

AN APPROACH TO APPRAISE THE FACTORS AFFECTING IMPLEMENTATION OF QUALITY MANAGEMENT SYSTEMS IN CONSTRUCTION PROJECT – ISM APPROACH

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Abstract – The need for quality assurance in construction is now widely accepted. Implementing the quality standard elements in the field, practically there will be lots of hurdles and most of the employees are very much interested and indulging themselves in this process but they don't get a proper way or benchmark to fix the standards.

Our study will discuss about the factors affecting implementation of quality management systems in construction project using Interpretive Structural Modelling (ISM).

Interpretive Structural Modelling (ISM) is a well-established methodology for identifying relationships among specific items, which define a problem or an issue.

Keywords: Quality Management Systems, Interpretive Structural Modelling

1. INTRODUCTION

A quality management system (QMS) is a collection of business processes focused on achieving quality policy and quality objectives to meet customer requirements. It is expressed as the organizational structure, policies, procedures, processes and resources needed to implement quality management.

The primary purpose of QMS is to provide excellence in customer satisfaction through continuous improvements of products and processes by the total involvement and dedication of each individual who is in any way, a part of that product/process.

The principles of QMS create the foundation for developing an organization's system for planning, controlling, and improving quality.

QMS is a structured approach to improvement. If correctly applied, it will assist a construction company in improving

its performance. It involves a strong commitment to two guiding principles:

- customer satisfaction and
- Continuous improvement.

Inspection traditionally has been one of the key attributes of a quality assurance/quality control system in the construction industry. Regarding inspection, "Routine 100% inspection is the same thing as planning for defects - acknowledgement that the process cannot make the product correctly, or that the specifications made no sense in the first place. Quality comes not from inspection, but from improvement of the process. This does not mean that inspection ceases. Instead, it means that more effort is put into preventing errors and deficiencies.

The construction industry has been following a path that has led to lack of trust and confidence, adversarial relations, and increased arbitration and litigation. The industry has become increasingly reliant on burdensome specifications, which seldom says exactly what the owner intends them to say. This has led the owners to shift more of the risks to the contractors. The net outcome is that the construction industry has been bogged down with paperwork, defensive posturing, and generally tends to have a hostile attitude towards the other participants. QMS can help reverse this trend. Although, not a magic pill or panacea for all illnesses, it will, if properly implemented, help construction companies improve and will help all the parties come closer.

