CUSTOMER RELATIONSHIPS MANAGEMENT IN AEC SECTOR

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SUMMARY

Quality is the major guide for enterprises in terms of competitive strength of organizations in the information age. While globalization increases its impact throughout the world, the term “Quality” expands its meaning and the cultural and social aspects of quality becomes the most important contributors of the product quality. The customer orientation of the finished product and after sales service is becoming vital in terms of marketing. Industrialized sectors had been providing solutions in that sense under the Total Quality Management (TQM) principles since the early 80’s. For the Architecture/Engineering/Construction (AEC) sector, several managerial tools and techniques has been adapted but these partial solutions do not perform well enough as they did success in other industrialized sectors. This is probably because the need for an enterprise-wide customer orientation infrastructure is not yet proposed. This paper discusses the early concepts about a “Customer Relationships Management” (CRM) model for the AEC sector which, CRM to be the foundation for TQM; issuing that CRM is the key enabler for any tool or technique towards quality and industrialization.

INTRODUCTION

This paper represents a new project, which aims at increasing communication and collaboration between design and use (including maintenance and operating) processes by addressing Information and Communication Technology (ICT) solutions through a Customer Relationships Management (CRM) reference model for the Architecture/Engineering/Construction (AEC) sector. CRM provides a strategic vision for Total Quality Management (TQM). TQM requires all participants of a project with the user at the core. To implement TQM in the construction sector, the AEC industry must re-invent itself to meet the increasing demands of high performance (Songer et al., 2001).

Today, in AEC sector many of the research and technical development studies focus on innovation in construction. The underlying reason behind this endeavor should be explained with the ongoing search for an optimization of three factors, which may be identified as quality, time, and cost. Industrialization is the key to achieve towards this goal, which means the reduction of labor use and high levels of mechanization (Koskela, 1992). Various project, process, and product models have been developed for Computer Integrated Construction (CIC) mostly searching comprehensive solutions for effective communication and collaboration.

To be discussed in detail, these efforts are considered as an ongoing search for quality and quality begins with design (Dyson, 2002). To increase the product quality, the feedback to the design phase from both production (construction) and use (post-construction) phases is essential. In that sense CRM is not an alternative way of implementing or using ICT solutions. CRM is a major contributor to valid CIC models in terms of “Total Quality”. The outcomes from this study are expected to affect many areas of research such as social architecture, sustainability, Product Data Management (PDM), and marketing management.

BACKGROUND

The main principles of Total Quality Management (TQM) depend on the Japanese “Kaizen” culture. By the early 80’s the combination of these principles with statistical quality assurance methods provided a new strategic vision for enterprises. This evolution enabled enterprises; to develop various organizational, productive and managerial models and tools in order to enhance the quality of the products and services while shortening the production lifecycle and cutting costs (Stasiowski and Burstein, 1993). It was then, the re-invention of the “Third Eye” – the customer. Up to then, only engineers could define quality, only in terms of better performance towards a specific need. Though after, customers defined their dreams about future, searching for a better standard for life, thus providing the key for innovation (Roth, 1999). This revolutionary movement had two primary supports behind: Emerging developments in information technologies and the unpredictable impact of globalization.

On the background of this research, there lie TQM principles, CIC models, and Information Society Technology (IST) projects, rather than simply the CRM applications. This is because; to realize the value of CRM we should look at the whole picture from a wider perspective. The evolution of quality as a term and as a management discipline happens in parallel to information technology capabilities available. Analyzing the research efforts under a “Total Quality” approach helps us to create and perceive the big picture (Figure 1).

