



Quality Improvement Practices of Award-Winning Residential Builders and Housing Developers

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ABSTRACT

New home buyers in United States are becoming more discriminating in their home buying decision. They are demanding quality construction at reasonable prices. The current state of construction market also gives construction buyers more ammunition to be more discriminate when they choose to purchase homes. To be competitive and remain in business, housing contractors and developers must meet the growing quality demands of the customers. Thus, the competition to meet the buyers' quality demand has forced many of them to rethink the ways they build their homes. The improved designs, and construction methods and practices have resulted into award-winning quality-built homes for many of these contractors. This study was conducted to examine the quality improvement characteristics of selected award-winning residential builders and housing developers in selected counties in North Carolina, U.S.A. Through a structured questionnaire, the researchers collected information relative to their common quality characteristics, organizational culture and overall business practices. Data analysis was performed using basic descriptive statistics. The results show that regular inspection of work in progress, feedback from customers, and immediate attention to punch list items, were highly ranked among the quality characteristics evaluated.

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1. Introduction

The quest for quality and productivity improvement continues to dominate the construction industry. Construction buyers in all sectors of the building industry continue to demand quality products with zero defects. Nowhere has this demand been so pronounced than in the residential building industry. Residential home building is a lucrative business in

United States with the production of several new homes each year.

With the decline in national economic growth which began late 2007, the construction industry became one of the hardest hit industries with no immediate ending in sight. Although construction starts for new housing units in the third quarter of 2010 were 1 percent above that of third quarter of 2009, permits for construction of new housing units, and sales of new single-family homes in the third quarter of 2010 were down 7 percent and 27 percent, respectively from the third quarter of 2009. Single-family starts in 2010 were 12 percent lower than the third quarter level of 2009. Similarly,

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average monthly inventory of new homes for sale in the third quarter 2010 was 21 percent below the third quarter of 2009 [1].

With the current abysmal national economic growth, mortgage interest rates and housing affordability appear to remain favorable to most home buyers. Despite the affordable interest rates, sales of new and existing homes continue to decline dramatically, resulting into what real estate Experts term “buyers market.” The decline in sales was partly due to huge inventory of new homes in the market. National homeownership, while still very strong in some areas of the country, the national data reported a decline in a new homeownership rate in the third quarter of 2010, which stands at 66.9 percent.

Due to the current housing market, home builders and developers are becoming concerned about the current and future sales expectation, customer expectations and interest. Clearly, the current housing market has become a major concern of home builders and developers. Various housing reports point to a hard road ahead for recovery. With the gloomy single-family housing market conditions, the race has begun for home builders and developers in pursuit of prospective home buyers.

Many builders and developers are using lucrative incentives to lure homebuyers into their developments. Experience has shown that these buyers are not concerned about incentives only. In addition to location, they are also looking at the quality of the house. With this in mind, builders and developers are rethinking the way they plan, design and build their homes. Many have embarked on quality improvement programs and practices that will ensure their competitive edge.

2. Quality Improvement Practices

Empirical studies on quality management in construction have shown that various quality improvement practices are common among non-residential builders and developers. Most of these practices have been collectively grouped under a successful management philosophy termed, “Total Quality Management” or TQM.

TQM concept addresses quality as the main focus area. Shofoluwe and Varzavand [2] and Loushine, Hoonakker, Carayon, Smith, and Kapp [3] identified the following quality characteristics as essential focal points of TQM: Customer focus, Team work, Continuous improvement, Management commitment, Partnering, Employee involvement, and Effective communication.

Elghamrawy and Shibayama [4] also reported that implementation of TQM in construction industry has resulted into higher customer satisfaction, improved quality products, and higher market share. Studies conducted by Tang, Qiang, Duffield, Young, and Lu [5] also showed that certain factors could enhance TQM of contracting firms, including customer focus,

measurement and improvement, total involvement, training, leadership, team work, motivation, and systems/process approach. Similarly, Pheng and Tao [6] reported that successful implementation of TQM has resulted into reduction in quality costs, better employee job satisfaction, quality work performance, close relationship with subs and suppliers, customer involvement and satisfaction, and employee involvement and empowerment. Improving the quality of residential construction has become a revolution in thinking. This is so because of the spate of defects commonly found in new residential construction.