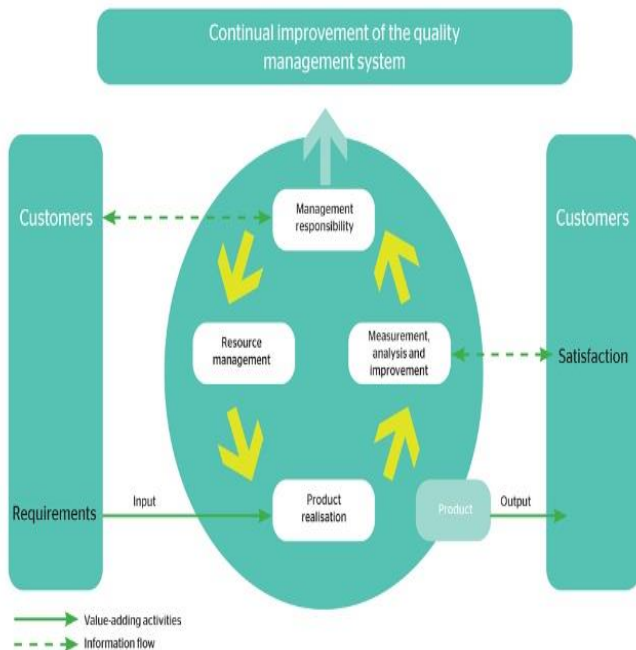


Fig 1 – Model of a process based QMS

2. STEPS INVOLVED IN ISM

- Enablers affecting the system under consideration are listed. A survey of group problem solving technique can be used for identification of the enabler related to the defined problem.
- From the step 1, a relative relationship is pointed out among the enablers with respect to which pairs of enabler would be examined.
- Structural self-interaction matrix (SSIM) is developed for enablers, which shows pair-wise relations between enablers.
- Initial reachability matrix is formed on the basis of structural self-interaction matrix and checked for transitivity to go in to final reachability matrix.
- After developing the final reachability matrix, next partitions are done in order to find hierarchy of each enabler.
- Next, conical matrix is developed from the partitioned reachability matrix by clubbing together of enablers according to their level position.
- Based on the relationships given above in the reachability matrix, a directed graph is drawn and the transitive links are removed. Then resultant digraph is converted in to an interpretive structural modeling, by replacing enabler nodes with statements.
- The model developed by interpretive structural modeling in step 7 is reviewed to check for conceptual inconsistency, and necessary modifications are made.

MICMAC analysis:

The implementation enablers are classified into four groups as autonomous enablers, dependent enablers, linkage enablers, and independent enablers on the basis of their driving power and dependencies. The first group is of autonomous enablers that have a weak driving power and weak dependence power. The enablers are relatively disconnected from the system. They may have only a few links. Enablers having strong dependence and weak driver are called dependent enablers. The third group consists of linkage enablers that have strong driving and dependence power. Any action on these enablers will have an impact on the other enablers and also a feedback effect on themselves, which may amplify any moves or measures. The fourth group consists of independent enablers that have strong driving power and weak dependence, these enablers condition all the other enablers, while being unaffected by them in return.

3. FRAMEWORK FOR INTERPRETIVE STRUCTURAL MODELLING

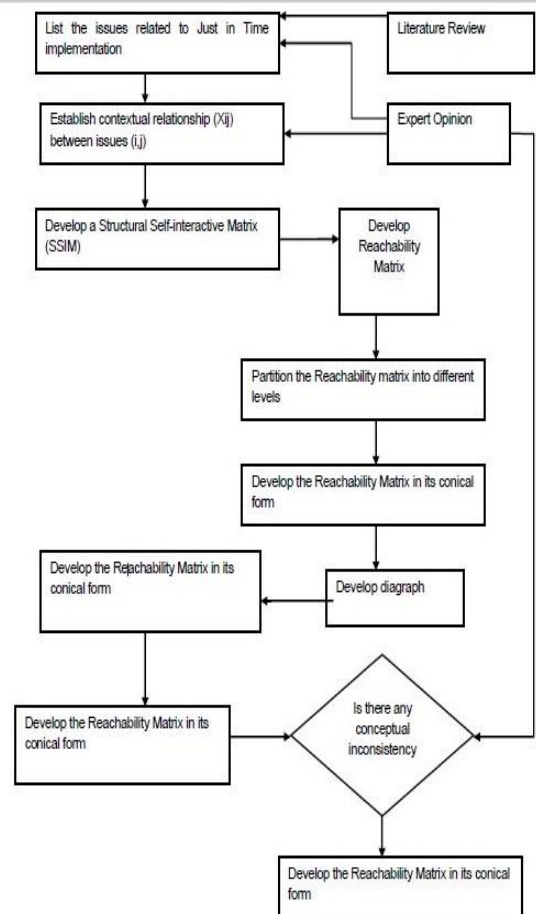


Fig 2- Flow diagram of ISM preparation

4. FACTORS AFFECTING QMS

- A. Commitment of top management.
- B. Understanding in the QMS
- C. Monitoring and feedback by project participants
- D. Conflict among project participants
- E. Time factor
- F. Cost factor
- G. Frequent design changes
- H. Quality of materials from vendors or suppliers
- I. Documentation and paperwork
- J. Training and education

5. IMPLEMENTATION OF ISM

Structural self-interaction matrix (SSIM)

