A MULTIVARIABLE SYSTEM BASED APPROACH FOR PROCESS IMPROVEMENT IN BID MANAGEMENT

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ABSTRACT
This paper presents a control system based approach on bidding process for winning business deals, which make use of a basic non linear model formulated with the steps involved in common bidding scenarios in the present industry. This system will follow an error-correcting mechanism for creating proposals which will result in successful business contracts. The input-output feedback system will assist us in predicting, identifying and fixing the issues, based on a priori information and optimize by itself giving better results for increased usage. Modules can be defined and integrated to the system by following a standardized architecture. This will pave the way to provide a system which helps bid/proposal managers for achieving high win rates, as well aid the organization to monitor, measure and improve process performance using the feedback mechanism.

Key words: Bidding process, Proposal management, Process improvement.

1. INTRODUCTION

In 1911, Frederick Taylor, father of scientific management proposed several methods to increase the worker productivity. Since then, researchers are trying to apply scientific methodologies to management in varying fields of interest [1-5]. A typical example is the application of the concept of control systems, which is a methodology commonly used in electrical sciences, in management systems [6]. A control system is a set of devices to manage, command, direct or regulate the behaviour of other devices of the system. These set of devices act together to maintain the actual system performance close to a desired set of performance specifications. A control system can be one which controls the output of another system. Control is a process by which a system is modulated, controlled, or changed depending upon the output, or response it produces.

In a management system, if the manager needs to achieve a target, his team should be aligned accordingly to reach the specified goal, for which he needs to monitor and regulate the performance of each team member [7]. Here the control system acts such as to align the team and control the team to get the optimum performance and reach the target in a short time with the best output.

Study of control systems is a wide branch in science which deals with system performance characteristics and improvement strategies for each of those. A very basic system will consist of an Input and an Output, i.e. Single Input- Single Output (SISO) system. In control system language, the system to be controlled is called the process or controlled system, which is having a command following nature, wherein the controlled attribute (output) follows a given command (input). Thus a control system can be considered as a regulator, where the command input is the desired value of the controlled output and is processed within the system (regulated) to achieve the optimal output. Systems can be broadly classified as Open type and Closed type. Output of open type system will

be affected by corresponding input and the system parameters. While in the case of closed type system there a feedback exists from the output to the input. A portion of the output of a process or system is returned to the input, especially when used to improve performance or to control the system or the process. The return of information about the result of a process or activity is an evaluative response. In feedback systems another variable, the error or manipulated variable is used to realize a prescribed accuracy and adequate stability for the system. Feedback is a process in which a system regulates itself by monitoring its own output. That is, it "feeds back" a part of its output to itself. For example, in a water tank level controller, the water level is detected (the output variable) and is used as the feed back variable which is compared with a set level and an error signal (deviation) is generated. This error signal is made use of by an on-off controller which controls the system to avoid tank overflow.

Management control systems are used to provide information to managers which help them in achieving their goals and to assist the organization in developing the strategic planning and maintaining operational control. In such systems feedback is inevitable for progress [7-9]. For achieving any goal one has to know where he stands and then plan accordingly to reach the goal. No matter whether in the planning or the execution stage only corrective action will assist improve to get better. This corrective action would be a result of feedback, which will essentially show the deviation from the expected outcome. If a system is defined to achieve a set of goals, we need to walk through the system and measure its performance based on the actual and expected results. Here, the control action will be decided based on the deviation parameters between the actual and the expected values. This deviation parameter can be called as the learning from the present system. This learning will contribute to the improvement in the next version of the system or even the inputs may be modified to achieve the expected results. The "feedback" in a management control system is any response or information about the result of a process.

From the feedback when a discrepancy or error is noted, the initial step is to determine whether to take an action for that corresponding variation or not. This decision of 'action' or 'no action' is decided by the controller. Is the error too small to act on or is it too large to be raised as a red flag to the system? This decision making process is entirely depended on a controller or a set of controllers. A manager in a small project based system can be considered as a controller for that specific project. He would be having enough information about the system and would also be having a clear idea about the expected output from each of the resources in his team. He would try to give inputs to the team members who are not approaching to his expectations (or set targets) and motivate them to reach up to the expected level. Here, the manager (controller) monitors a team, gives suggestions (feedback) to his team members and tries to motivate (error correct) them to achieve the desired target (expected output).