This claim was supported by a study conducted by Mills, Love, and Williams [7]. In their study of defects in new residential construction, the authors found that one in eight new homes was defective, with the cost of rectification accounting for 4% of the construction contract value. Although this research was limited to residential construction, it would suffice to argue in this paper that poor quality construction is prevalent in all types of construction. This argument was supported by a study conducted by Patton [8] in which he argued that sub-optimal task execution often leads to construction value loss, which in turn leads to customer dissatisfaction. Although the application of TQM has been most popular among non-residential contractors, many home builders and developers now implement most of its components.

Other most commonly cited techniques used by home builders to improve productivity and quality include teamwork, adherence to building standards, education and training of employees, job rotation, and subcontractor pre-qualifications. Shofoluwe and Varzavand [2] argued that quality could only be achieved through an integrated effort among all levels of a company, regardless of size. They further argued that it takes more than one single entity to satisfy customers. This means that a team approach is needed in order to have a meaningful quality program. The ultimate goal is to be more productive and to improve work process, which will eventually lead to customer satisfaction.

As part of an effort to improve quality in residential construction, Sacks and Goldin [9] argued in favor of using a lean construction application model, such as Lean Management System (LMS). They believed that LMS has a high potential to reduce waste and improve quality and productivity. Similarly, Waste-Based Management System has been espoused to be an effective lean construction system that could be used to improve productivity, safety, and quality of residential construction [10]. The concept of Waste-Based Management System is congruent with the argument of Shofoluwe and Varzavand [2] that an integrated approach is needed by all stakeholders in order to improve quality and productivity in construction.

Other authors have also tested the applicability and efficacy of other quality improvement systems to residential construction. Such systems include Value

Stream Mapping Lean Model used by Yu, Tweed, Al-Hussein, and Nassen [11] to study how quality and productivity could be improved in residential construction. Likewise, Mitropoulos and Nichita [12] used a Production Control System to assess the problems of delays and rework. Both of these authors came with convincing conclusions that residential construction industry would benefit from applications of lean construction systems through improved quality, productivity and efficiency.

3. Purpose of Study

The purpose of this study was to examine and assess the quality improvement characteristics of selected award-winning residential builders and developers operating in selected counties in North Carolina, U.S.A. The major objectives were:

1. To assess the organizational culture and general business practices of the participating firms
2. To assess the quality improvement practices currently being used by the participating firms.
3. To collect general demographic information about the firms
4. To use the data collected to make recommendation for quality improvement of future new residential homes.

4. Methodology

Every year, several home builders participate in the "Parade of Homes" organized by the local builders' association in the selected counties. During the parade of homes, registered builders have the opportunity to showcase their homes. Homes in the parade typically range in size from 1,200 to over 5,000 square feet. The price could also range from \$150,000 to over million dollars.

These homes are judged on various criteria ranging from quality design to construction innovation. Winners are then selected to receive awards in various judging categories. Many of the builders and

developers are repeat winners of these awards; a strong indication of their commitment to quality.

In order to gather data on the quality improvement characteristics of the award-winning builders and developers, the researchers used survey instrument to collect all necessary information. The survey participants were selected based on their past performance as award winners in the Parade of Homes. The questionnaire was designed to examine the business and quality improvement practices that have set the companies apart from their competitors. The questionnaire consisted of two major parts. The first part was designed to collect general background information about the company.

The second part addresses factors involving quality improvement practices. Out of the 28 questionnaires sent, 13 were returned, for a total return rate of 46.4 percent. The data collected were analyzed using simple descriptive statistics involving cross tabulation and mean rating.

