuous environment, which are fundamentally practiced within construction companies and the approach of these organisations towards Six Sigma. The organisations using Six Sigma for continuous improvement generally uses DMAIC approach which acts as an instrument for project managers in improving their processes. As opined by Yadav et al. (2017), by using project charter the goals and goals for the project will be defined and utilising SIPOC diagram, the managers will be able to obtain the output and input of work processes as well as customer requirements. The data which will be gathered from surveys will be quantified using Relative Importance Index. Moreover, a cause and effect diagram will be utilised for identifying the underlying reasons behind certain events and the plan and processes will be developed and analysed using FMEA. In accordance to Cherrafi et al. (2017), quantitative research is more flexible and transparent as it establishes greater adoption and spontaneity between the participant groups and researcher. A quantitative research fundamentally aims towards gaining valuable information for the study and the study has been aimed towards implementation of six sigma methodologies in construction industries for enhancing their overall processes (Dixit et al. 2017). The researcher will be conducting interviews with the managers and ask them with open ended questions in order to obtain their intricate and inclusive views. The questionnaires for interviews and surveys will be prepared for accessing the concepts of six sigma which are used in construction industries. The six sigma concepts will be used within construction organisations due to the following reasons:

- Enhancing the quality of construction
- Reduce wastage and shortening cycle time
- Reducing the process and cost of construction

- Enhancing the process control in order to maintain perceptibility and reliability

The questionnaires will be prepared keeping in mind the objectives and aims of the research and the reasons to which construction organisations are reluctant in implementing six sigma methodology within their processes. As highlighted by Sreedharan and Raju (2016), the interviewers are independent in creation of questionnaires, which will be able to empower participants in providing required information which are required by the researchers for gathering efficient data for conducting the research. The interviewers are also required to keep in mind not to influence the answers, which are provided by the participants. The interviewer has intended to, ask open ended questions to, participants and design them in a manner to, make sure that it requires explanation from participants rather than simply providing the answers as a Yes or No. Moreover, an interviewer also requires to discuss the questions with their fellow employees and supervisors for making sure that the questions does not mean otherwise.

Data Collection Methods

List and describe the data collection methods that you plan to employ with your chosen strategy. Use the terms and justifications presented to you in the lectures. If you are using quantitative data, such a property database, describe the type of data you plan to access, and the variables you expect to analyse. Also comment on the reliability of the data and its source. If you are using qualitative data, such as documents, you should include as much detail as possible about the selection criteria (authenticity, credibility, representativeness, meaning) and analytical approach (content analysis, semiotics, historical analysis). Use appropriate in-text references.

A quantitative approach has been adopted in this study for attaining a research goal. The researcher will be preparing two separate questionnaires on the basis of secondary data, primary data and literature survey for waste and quality. The researchers will be conducting surveys with 51 employees who are operating within multinational construction companies with an annual turnover of more than $1 million. The open-ended questions will be asked to consultants, site engineers, contractors, directors and project managers of these companies in order to obtain their perspectives regarding implementation of six sigma in their companies in order to enhance quality within their production (Ottou et al. 2016). The survey is intended to be completed within duration of 2 months and an interview session will range from 30 minutes to 1 hour. The participants will be provided with options and closed end questions for scoring on a five-point Likert Scale where 5 stands for very high and 1 for very low respectively. The collected data will be quantified within the measure stage within DMAIC approach. The sample questions which will be asked in interviews and surveys are:

Interviews

- How do you think that implementation of six sigma methodology will enhance the quality of construction within your organisation?
- What do you think are the perceived benefits of implementing six sigma methodologies towards construction industry?

Surveys

- Do you agree that customer satisfaction and quality management is essential and important in construction industries?
- Do you consider that six sigma methodologies will enable the construction industries in yielding better quality results?

The responses which obtained from the participants will be evaluated using SPSS v 22 which will be recorded using Relative Importance Index which will be used for calculating the ranking factors.

Relative Importance Method

The data, which are gathered from surveys of various officials of construction companies, will be quantified using RII method for identifying the importance of the factors, which are critical for causing wastage and quality within the process of construction. In accordance to Gupta et al. (2019), each factor is ranked on the basis of their importance towards waste and quality respectively. The calculation of RII can be performed for the variables which are involved as per the equation:

RII = ?W / (A*N)

Where W stands for rankings provided by the participants, A= Highest ranking, N= overall number of participants and RII stands for Return Investment Index. Hence, it can be stated that with increase in the value of RII, the influence placed on the variables will be greater. The study will be using five rating scale and weighing will be performed as:

- 1= Strongly Dissented
- 2= Dissented
- 3= Neutral
- 4= Acknowledged
- 5= Strongly Acknowledged

Ranking cause of factors

The factors related to quality and waste which will be identified from the surveys and interviews of participants will be analysed. It has been pointed out by Sarhan et al. (2017) that these factors need to be analysed in accordance to the value of Relative Investment Index which will be calculated for different respondent groups which includes contractors, consultants, project managers, directors and site engineers. The rankings which will be identified from calculation of RII will enable the researcher in understanding the reasons for which the managers of construction companies are reluctant in implementing six sigma methodologies within their organisation. The researcher would also be aware of the fact whether managers have the knowledge of the benefits provided with the implementation of the six-sigma methodology and that it will enable their organisations in achieving desired goals.

After the data is measured from RII value and information is gathered regarding the reasons as to why there is a risk of generating a huge amount of waste when quality within processes are enhanced. The data collection and analysis will enable the researcher in identifying the factors leading to generation of waste and improvement in quality. When the organisations are able to

identify such factors, they will be able to implement six sigma methodologies within their process for attaining better outcomes.

References

1. Raval, S.J. and Kant, R.,2017, Study on Lean Six Sigma frameworks: a critical literature review. International Journal of Lean Six Sigma, vol.8, no.3, pp.275-334.
2. Yadav, G., Seth, D. and Desai, T.N.,2017, Analysis of research trends and constructs in context to lean six sigma frameworks. Journal of Manufacturing Technology Management, vol.28, no.6, pp.794-821.
3. Cherrafi, A., Elfezazi, S., Govindan, K., Garza-Reyes, J.A., Benhida, K. and Mokhlis, A,2017, A framework for the integration of Green and Lean Six Sigma for superior sustainability performance. International Journal of Production Research, vol.55, no.15, pp.4481-4515.
4. Dixit, S., Mandal, S.N., Sawhney, A. and Singh, S., 2017, Area of linkage between lean construction and sustainability in Indian construction industry. International Journal of Civil Engineering and Technology, vol.8, no.8, pp. 19-67
5. Sreedharan, V.R. and Raju, R., 2016, A systematic literature review of Lean Six Sigma in different industries. International Journal of Lean Six Sigma, vol. 7, no.4, pp.430-466.
6. Ottou, J.A., Baiden, B.K. and Ofori-Kuragu, J.K., 2016, The Use of Six Sigma as a Performance Improvement Strategy in the Construction Industry: New Trends and Applications. International Journal of Engineering and Management Research (IJEMR), vol 6, no.1, pp.538-546.
7. Gupta, S., Modgil, S. and Gunasekaran, A., 2019, Big data in lean six sigma: a review and further research directions. International Journal of Production Research, vol.3, no.5, pp.1-23.
8. Sarhan, J.G., Xia, B., Fawzia, S. and Karim, A., 2017, Lean construction implementation in the Saudi Arabian construction industry. Construction Economics and Building, vol.17, no.1, p.46.