The idea of creating similarities between inanimate mechanical control systems and humans might not be pleasing for many. Sir Geoffrey Vickers [10] says "In the days when our minds were dominated by mechanical analogies, industry was

inclined to think of men as cogs in a machine. It is probably no less misleading to think of them as relays". Even though, humans cannot be considered as just machines or relays, it is required to have a control mechanism to ensure the improvement in performance.

To complete any task and to achieve desired targets we follow a process, which will eventually be the modification of system parameters which assists in modifying the input to reach the expected output. The process should be defined to make the tasks simple and effective and to get the desired measurable performance. Measuring and monitoring of the process makes it easy and simple to make sure that the tasks are done according to the defined set of protocols. These protocols are defined in order to break the complex steps into simple ones and easy to understand. Having smaller modules will make the complex system functionalities straightforward especially at the time of troubleshooting.

Initially, Bid Management was widely used in the civil engineering industry for high valued deals for contractors [11]. Now, managing bids is very crucial in the IT service industry [12]. For large deals which involve multi-domain requirements, we need to have wide spectrum of expertise. Managing a team of specialists starting from sales till the delivery and producing a winnable bid out of it is not an easy task [13].

In this paper an attempt is made to apply, a methodology based on conventional feedback control systems to Bid Management process. Section 2 describes the bid management process in general, and its model. In Section 3 the concept of feedback control system is introduced and the bid management model is considered as a typical feedback control system. Section 4 deals with the system input variables and Section 5 is devoted for the error correcting mechanism and the process automation. Section 6 gives the simulation studies along with system performance improvement criteria and Section 7 is the concluding remarks

2. BID MANAGEMENT PROCESS

To make successful business in a competitive environment outstanding skills and experiences are required. Active bid management helps an organization in determining whether bids lead to successful deal, creating return on the investment by closely observing the customer requirements [13, 14].

Bidding performance can be improved by: (i) Assessing the approach to major opportunities to establish what works well and what needs attention. Here the priority is to maximize early returns on investment satisfying the customer requirements. (ii) Implementing a structured bid management method that suits the organization's needs and (iii) Helping to decide what to bid for and what not to bid for (qualifying).

A very basic model for Bid Management process will involve the following steps.

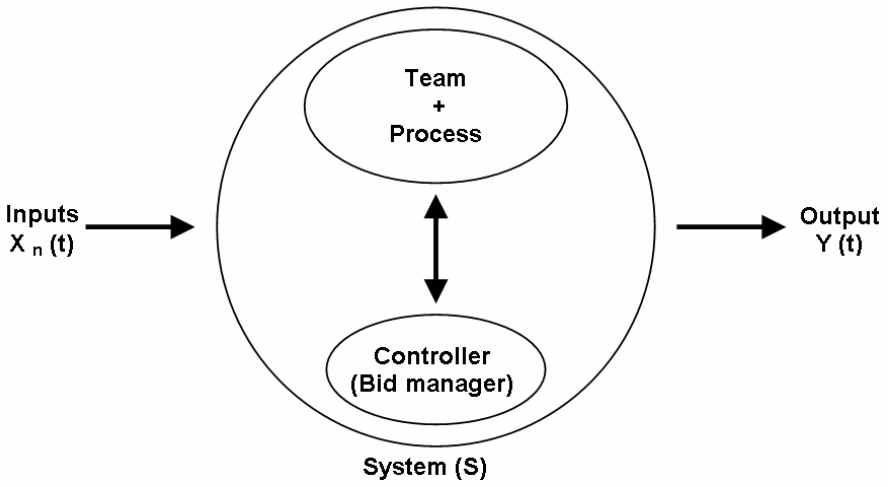
1. Qualifying the Request For Proposal (RFP)/ Request For Quotation (RFQ)
2. Identifying the team and Assigning roles and responsibilities

3. Planning
4. Preparation - Generating the content Compiling Building
5. Reviewing
6. Submitting

Bid Management system maps the conventional Multiple-input and single-output (MISO) model. The key input for the Bid Manager is the Request for Proposal that he would get from the customer; along with the target date for submission and other specific requirements mentioned in the RFP. The output that a Bid Manager needs to produce is a winnable proposal/ bid within this stipulated time defined by the customer. The Bid Manager needs to feed in the input to the system which comprises of specific set of process and people, whilst he himself is a part of the system being a controller. In Figure 1, this concept is shown as a block diagram for bid management system. The variable notations used are: X n (t) is the inputs to the system which includes RFP document in the time domain, sales inputs, etc. S is the system; including the Bid Manager; team and process and Y (t) is the output bid document ready at the expected time.