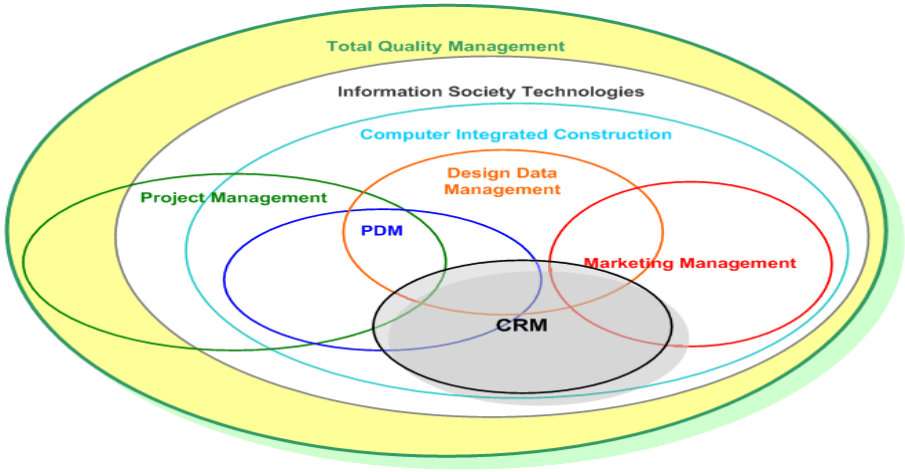

Figure 1 Background of Research

Since the industry revolution, the humanity met with a vast number of inventions and new trends. The theological and technical know-how increased rapidly. The increase at the amount of knowledge accumulation resulted with the diversification of expertise areas. Increasing the communication and collaboration between diversified expertises had become a vital need (Turk, 1997). This “need” is the primary factor, which forced the humanity towards Information Society Technologies. In that sense, we define quality as “the need of better standards for life”; and CRM acts as a gate towards total quality.

Engineering and architectural products are concrete objects. In order to process product information related with any product in digital environment, it is essential to simulate the methods, properties, and data allocated with the product as well as the processes such as management and production processes through a conceptual model. This is the subject of Product Data Management (PDM) and PDM provides a bridge between CRM and on-line quality. With the use of information technologies through this relation, the “quality” and other characteristics related with a specific product become manageable in digital environment. Because the TQM tools are mostly ICT software models and applications, TQM would become a buzzword, without information technologies.

When the primary objective is defined in parallel to the kaizen culture, continuous improvement in terms of total quality is the vision of future. In order to increase the quality of the finished product, design quality should be increased first. Increasing design quality depends on mainly two kinds of data:

1. Data collected from implementation – production processes/stages.
2. Data collected from end user – usage processes/stages.

Figure 2 shows the flow of feedback information from these both sources for improving the quality of design.