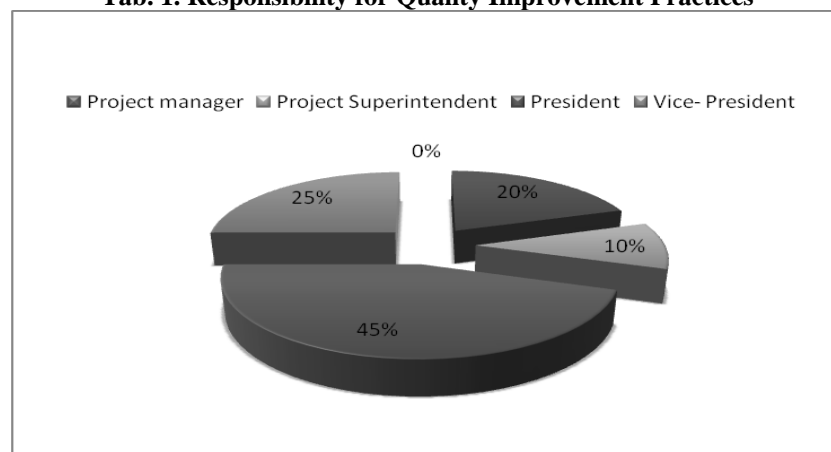
5. Results

5.1. Background Information

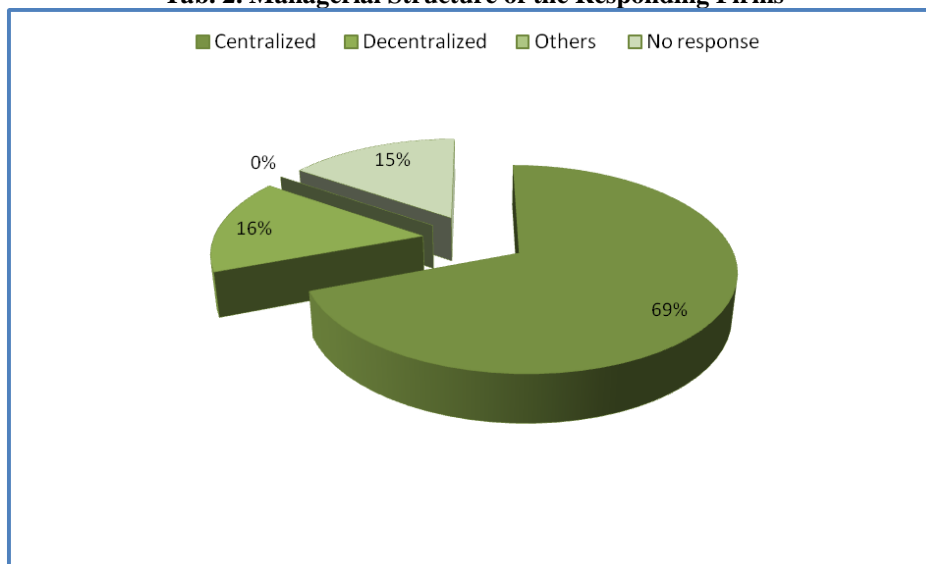
Analysis of data shows that majority of respondents have been in homebuilding business between 5 and 20 years and their major operations were within 25 mile radius of the county where their main offices are located. The annual volume of sales for most of these companies is under \$10 million. All respondents reported that over 50 percent of their work is subcontracted.

On the question of having a policy manual for quality improvement practices, only 50 percent of the respondents reported having one. As shown in Table 1, a large number (45%) of respondents reported that their company president was responsible for quality improvement practices. About 77 percent have no active quality improvement committee. When respondents were asked to indicate the managerial structure of their organizations, an overwhelming majority (69%) indicated "centralized" structure (Table 2).

Tab. 1. Responsibility for Quality Improvement Practices



Tab. 2. Managerial Structure of the Responding Firms



6. Factors on Quality Improvement

In order to assess the quality improvement practices of the respondents, a 24 quality improvement factors were constructed and pilot-tested for content validity. Respondents were asked to rate each item on a scale of 1 to 5 where 5 represents Extreme Commitment; 4 represents Strong Commitment; 3 represents Average Commitment; 2 represents Low Commitment; and 1 represents No commitment. The mean rating values for each factor were then determined using the following formula:

$$\text{Mean rating} = \frac{\sum_{i=1}^5 W * F_i}{n} \quad (1)$$

Where:

W = weight assigned or scale value of respondent's response for the specified quality improvement factor: W=1, 2, 3, 4 and 5;

F_i = frequency of the i^{th} response;

n = total number of respondents to the specified quality improvement factor;

i = response scale value 1,2,3,4 and 5; representing No commitment, Low commitment, Average commitment, Strong commitment, Extreme commitment, respectively.