For every system there exist variables and constants. An attempt is made to define the corresponding constants and variables very broadly in the system under consideration. The constants are mostly the dead line limits specified by the customer and the process stages, which is unlikely to vary in most circumstances. The variables include the bid team (resource), team member response, and content for the proposal (text document), process parameters, strategy, and decision makers. The Bid Manager, the controller of the system, is responsible for handling the variables in an efficient way to produce the best results in all situations. All the above said variables need to be aligned towards producing the best results (excellent proposal) which requires efficient co-ordination and decision making skills.

Figure – 1: Model for a bid management system



2.1 Defining System

The expected outcome for any bid is the state of 'win' and that end result can only be achieved after submitting the bid. There arises a question on how do we include the measure of winning a bid, proactively. We try to model a system which will invariably include the parameters learnt from the previous action (previous similar bid submission) and map those learnings to decide on the output action. Here we do a walk through the defined system, with a set of error corrected parameters to ensure the success rate and minimise the weakness or chances for losing. Let us consider the following system for the present study. System constants are Time/ Process steps, system variables include people and process parameters, the controller is the Bid Manager, process parameters includes proposal structure, strategy, solution for the requirement, planning. Inputs to the system are customer document, sales representation inputs, senior management inputs and the output variable is the winnable appealing proposal.

2.1.1 System performance

The inputs are fed on to the variables and are controlled by the controller to ensure a smooth process The process is initiated by a set input, the controlling processes monitor the results of the executing processes, assign appropriate resources, and define strategies which are then used by the planning and executing processes. The results of the executing processes are feedback to the controlling processes that adjust the resources and the strategies to optimize some assigned criteria like optimal resource allocation, minimum time delivery, "Just in time" delivery, and minimum cost [7]. The constants are maintained as it is and the variables are made to work out in a way to reach the target. For example the competitor analysis report given by the sales representative is an input which plays an important role in the strategy development for winning the deal. Once the outputs reach a level of defined satisfaction, the process is concluded.

2.2 Defining the role of Controller

The role of the controller (Bid manager) varies from organization to organization. The duties of a controller, at one end of the scale must be largely an administrative and logistical one on the other, can be the combination of that of sales, delivery and project management. The key element of successful bid management is proper planning. This does not mean that the production of complicated network diagrams or highly detailed micromanagement plans are required. The bid environment can be highly changeable, the client may request a new requirement and may be included at some stage or sales may identify a different approach by which, requires the work to be reviewed and so on. In a feedback system, the controller will be updating the plan according to who does what, when and where? Figure 2 shows the block diagram of a feedback control system.

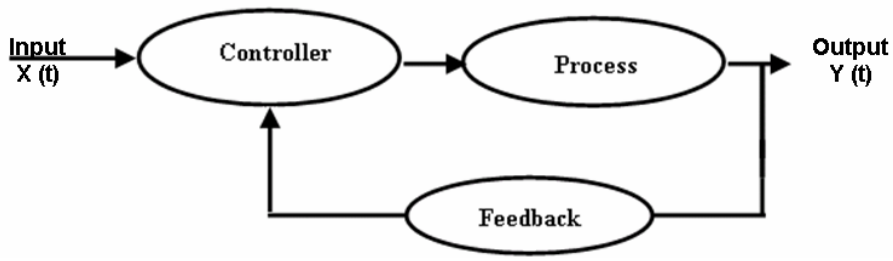
3. SYSTEM WITH FEEDBACK

In a BM control system, the feedback variables are obtained from three sources. They are (i) internal reviews, (ii) external reviews [15] and (iii) benchmark results.

