# Bridging the Gap Between Design and Use Processes:
## Sector-Based Problems of a CRM Oriented Approach

**Kerem ERCOSKUN[*], Alaattin KANOGLU[**],**

*Abstract: Architectural Design and Facility Management are seen as distinct processes that one involves with the very beginning of the construction process and other involves with post construction processes. However, feedback from use processes is essential to improve design quality. On demand information is not enough for off-line quality control. Customer Relationships Management (CRM) provides various Information and Communication Technologies (ICT) for bridging between design and use processes in that manner. Providing a continuous feedback from operation phase to design phase, these technologies help to bridge this gap and provide a backbone to obtain "Total Quality" for any individual product. This paper discusses main challenges of construction sector to implement a CRM oriented approach, which provide the preliminary concepts of an ongoing research about a CRM Reference Model for the AEC/FM sector.*

*Keywords: Total quality, Customer, CRM, Design quality, Change Management, AEC/FM*

### 1 Introduction

This paper discusses the problems within an ongoing project, which is about a "Customer Relationships Management" (CRM) reference model for the AEC/FM sector. The research focuses on housing projects in particular and some preliminary solutions are expressed through a "Change Management" mechanism, which is considered to be an essential part of the proposed CRM reference model. Not the part of the model expressed in this paper, but the model as a whole is intended to guide the AEC/FM sector towards quality and industrialization. Industrialization is a key issue to optimize the quality, time and cost of construction projects. Conventional approaches yield with a potential impact of preventing innovation and creating subjective barriers in front of industrialization for the AEC/FM sector.

### 2 Background

CRM is mostly considered to be a phenomenon of the late 90's. However the origins can be traced to the 80's in which the Total Quality Management (TQM) principles were born and relevant concepts extend to the times when, foundation for Sales Force Automation (SFA) was being formed. Many contemporary tools and techniques developed in order to optimize cost, time and quality depend on TQM principles (such as Concurrent Engineering (CE), Computer Integrated Construction

[*] Faculty of Engineering & Architecture, Yeditepe University, Turkey. keremer@yeditepe.edu.tr
[**] Faculty of Architecture, Istanbul Technical University, Turkey. kanoglu@itu.edu.tr

(CIC) Models, Knowledge Management (KM) mechanisms, etc.) CRM contributes these techniques to obtain Total Quality of a product and/or service.

CRM provides the customer interface of TQM and it provides the Information and Communication Technology (ICT) tools, which offers invaluable assistance for "Marketing Management" and "Design Data Management" in terms of "Total Quality". Implementation examples in other industrialized sectors prove that, asking the user is an efficient way to obtain innovation.

Information Society Technologies are built on this foundation, and being developed according to the strategies derived from society (union of customers). Even though CRM is an essential part of TQM, interest on focusing CRM is new. Thus there is no or little implementation in AEC sector. CRM seems more applicable for Facility Management (FM) and used at its least potential in FM sector.

## 3 Statement of Problem

In AEC sector, the customer is mostly the client and problems mostly address the unexpected or unaddressed requirements of the client. Inner dynamics of a construction progress is mostly oriented towards the client [LH 01]. Research efforts, which focus on integration, communication and collaboration mechanisms - in that sense – mostly focus on on-line construction process. The know-how captured from construction process is vital to elaborate on the quality of design. However this data is experience based. This experience-based approach yields a closed system. There is a need to capture data, which address future requirements to be used in the preliminary design phase. Such data is usually derived from use processes.

Because of the gap between the design processes and the use processes, marketing capabilities of the sector is greatly weakened. For the construction sector whom called the "customer" is mostly the owner (client). The user of the end product is completely discarded from the very beginning of the whole process. There is a problem with the current state of actors of the sector. This problem addresses three issues as: re-organization of actors, a cultural evolution and financing models.

The problem has a multi-layer character. Thus, proposing solutions leads to the determination of basic problems and barriers for the implementation of a CRM oriented approach. Special methods should be developed to overcome this challenge.

## 4 Related Work

There is not much study in this area for the AEC sector. One significant effort is the COMET project under the STAR research program in Finland [HS 98]. COMET aims at developing methods and tools for customer oriented design of buildings by the support of certain techniques of CE such as Quality Function Deployment (QFD) and Design Structure Matrix (DSM) [STE 81]. COMET suggests a "Requirements Management" system for the lifecycle of a project.

It is generally accepted that the quality of a product is largely determined in the early phases of design [RED 00]. Quality of information, which the design based on, is extremely important. Baldwin works on the problem and suggests an information flow model for the early stages of design [BAL et al. 99]. Mokhtar works on managing design changes [MOK et al. 98]. Burati works on TQM implementations in construction sector [BUR et al. 91].