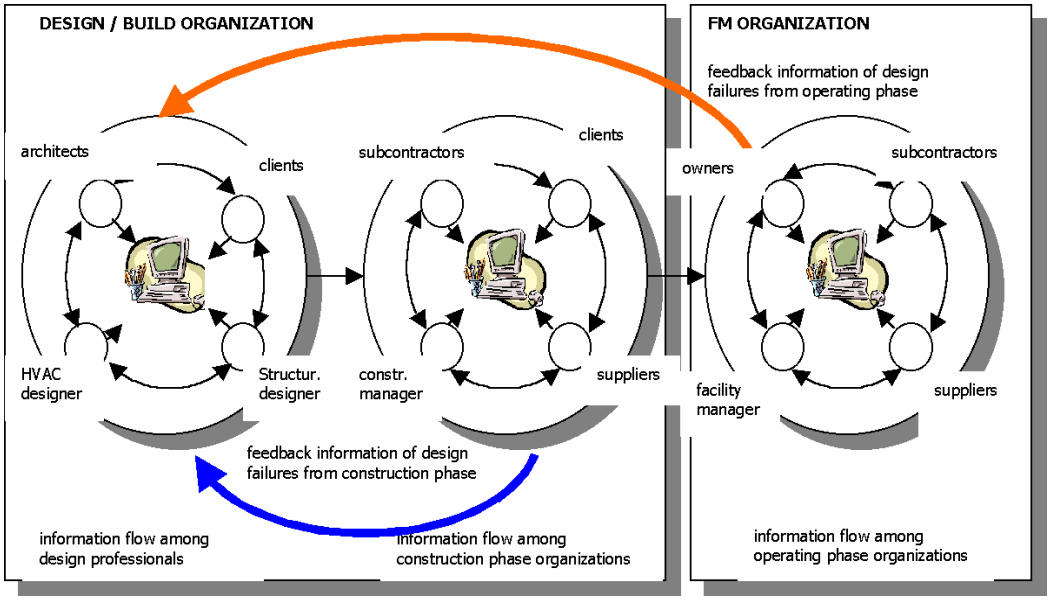

Figure 2 Information flow from construction and operating phases to design

"In the near future, design and construction will be integral parts of a bigger cluster. AEC/FM is seen as one industry. Design and construction will be closely connected to the core business of end users and must provide not only the physical spaces for activities, but also essential information for the use and maintenance of the buildings as well as services based on the information" (Kiviniemi et al., 1999). If there is one basic principle of TQM, it is that "Quality is not what the engineers define it as, but the end user." As a marketing term, the end user is simply the customer. Customer orientation is becoming an important competitive factor in the building industry (Huovila and Serén, 1995).

STATEMENT OF THE PROBLEM

Everyone is aware that something is not going the way it should. Most of the CIC models are being developed over past experiences, meaning a step-by-step evolution (Plenert and Hibino, 1998). The latest technology is dynamically adapted to the conventional process models in parallel to this evolution. However, conventional approaches are providing a great barrier in front of industrialization, communication and collaboration. Since old habits die hard, the past experiences become the primary reason for prevention of innovation. Although it is hard for the construction sector to appropriate a total cultural revolution; it is time for "Rethinking Construction".

One of the very basic problems of the construction sector is the instability of the market. Existence of a coherent customer profile has the potential to direct the sector towards right strategies, and high demand marketing environment. Nevertheless, the architectural design processes still use the "rights" which are defined thousands of years ago. It is not clear, how much the end user's needs are being taken into account by the architects. There is a "social architecture" issue to be solved. This rigid aristocracy is a subjective barrier in front of the design quality.

Because of the gap between the design processes and the use processes, marketing capabilities of the sector is greatly weakened. Maintaining the conformity of the technical solutions to the requirements is a responsibility assigned to all project participants of the building production process. Today's vision is that these requirements are expressed in a complex and rapidly changing environment or, sometimes only expected throughout the whole construction process. In order to fulfill the individual needs of customers, systematic methods should be developed to eliminate this gap. For

the construction sector, who called the “customer” is mostly the owner. The real customer (the user) is completely discarded from the very beginning of the whole process. The analysis regarding the above statements is summarized in Table 1.

In terms of Product Development	• The lost know-how related with the past experiences during product development is the primary barrier in front of quality improvement. • Information used through development processes is not always clear. • Information constantly develops and changes. • Information is not always uniform. • There is always some information lost on the way.
Physical Characteristics of the Sector	• The primary barrier in front of industrialization is the construction technology itself, which is available today. • The clumsy and complex characteristics of building production prevent the innovative impact of project management. • The amount of labor use in construction is high.
Information Technologies	• Because the production processes depend on labor use, the information systems are being designed according to that need. • There are heterogeneous systems. • Thus the primary problem becomes the “integration”. • Effective collaboration between enterprises and actors has not yet been established.

Table 1 Generic Problems of The AEC/FM Sector (Wix and Liebich, 2001)

RELATED WORK

Stated problems direct the sector to search for new, innovative, even revolutionary construction techniques. However any new product model should be donated with a compatible process and project model. In that sense any effort on the way of industrialization of construction may also be evaluated as an ongoing search for a new culture. Sustainability issues are forcing the barriers in that sense and - in particular - are an inspiration source for this research as the primary objectives match: “integrating the evolving needs of building users now and in the future” (Agenda 21, 1999).