3.1 Feedback from internal reviews

These include the feedback obtained from reviewing the proposed bid, proof reading and editing done by the bid team itself. The frequency and time of the feedback depends upon the nature of the bid, skills of the team and requirements of team. Such feedbacks act as a part of the process of refining the bid. Sometimes this is just checking the clarity of what is written against the overall strategy for winning the bid. In some other situations feedback will be based on a full review by the team and the controller (bid manager) need to plan, organize and act according to this feedback for a winning deal.

Figure – 2: The block diagram of a feedback control system



3.2 Feedback from external reviews

The external feedback arises from a condition, when the bid is reviewed by a separate review team. The external feedback ensures that the content of the bid is correct that there is a feasible solution behind the bid. The external review acts as a quality control on the process rather than a proof reading as done by the team members. The external feedback obtained will have an active part on developing a bid. The advantages of such a feedback mechanism are: (i) An independent opinion on the team's ideas are obtained, (ii) New ideas will be suggested by the review team, (iii) The quality assurance role helps eliminate mistakes and misconceptions and (iv) Thought process from a customer's point of view also may be involved

3.3 Feedback from benchmark results, sales strategies and competitors

The results of similar projects which were successful, will be considered as some bench mark results for a new one. Such comparisons will help in proceeding through a right path. Other important factors are, know much about the customer from the sales team, collect key points from the sales strategy for winning the bid etc. Based on these important feedback criteria, plan the process in terms of who does, what and when.

4 SYSTEM INPUT VARIABLES

Being a multi input system, there will be more than one input which is equally important for the system. The major inputs for a BM control system are the customer document and the sales representation. Figure 3 gives the over all idea of the variables involved as input, output and system variables for Bid management model based on feedback control system

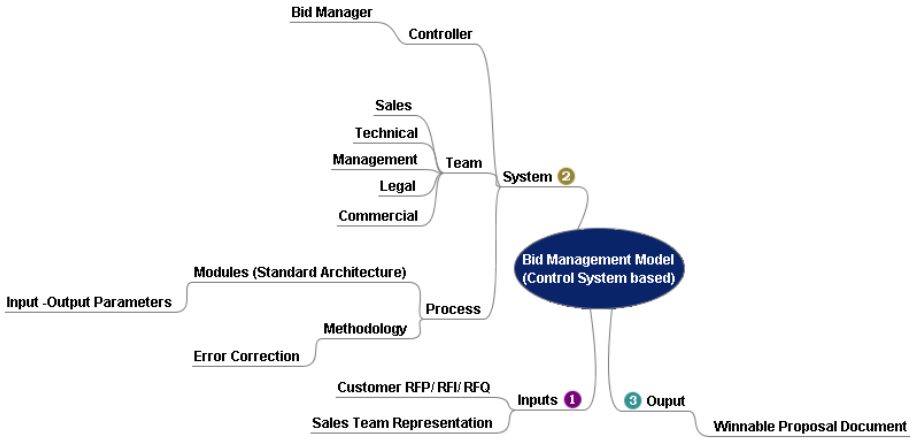
4.1 Customer document

Customer document is the available bible for the bid, if in case many inputs are not available from the sales team. But in most practical cases customer document alone will have a meagre chance in achieving a good end result. This input will typically be containing the specifications of the requirement along and their expectations from the vendor. This input (document) is fed to all the team members and they will respond to their own respective sections. Broadly, following are the important parameters that accompany this input: technical requirement, legal and commercial, important dates (submission date) and the format of the proposal copy.

4.2 Sales Representation

This is the most crucial input for any deal. The chance for winning is proportional to the information that the sales team carry in particular to each bid. The key parameters for this input will include (i) The Customers requirements (ii) Known Competitors and their details and (iii) The expected gain for the organization and the customer.