## 5 Sector Specific Problems for CRM Implementation

In COMET project the sector specific problems of design quality are identified as follows: (1) Clients' needs are not sufficiently studied and considered, (2) Requirements that are set are not documented (and therefore cannot be traced), (3) Some essential requirements are excluded in the (cost-) iteration process without realizing what that means for the final product, (4) The design process is not planned, (5) The conformity of selected technical solutions is not managed systematically, (6) Needed products are not available [HS 98].

Implementation of any TQM technique for construction sector requires a cultural change in organization hence TQM is a company wide effort and requires everyone to be involved in an effort to improve performance [MAR et al. 02]. This progress requires considerably more training efforts than the non-TQM companies as well as a change in roles and responsibilities [BUR et al. 91]. In that sense, the proposal CRM reference model is planned to include an autonomous education and evolution mechanism for the craft towards this cultural change [THO et al. 02]. Managing this change is a major challenge.

### 5.1 Cost and Financing Issues

Every CRM implementation has a cost and it is really hard to obtain "Return on Investment" (ROI) in construction sector in which the demand and marketing conditions are instable. The cost of CRM is indirect for projects. It requires additional trained personnel. CRM does not provide expected value unless scalable systems and centralized data management is provided with a robust 24x7 environment (Such kind of a speculation is something which seems not applicable today but this issue is also a part of what we call "change"). The cornerstone of such an infrastructure is an enterprise storage designed as customer at the centre of the operation. Creation of such an integrated environment is due to a significant amount of investment on information technologies (IT). Small to Medium Enterprises (SME) are not strong enough to roll out under such big investments.

### 5.2 Organizational Alignment

Today there are typically six parties involved within a single project: the investor, the designer, the producer (with its sub-contractors), inspector agent, the user, and society. Taking into account the complex relationships between the parties, other contributors may be added as procurement companies, resellers, logistics companies, etc. In other industrialized sectors primary parties are - at least - grouped under enterprises and the number of actors in marketing decreases, making it easier to

define inner and outer dynamics of an organization [SAN 97]. This definition is pretty difficult for the construction sector, and at first sight it seems, for the implementation of CRM, addition of a new actor is necessary. This is also a major challenge since the model should have a unifying character for the sector, instead of diversifying it at further extends.

### 5.3 Legacy Issues

The data used for CRM is private. Privacy is an ethical issue to be solved while implementing any CRM solution. Security issues are great challenges to be solved. It is not easy to answer to the question "What data will be held by whom and where?". This challenge is composed of issues related with law and regulations, company politics and culture, and communication protocols. Identification of "owned" data and "shared" data is important. There are solution examples of some part of the problem such as the Construction and Real Estate Network (CORENET) in Singapore. A legislation arrangement seems necessary for the implementation of CRM in construction sector; however the necessity of such an arrangement would be kept in its least within the models subject to be proposed.

## 6 The Proposed Change Management Mechanism within CRM Model

The fundamental principle of TQM is that "Quality is not what the engineers define it as, but the end user". As Einstein stated, "The significant problems can not be solved at the same level of thinking we were at when we created them". So must we rethink the whole construction process again? This will lead the entire sector towards a change. This change is supposed to force towards the elimination and unification of roles and responsibilities in which the design, build and facility management processes will be owned by unified authorities. The solutions to above stated problems would be provided through a change management mechanism (Figure 1). Here technology provides the structure of the bridge between the organizational performance (including design processes) and final product quality. On one side of the organizational alignment in parallel to the evolving culture lies Customer Relations (where expectations possess specifications) and on the other side Product Data Management (PDM). The integrity of the system is constantly checked through a measurement system.

### 6.1 Components of the CRM Approach

CRM is a knowledge management activity. CRM is a gate for transforming tacit knowledge into explicit knowledge. Knowledge capture from CRM will address three major information subsets as defined in Design Quality Indicators (DQI):

- **Functionality** is concerned with the arrangement, quality and interrelationship of space, and the way in which the building is designed to be useful.
- **Build Quality** relates to the engineering performance of a building, which includes structural stability and the integration and robustness of the systems, finishes and fittings.

- **Impact** refers to the building's ability to create a sense of place, and to have a positive effect on the local community and environment. It also encompasses the wider effect the design may have on the arts of building and architecture.

The CRM model will collect information on functional and build quality parameters of the building through its impact on customers. Customer process is the driver for the proposed change mechanism and this mechanism is identified as where the customer satisfaction begins (Figure 1).