Structural self-interaction matrix is formed from the data collected through questionnaire. Specialist, both from industry and educational surroundings, has been discussing within be familiar with and mounting the background association in the middle of the enablers. Following four secret codes have been used to signify the supervision of the association flanked by two enablers (i and j):

- V is used for the family member from enabler i to enabler j (i.e. if enabler i have an effect on enabler j).
- A is used for the next of kin from enabler j to enabler i (i.e. if enabler j have an effect on enabler i).
- X is used for equally direction associations (i.e. if enablers i and j have an effect on each other).
- O is used for no next of kin flanked by two enablers (i.e. if enablers i and j are unrelated).Based on a circumstance association, the SSIM has been developed. To attain preponderance, the SSIM was arguing in a set of specialists and support on their responses.

Initial reachability matrix

The SSIM is modified into a reachability medium arrangement by altering the in order, in each evidence of the SSIM into 1s and 0s in the reachability medium. The replacement of 1s and 0s are as per the subsequent rules:

- (1) If the (i, j) proof in the SSIM is V, then the (i, j) record in the reachability medium turn out to be 1 and the (j, i) record become 0.
- (2) If the (i, j) record in the SSIM is A, then the (i, j) record in the medium becomes 0 and the (j, i) record be converted into 1.

(3) If the (i, j) record in the SSIM is X, then the (i, j) record in the surrounding substance becomes 1 and the (j, i) record also be converted into 1.

(4) If the (i, j) record in the SSIM is O, then the (i, j) record in the medium becomes 0 and the (j, i) record also be converted into 0.

Final Reachability matrix

Next step is to get final reachability matrix which is achieved by incorporating the transitivity. Basically, transitivity concept is introduced for this purpose, and few cells of the initial reachability matrix are filled by inference.

Dividing the Final reachability matrix

The matrix is alienated, by assessment the reachability and happening sets for every variable. The reachability position encompass of the constituent itself and other elements, which it may assist to attain, since the previous put encompass of the constituent itself and additional elements, which may assist accomplishing it. Afterwards the journey of this position is derivative for all the rudiments. The fundamentals for which the reachability and the voyage sets are the similar connect to the summit stage in the ISM hierarchy. The top-level constituent in the pecking order would not assist to attain any additional constituent on top of its self-level. Just the once the top-level constituent is documented, it is rip out from the additional rudiments. Then, the similar process is frequent to come across out the rudiments in the subsequent stage. This process is sustained awaiting the height of every constituent is originated.

Evolvement of digraph

On the foundation of pointed medium, a primary digraph as well as impermanence links is attained. It is produced by nodes and appearance of boundaries. After eliminating the tortuous links, a final digraph is expanded. In this evolvement, the summit stage enabler is situated at the peak of the digraph and subsequent stage enabler is located at second place and so resting on, until the underneath level is located at the lowest position in the digraph. Next, the digraph is misrepresented into an ISM mock-up by put back nodes of the rudiments with declaration.

MICMAC analysis

MICMAC analysis was done with the help of the driving power and dependence power of the variables [10]. Variables are classified into four clusters: autonomous, dependent, linkage, and independent. In the final reachability matrix, the driving power and dependence power of each of the variables were plotted. Autonomous variables (cluster I) had weak driving power and dependence power. These variables could be disconnected from the system. The dependent variables (cluster II) had weak driving power and strong dependence power. The linkage variables (cluster III) had strong driving power and

dependence power. The independent variables (cluster IV) had strong driving power and weak dependence power.

6. CONCLUSION

It is important to know the levels of enablers for the successful implementation of QMS. The ISM emphasizes that commitment of top management along with cost factor are the most important enabler due to their high driving power and low dependence among all the QMS enablers. Hence top management must pay its full attention to its commitment towards implementation of QMS and analyzing the cost factor. These enablers are positioned at the lowest level in the hierarchy of the ISM-based model.

The model developed in this research was based upon expert opinions. The results of the analysis may vary in real world setting as the study considered ten variables, which directly influence adoption of QMS. In case a model needs to be developed for a specific organization.

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