Figure – 3: Input, output and system details for Bid management model based on feedback control system



5 ERROR CORRECTING MECHANISM

Error occurs when there is a variation in the expected result from the actual or desired result. Errors can happen at any stage which includes input, output or inside the system parameters. The total error can be given as

$TE = X(e) + Y(e) + S(e)$

Where X (e) is the error in input parameters, Y (e) error in output parameters, S (e) is the error in system parameters. An error in any of these three parameters will add up the total error which will result in increasing the chances of losing the deal. Error inside the system can be due to any of the following parameters:

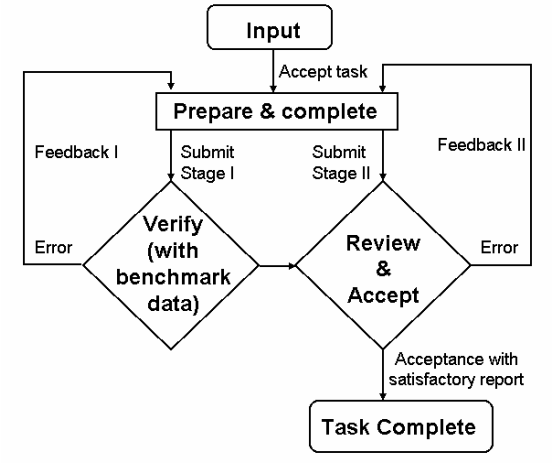
(i) Insufficient Input parameters (ii) Lack of clear understanding of customer requirements or deviations from the requirement mentioned in the RFP and the understanding – RFP (e) and (iii) Deviations from the actual details & the details presented by the sales team – ST (e)

When the system nonlinear components are considered, the error in the model can be given as error involved in constants which occur in the time/ process steps, in variables, where people are involved, and in the process parameters and controller which arises due to the inadequacy of the Bid Manager.

6 SIMULATION STUDIES

Self learning methodology incorporates the error correction method which practises on the existing benchmark data (if in case it is available) and generate the set point parameters. These parameters can be generated using the simulation studies and it will again feed in as another input for the system. So, if an opportunity comes up for delivering a network implementation and if we have lost similar opportunity in the past, we can use the acquired knowledge (simulation) from the benchmark data and arrive at a best result in decision making/ strategy development. The key output from the simulation studies is the correlation report from the events happened already which resulted in a loss or win of previous business deals. These analysis reports can also be mapped into SWOT (Strength, Weakness, Opportunity, Threat) report, which gives a high business value add in terms of positioning/ presenting our solution to the customer. Figure 4 describes the flow chart for a bid management scheme simulated as a feedback control system. Accepting a task is based on identifying requirements, defining goals, foreseeing the risk and selling the concept. The process of gathering data is not only from the input, but also from the feedback channels as shown in the flow chart. The error occurring from the comparison with the bench mark data as well as the feedback from the review team are considered at this stage. Based on the result of comparison with the benchmark data and the decisions of the review, a satisfactory report can be finalised which completes the task.

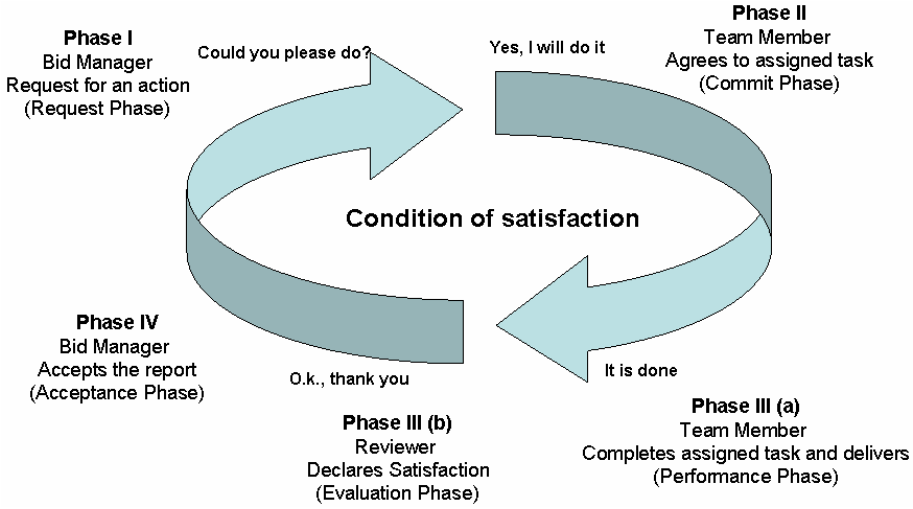
Figure – 4: Flow chart for a bid management scheme simulated as a feedback control system



6.1 Performance improvement

Once the 'go' call is made for a particular RFP, the initial step is team building. The team building including the roles and responsibilities assignment is done according to the problem definition with a given set of inputs. The early clarity in problem definition will have high impact on the chances for winning. We break down each of these steps into independent modules by giving a clear problem definition in order to make the process simple and effective. The risks involved in this process might be the multi domain involvement where one solution will have high impact on the other team's solution. Basically there are many cases where they follow a workflow, where one team's output would be another teams input. So, in these cases they need to work together to come up with a best fit solution for the problem. In these cases the multiple modules would be plugged together to give a desired result. The action workflow methodology holds well in bid management process with some variations.