Tab. 3. Top 10 Quality Improvement practices of Residential Home builders and developers

RANK	QUALITY IMPROVEMENT FACTORS	MEAN RATING
1	Regular inspection of work in progress	4.20
2	Feedback from customers is strongly encouraged	4.13
3	Proper immediate attention to punch list items	4.00
4	Regular review and strict compliance to regulations and codes	3.93
5	Excellent labor relations	3.80
5	Quality improvement efforts have the full support of the top management	3.80
6	Aggressive pursuance of methods and materials for improving productivity	3.67
6	Excellent job site conditions to promote positive working attitudes	3.67
6	Very selective recruitment and hiring process	3.67
7	Availability of funds to support quality improvement efforts	3.60
7	Maintenance of effective communication channels	3.60
8	Effective material delivery, storage and utilization practices	3.53
9	Effective use of computers and software to improve quality	3.47
10	Constant update of management tools and techniques	3.20
10	Development of incentives for motivating employees	3.20

Table 3 presents the top 10 quality improvement practices as reported by the respondents. Evidently, regular inspection of work in progress ranked number 1, with a mean rating of 4.20. This is not surprising, given the fact that any detection of defects in construction can only be noted through regular inspection. Failure to conduct periodic inspection could lead to poor work performance and attempts to make the correction at a later time could be costly. In order to ensure quality and customer satisfaction, feedback from clients is highly essential. This factor was ranked number 2 among the quality characteristic factors rated by the builders and developers. Proper immediate attention to punch list items was ranked number 3, followed by regular review and strict compliance to regulations and codes. Building codes are enforced to ensure compliance with minimum quality standards and safety of residents. Many builders go beyond the minimum quality standards in order to achieve quality credibility with home buyers. Further analysis reveals that 92.4 percent of respondents were strongly committed to excellent labor relations.

Support from employees and site personnel play crucial role in quality improvement efforts. Thus, a company must foster a collaborative working environment among various labor units if quality initiatives are to be embraced. The importance of top management involvement with quality improvement initiatives cannot be overemphasized. Various empirical studies have suggested that for any quality improvement program to succeed, it must receive the support of top management [2]. In this study, over 84 percent of the respondents reported having a full support of their company president. It is suffice to argue here that any quality improvement effort will be meaningless unless it has a full support of top administrator.

Three factors vied for the 6th rank. They include (1) Aggressive pursuance of methods and materials for improving productivity; (2) Excellent job site conditions to promote positive working attitudes; and (3) Very selective recruitment and hiring process. These three factors have been consistently cited in other quality and productivity improvement studies as having significant influence on construction quality. Availability of funds to support quality improvement efforts, and maintenance of effective communication channels were ranked 7th with a mean rating of 3.60. Management cannot institute a quality improvement program without backing it up with funds to operate it. Management must allocate sufficient budget if quality improvement program is to be successful. Any outcome of quality improvement effort must be communicated to the appropriate company official on timely basis.

This can be done through an effective feedback system. Our study respondents appear to be cognizant of the importance of technology as a tool to improve the quality of construction work. Effective use of

computers and software to improve quality was ranked 9th among the top 10 factors. Further data analysis revealed that 23 percent of respondents use Timberline Precision Estimating software to handle their estimating needs. Fifteen (15) percent use Microsoft Project for their planning and scheduling needs. Over 45 percent of respondents use other types of software, including Basic Builder, CDCI, Buildsoft, Intuit Quick books Pro, and Basic Estimate.