One of the significant efforts on this research area is the COMET project (Huovila and Serén, 1995) under the STAR research program, in Finland. COMET aims at developing systematic methods and tools for understanding the customers' needs, and managing the conformity of the technical solutions to the requirements throughout the construction process. COMET defines three actors as “Customer”; investors, owners and users.

There are a vast amount of CRM applications available today for industrialized sectors. However no standardized tools or models are available for CRM software development. As a result the functionality of the solutions provided greatly differs from each other. There are standardization efforts for implementing CRM through web services. ECREM (Electronic Customer Relationship Management) project is an example of these efforts. Today some FM companies, which serve for construction sector, have been implementing limited CRM solutions (Naaranoja, 2000).

Reference models such as GARM (Gielingh, 1988), and PISA (Leavens and Tempero, 1997) will hopefully provide a basis for a CRM model in terms of CIC. Post Occupancy Evaluation (POE) studies will provide a starting point for the research. Quality Function Deployment (QFD) studies will be used to transfer customer profiles into product performance parameters.

Standards such as Industry Foundation Classes and STEP have been adapted for the enterprise. Today information technologies have the capability to produce 4D models, in other words “digital industrialization” is enabled for the AEC/FM sector in a virtual environment.

OUTLINE OF THE CRM MODEL PHILOSOPHY

Hypotheses

Social life has changed dramatically in the last fifty years with emergence of the stated factors. Today we live in a dynamic world, and many of us even cannot imagine a fifty years after. Up to today push thinking was enough for evolution, but it is time to use “pull thinking” now, meaning we have to think “in” future. It is hard to develop a full scenario about the future of construction industry but we may develop some hypotheses for rethinking construction:

- The first hypothesis is that the construction sector will be highly mechanized meaning a high level of industrialization. Labor (not human) factor of quality will have less/no meaning.
- The second hypothesis is that the building itself will become a pure manufacturing product, which there will be no difference between an automobile and the homes in terms of manufacturing. Buildings will be cheap, recyclable, renewable products. Tomorrow, we will have the opportunity to send our homes to a special recycling facility and buy a new one just like changing our cars.
- The third hypothesis is about the sociological aspect of the above statements. Our environment will be dynamic in terms of the buildings we live. The ergonomic, functional, and sociological needs will change dynamically, meaning a change in our lifestyles. And the spaces we use should be compatible with those evolving needs. Changing the furniture settlement of our office or home will not be enough.
- The fourth hypothesis is that CRM for AEC sector will become an essential foundation in such a scenario.

The easiest definition of CRM is that CRM is about systems that allow for a more intelligent and specific relationship between a company and any individual customer. The other essential component of CRM is the technology behind. Taking as a whole, CRM is at heart, a philosophy about doing business with the customer positioned at the centre of the operation.

Within the modeling context, CRM will be a foundation for any ICT solution. The core principles of TQM will be implemented over CRM to represent the core values of an enterprise directly to the customer. TQM is strictly related with the organizational culture of a company. Implementation of company strategy and scope, the company politics, rules, and principles, data flow, integration mechanism and collaboration through the company, customer privacy, and data security provided with the implemented technology will define the real value of an enterprise on a unified basis with the experience and know-how that company owns (Figure 3, WP4). Focusing on the customer, through the stated integrated processes and teams, a quality driven agenda will be defined.

Scope and Objectives

CRM is a strategy at the core. And for this strategy the overall view of customers is vital. To deliver this need a six step approach is necessary:

- Approaching CRM as a strategy, rather than a technology with a specific set of goals and rules.
- Establishing a single CRM foundation that accommodates data and systems interoperability across the entire enterprise.
- Organizing and re-deploying as much customer data as possible in a scalable data warehouse for easy access by the entire organization and improved management productivity.
- Cleansing data continuously and rigorously to assemble fragmented customer data into a single unified view of each customer with the latest information possible (Figure 3, WP1 & WP4).
- Updating company privacy policies and implement processes that support and enhance capabilities on behalf of customers.
- The ultimate goal is always the overall improvement of the customer experience.