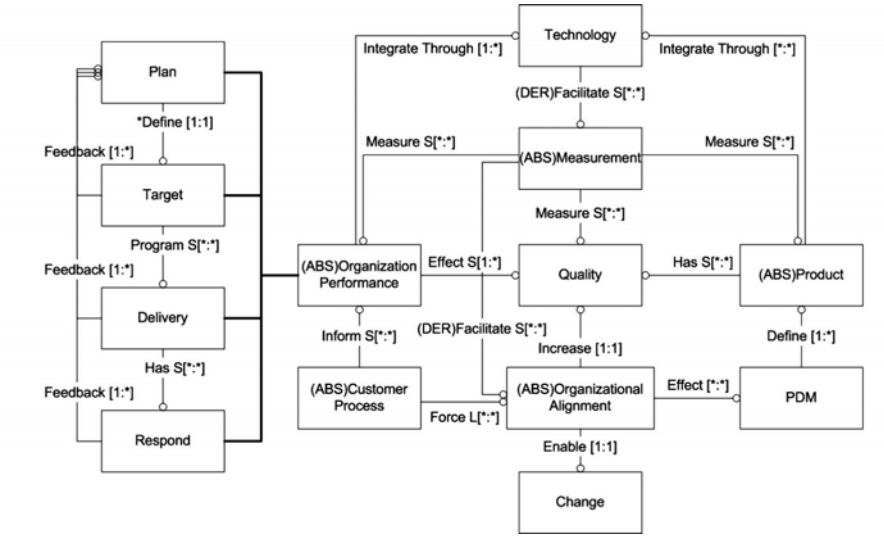


*Figure 1 Conceptual Express G Model of the CRM Change Management Mechanism*

## 7 Conclusion

Previous studies did not work through the problem of retaining customer information through a strict relationship, since implementation seemed not possible. This line of research does not emphasize the formulation of enterprise level barriers since clients are also investors and usually owners of the building. In order to resolve this conflict this research focuses on housing projects only; though it is being developed with a total approach and believed that the model would be applied to any type of construction projects afterwards. Regarding that any trusted solution implemented in any industrialized sector; should also be possible to be adapted to the construction sector to utilize the benefits of provided mechanisms. CRM may be implemented in the AEC/FM sector, after the multi-layered, sector-specific problems have been identified clearly. No comprehensive analysis about the impact

and composition of the problems are made in this paper. Better we tried to take the whole picture to determine objectives to elaborate through. Identification of the problems enables to create scenarios about future and facilitate the elimination of these problems. Hypotheses in order to provide the basis of solution mechanisms can be developed only after the resolution of the total system. In this paper sector based problems are identified, in order to start a CRM reference model for AEC/FM sector in which, we hope to provide new perspectives to approach to the studies on innovation in construction.

## 8 Bibliography


[BAL et al. 99] Baldwin A. N., Austin S. A., Hassan T. M., Thorpe A. 1999. Modelling information flow during the conceptual and schematic stages of building design, *Construction Management and Economics*, Vol.17, pp.155-167.

[BUR et al. 91] Burati J. L., Matthews M. F., Kalidindi S. N., 1991. Quality management in construction industry. *Journal of Construction Engineering and Management*, Vol.117, No.2, pp. 341-359.

[HS 98] Houvila P., Seren K-J. 1998, Customer-oriented design methods for construction projects, *Journal of Engineering Design*, Vol.9, No.3, pp.225-238.

[LH 01] Leinonen J., Houvila P. 2001. Requirements management tool as a catalyst for communication, *Symposium Report on the 2nd Worldwide ECCE Symposium. Information and Communication Technology in the Practice of Building and Civil Engineering*, Espoo, Finland.

[MAR et al. 02] Marosszeky M., Thomas R., Karim K., Davis S., McGeorge D. 2002. Quality management tools for lean production - moving from enforcement to empowerment, *Proceedings IGLC-10*, Gramado, Brazil

[MOK et al. 98] Mokhtar A., Bédard C., Fazio P. 1998, Information model for managing design changes in a collaborative environment, *Journal of Computing and Civil Engineering*, Vol.12, No.2, pp.82-92.

[RED 00] Redelinghuys, C. 2000. Proposed criteria for the detection of invention in engineering design, *Journal of Engineering Design*, Vol. 11, No.3,.pp. 265-282.

[SAN 97] Sanchez R. 1997. Strategic Management At The Point Of Inflection: Systems, Complexity And Competence Theory, *Long Range Planning*, Vol.30, No.6, s. 939 – 946

[STE 81] Steward, D. V. 1981. The design structure system: a method for managing the design of complex systems, *IEEE Transactions on Engineering Management*, Vol. 28, pp. 71-74.

[THO et al. 02] Thomas R., Marosszeky M., Karim K., Davis S., McGeorge D. 2002. The importance of project culture in achieving quality outcomes in construction, *Proceedings IGLC-10*, Gramado, Brazil