Figure – 5: Bid management action workflow loop based representation (Source: Based on Ref.16)



Task based analysis will give us a clear understanding of the team performance which would in turn give them a feedback to improve.

7. CONCLUSION

A basic framework model for control system based bid management process is defined. The modules developed using a standard architecture model will always have an option to fit into any system since the input-output and parameters format is standardised. The feedback control system approach infuses valuable expertise into the bid management system. The success of the approach depends on many key factors. The most important one is the co-ordination and overall communication between the bid manager, his team and the review and sales teams. The feed back in a bid management system can be described as lessons

learning sessions. These learnings can be utilized to review and analyse the problems encountered during the preparation stage. Near the end of each project, the feedback paths could have enabled many times and the effect of which will be to provide a dynamic road map to drive, guide and co-ordinate a well planned hundred percent winning deal. Building a software based model is the next step for this approach, which could result in off the shelf implementation state.

REFERENCE

1. R. Max Wideman (1990), "Total Project Management of Complex Projects Improving Performance with Modern Techniques", Acres International Limited, Vancouver, BC, Canada.

2. W.R Allen (2000), "Basic management cycle: A systems approach to the management process", International Conference on Systems Thinking in Management.

3. David Otley (1999), "Performance management: a framework for management control systems research" Management Accounting Research, 10, pp 363-382

4. Y. Diao, J. L. Hellerstein, and S. Parekh (2002), "Using fuzzy control to maximize profits in service level management" Artificial Intelligence: IBM Systems journal, Volume 41, Number 3.

5. Margherita Grasso and Matteo Manera (2007), "Asymmetric Error Correction Models for the Oil - Gasoline Price relationship", Energy Policy,Vol. 35, Issue 1, January, pp 156-177

6. Pradip Mehta (2007), "Selecting a project control system is one thing, implementing is quite another" NW Communiqué, vol.2.2, February.
7. L. Scibile (2000),"Feedback control in project-based management", CERN: Geneva.

8. Tian He, John A. Stankovic, Michael Marley, Chenyang Lu, Yin Lu, Tarek Abdelzaher,Sang Son, and Gang Tao (2007), "Feedback Control-based Dynamic Resource Management in Distributed Real-Time Systems", Journal of Systems and Software, Vol 80, Issue 7 (July 2007), pp997-1004.

9. Robert F. Engle and Andrew J. Patton (2004), "Impacts of trades in an error-correction model of quote prices", Journal of Financial Markets, Volume 7, Number 1, January, pp. 1-25(25)

10. Sir Geoffrey Vickers (1967), "Towards a Sociology of Management", Chapman and Hall, , p.104

11. R.M. Skitmore, "Fundamental research in bidding and estimating", The International Council for Construction Research Studies and Documentation CIB W-55.

12. David Raffo and Warren Harrison (2000), "Combining Process Feedback with Discrete Event Simulation Models to Support Software Project Management," Proceedings of the International Workshop on Feedback and Evolution in Software and Business Processes (FEAST), London, UK, July.

13. Ashkan R. Kiana, Jose B. Cruz Jr.b (2005), "Bidding strategies in dynamic electricity markets" Decision Support Systems 40 pp 543– 551

14. Sebal.S , Zarate .R (1997), "A decision support system for bidding process", 'Computational Cybernetics and Simulation', IEEE International Conference on Systems, Man, and Cybernetics, vol.4 pp 3603-3608

15. The Bid Manager's Handbook by David Nickson, Gower Publishing, Ltd.

16. Thomas Schael (1996), 'Workflow Management Systems for Process Organisations', Lecture Notes in Computer Science Vol. 1096 Springer