Ranking 10th among the quality improvement factors are: (1) Constant update of management tools, and (2) Development of incentives for motivating employees. These rankings show that construction firms must embark on periodic update of their management tools and techniques in order to ensure continuous improvement of their products. Likewise, in order to continue encouraging employees to strive for quality in the discharge of their work, top management must be obligated to reward them with financial and other incentives

7. Conclusions

This study has clearly shed light into the quality improvement characteristics of selected award-winning residential builders and developers operating in selected counties in North Carolina. These builders and developers have set their organizations apart from the rest by incorporating some key quality improvement practices in their daily operations.

The top ten quality improvement factors identified in Table 1 have become their regular routine practices in ensuring that their products stand out from their competitors. From the outcome of the study, "feedback from the customers" clearly stands out. Apparently these builders and developers are using the information gathered from customer feedback to improve future operations.

By so doing, they are guaranteed to continue winning more awards and using that recognition to woo customers to their new development. No quality improvement efforts would be successful without the support of top management. The findings of this study clearly support that.

Although not statistically proven, it could be argued that the award-winning contracting firms were able to succeed in their quality improvement efforts partly due to the centralized nature of their organization. Centralization allows key tasks to get done in an efficient and timely manner. In order to stay committed to quality in construction, regular scheduled inspection must be carried out to detect defective materials and non-conforming work. This is a limited study focusing on one geographical area of the state. It is recommended that further study be conducted in other geographical areas of the country to compare the results with the findings of this study. It would also be useful to statistically compare responses among the respondents using various predictor variables.

References

- [1] U.S., *Department of Housing and Urban Development*, "U. S. Housing Market Conditions, 3rd, Quarter". Retrieved Nov. 27, 2010 from www.huduser.org/portal/periodicals/ushmc.html.
- [2] Shofoluwe, M.A., Varzavand, S., "*The need for Total Quality Management Constructors*". *The Journal of the American Institute of Constructors*, 17, (3) 1993, pp. 21–24.
- [3] Loushine, T.W., Hoonakker, P., Carayon, P., Smith, N.J., Kapp, E.A., "*Quality Management Systems in Construction: Some insights from Contractors*". Center of Quality and Productivity Improvement, University of Wisconsin-Madison, USA, 2003.
- [4] Elghamrawy, T., Shibayama, T., "*Total Quality Management Implementation in the Egyptian Construction Industry*". *Journal of Management in Engineering*, 24(3), 2008, pp. 156-161.
- [5] Tang, W., Qiang, M., Duffield, C., Young D., Lu, Y., "*Enhancing Total Quality Management by Partnering*". *Journal of Professional Issues in Engineering Education*, 135(4), 2009, pp. 129-141.
- [6] Pheng, L., Teo, A., "*Implementing Total Quality Management in Construction Firms*". *Journal of Management in Engineering*, 20(1), 2004, pp. 8-15.
- [7] Mills, A., Love, P., Williams, P., *Defect Costs in Residential Construction*. *Journal of Construction Engineering and Management*, 135(1), 2009, pp. 12-16.
- [8] Patton, J., *Task Diminishment: Construction Value Loss through Sub-Optimal Task Execution Proceeding of the 2008 IAJC-IJME International Conference*, Nashville, TN. 2008.
- [9] Sacks, R., Goldin, M., *Lean Management Model for Construction of High-Rise Apartment Buildings*. *Journal of Construction Engineering and Management*, 133(5) 2007, pp. 374-384.
- [10] Zhang, J., Eastham, D., Bernold, L., *Waste-Based Management in Residential Construction*. *Journal of Construction Engineering and management*, 131(4), 2005, pp. 423-430.
- [11] Yu, H., Tweed, T., Al-Hussein, M., Nassen, R., *Development of Lean Model for House Construction Using Value Stream Mapping*. *Journal of Construction Engineering and Management*, 135 (8), 2009, pp.782-790.
- [12] Mitropoulos, P., Nichita, T., *Critical Concerns of Production Control System on Projects with Labor Constraints: Lessons from a Residential Case Study*. *Journal of Management in Engineering* 26(3), 2010, pp. 153-159.