The scope of this research is defined as to develop a reference model for the AEC/FM sector over a CRM foundation, thus enabling better communication between use processes and design processes. This connection is considered to empower the innovation efforts in the sector and forcing the sector towards industrialization. The research study is divided into four primary work packages defining the objectives in order to achieve the stated scope. The work packages are defined in Table 2.

WP1	Analysis and Synthesis of TQM principles, IST projects and CIC models in order to collect standards, technologies, approaches, and reference models, which are appropriate to use for the model philosophy.
WP2	Collection of data about past efforts in the field of design quality and design data management.
WP3	Development of the future scenario for the AEC/FM sector on behalf of the stated hypothesis.
WP4	Design of a CRM Reference Model for the AEC/FM sector, which will be a guide towards industrialization while implementing it through a type model as a software package for a more limited purpose to be used as a tool in order to increase communication and collaboration of actors in the AEC/FM industry.

Table 2 Primary Work Packages Defining Objectives

The layout of the proposed model and the work packages are given in Figure 3.

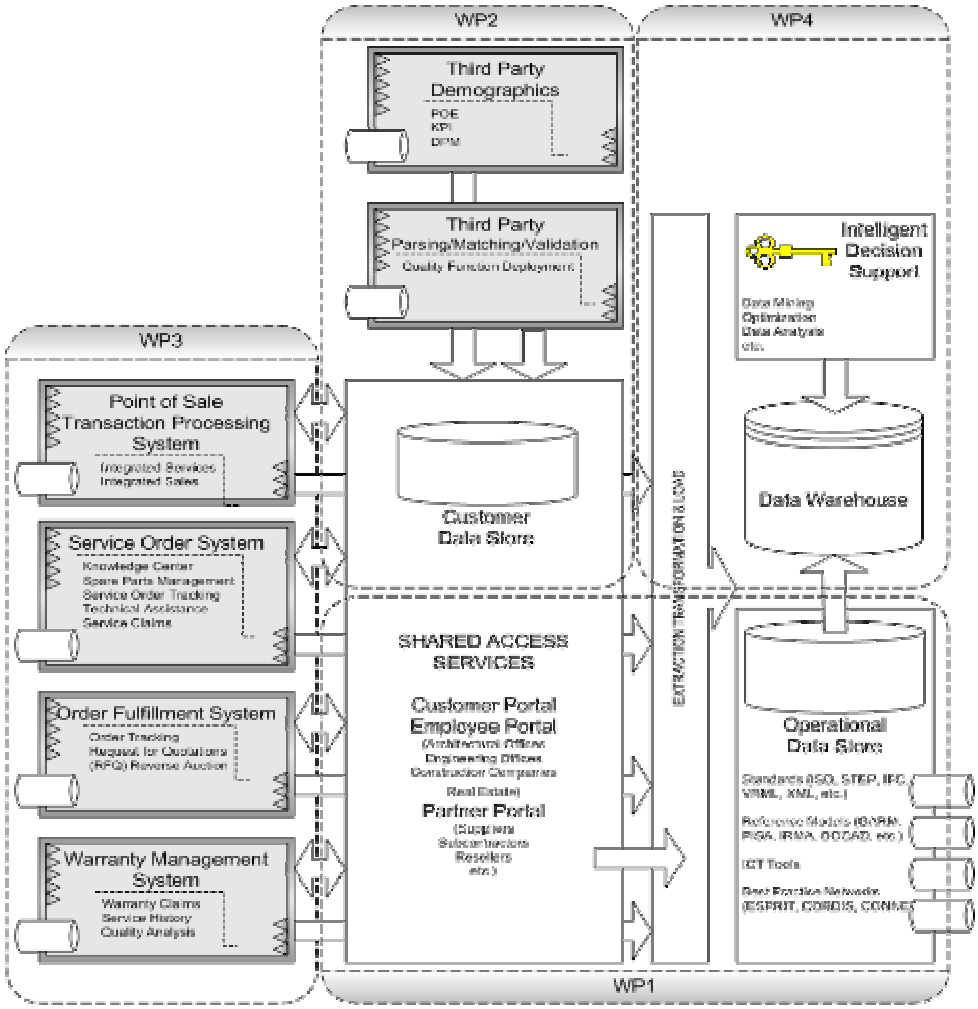

Figure 3 The Layout of The Proposed Model and Work packages

The major challenge in this study is the resolving of actors and responsibilities. The WP3 in Figure 3 reflects a typical user interface for CRM provided by CRM software vendors today and this scheme is applicable to many industries. For the AEC sector, functions and responsibilities defined by the model will address the current requirements while being compatible with future needs. Today's requirements bring up several problems to be solved such as legal issues, data security, and communication protocols because of the diversified structure of the sector. However there are researches on distributed systems available today and hopefully provide a basis to develop needed solutions. This problem will not affect the core of the model since it will mainly be based on future scenarios.

A typical CRM application has two primary components both subject to interface design. One component is data capture mechanisms such as web services, call centers, financial communications, product service requests (Figure 3, WP3), as well as third party demographics (Figure 3, WP2). This part of a CRM system includes IT solutions in operational level. The other primary component includes knowledge management modules, decision support systems, and expert systems, which provide intelligent mechanisms for support in tactical and strategic levels (Figure 3, WP4). There exists a buffer between those components addressing both. This buffer includes shared access services and is suggested to be provided by the government (like CORENET in Singapore), standards authorities and third party web services vendors (Figure 3, WP1 & WP2). All the data will be filtered in this buffer to create true and valid information. Data flow will be provided through secure pipelines.

To suggest a compatible and consistent CRM reference model for the AEC sector, collection of POE studies is essential. The principal objective is to load any data over off-line quality improvement, to focus directly on design quality. In that sense, performance indicators such as Design Performance Measure (DPM) and Design Quality Index (DQI) are being collected. QFD technique is used as a tool for assignment of needs as product specifications. This part of the model leads to other CIC models and PDM applications in practice (Figure 3, WP1 & WP2). In those phases of the project, compatibility issues with other project, process, and product reference models and conformance to the applicable standards is vital.

Unlike the COMET model, the customer is defined as only the end user for the proposed model philosophy. Since there is great possibility of interference between the owner's and investor(s)' needs and the end users' needs, the model primarily focuses on the end users. It is considered that the satisfaction of the end user is the primary director towards innovation.

The model is suggested for a single building type. Housing projects are the main subject of this research. However the hypotheses are speculated for the entire sector. The best place where internal characteristics of a product (the house) such as functions and effects, functionality determined, operational, manufacturing, planning, liquidation, ergonomic, aesthetic, law conformance and economic characteristics which the customer sees and judges is determined as the home.

CONCLUSION

It is essential for CRM to define what it means for AEC sector. The model will collect data from the end user; however, asset and property management, facility management, project management and all the key actors of the construction process will benefit from the proposed system. This model is intended to be for the use of entire enterprises. The proposed model will be a "live" model, which will dynamically adapt to the evolving nature of the AEC sector. It is foreseen that actors and responsibilities assigned in different work packages will be unified and be simplified.

Efforts, in order to reach to a better standard of life are directed towards the needs of a community which is composed of individual people having specific desires, culture, lifestyle, etc. These efforts may be evaluated as an ongoing search for higher quality for every aspect of life. From other point of view, the man-made artificial environment defines the quality level of our life. In that sense, AEC sector is the most responsible sector for the quality of the artificial environment. Reengineering processes are the contemporary environment for the development of products, processes, and organizations in terms of higher "total" quality. If we are rethinking construction today, then it is time to look at the whole picture from the "third eye".

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