

Use of Customer Satisfaction to Minimize Risks

by

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ABSTRACT

A roofing manufacturer wants to differentiate themselves from other roofing manufacturers based on performance information. However, construction industry has revealed poor performance documentation in the last couple of decades. With no current developed performance measurement model in the industry, two roofing manufacturers approached the research group to implement a warranty program that measures the performance information of their systems and applicators. Moreover, the success of any project in the construction industry heavily relies upon the capability of the contractor(s) executing the project. Low-performing contractors are correlated with increased cost and delayed schedules, resulting in end-user dissatisfaction with the final product. Hence, the identification and differentiation of the high performing contractors from their competitors is also crucial. The purpose of this study is to identify and describe a new model for measuring manufacturer performance and differentiating contractor performance and capability for two roofing manufacturers (Manufacturer 1 and Manufacturer 2) in the roofing industry. The research uses multiple years of project data and customer satisfaction data collected for two roofing manufacturers for over 1,000 roofing contractors. The performance and end-user satisfaction was obtained for over 7,000 manufacturers' projects and each contractor associated with that project for cost, schedule, and quality metrics. The measurement process was successfully able to provide a performance measurement for the manufacturer based on the customer satisfaction and able to identify low performing contractors. This study presents the research method, the developed measurement model, and proposes a new performance measurement process that entities in the construction industry can use to measure performance.

DEDICATION

I would like to dedicate this to my parents and to my wife who have supported me all the way through my academic career.

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CHAPTER 1

INTRODUCTION

The last couple of decades have revealed a poor documentation of performance information in the construction industry (Cahill and Puybaraud, 1994; CFMA, 2006; Davis et. al., 2009, Egan, 1998, Flores and Chase, 2005). Due to poor documentation of performance, roofing manufacturers and contractors are unable to differentiate themselves from other competitors and are enticing buyers to purchase their services based on low price and long term warranty durations. Due to this trend the manufacturers and contractors that provide high quality service and products are unable to compete in this price-based market which is riddled with false promises through the use of warranties (Kashiwagi, 2012).

For a long time the duration of the warranty has been used in the construction industry as a marketing tool. However, the warranty does not protect the buyer since it is an offer of protection provided by the manufacturer to the buyer (Agrawal et. al. 1996). The warranty is written by a roofing manufacturer and its legal representatives that contain certain exclusions, if encountered, will void the warranty (Christozov *et al.*, 2009). Hence, the long term warranties have no proven correlation with the performance and the life cycle of a roofing product (Kashiwagi, 2011).

This trend is dominantly seen prevalent in the manufacturing sector of the construction industry. The industry is flooded with manufacturers and contractors that sell products and systems based solely on the length of the warranties. The use of warranties for marketing is not a right approach and does not assist the end user to achieve a quality product. Many researchers have suggested different type of risk

minimization systems and processes in attempt to change this trend. (Hillson, 1997; CII, 1995; Gibson et. al., 2006; Hamilton, 1996; Kashiwagi, 2009; Sullivan, 2010; Davis, et. al., 2009; Sweet, 2011).

Two subject manufacturers realized that in order to survive in the competitive market saturated with low price and false promises of the warranty, it is critical to differentiate themselves from other manufacturers. Along with differentiating from other manufacturers, creating an environment where warranty is used to measure performance that will minimize the risk of the manufacturer and provide the client with the best quality service and product is crucial. In order to achieve this objective, two subject manufacturers approached the research group.

The researchers proposed a Post Occupancy Evaluation (POE) method that tracks the satisfaction rating of the buyers through the use of performance information of all the warranties issued by the manufacturer known as the warranty tracking program. The Post Occupancy Evaluation (POE) method, where a finished product is evaluated to measure the quality for continuous improvement on future products, is currently being implemented in the industry (Wicks and Roethlein, 2009). Buyer satisfaction questionnaires have been distributed after each project to impact future projects positively through corrective behavior modifications (Forbes 2002; Gajjar et. al. 2012).

This paper presents the research method used to implement the warranty tracking program that measures performance information with the use of customer satisfaction , present the findings of the program, and proposes a new performance measurement process that entities in the construction industry can use to measure performance and differentiate high performing contractors.

CHAPTER 2

METHODOLOGY

The methodology was to implement the initial warranty tracking program, refine the process based on the pilot study and implement the final process for all the manufacturers' projects. After the implementation of the final warranty tracking process the feedback process was created in the form of real-time database that reports the performance information findings back to the manufacturer.

The manufacturer initiates the client satisfaction warranty tracking program by sending a list of all the warranted jobs to the researchers as illustrated in Fig. 1. After receiving the list of jobs, researchers contact the end users for satisfaction ratings and direct feedback regarding the job. The researchers report back the information to the manufacturer with satisfaction ratings, problems and issues identified by the buyer that is compiled into a performance information matrix.

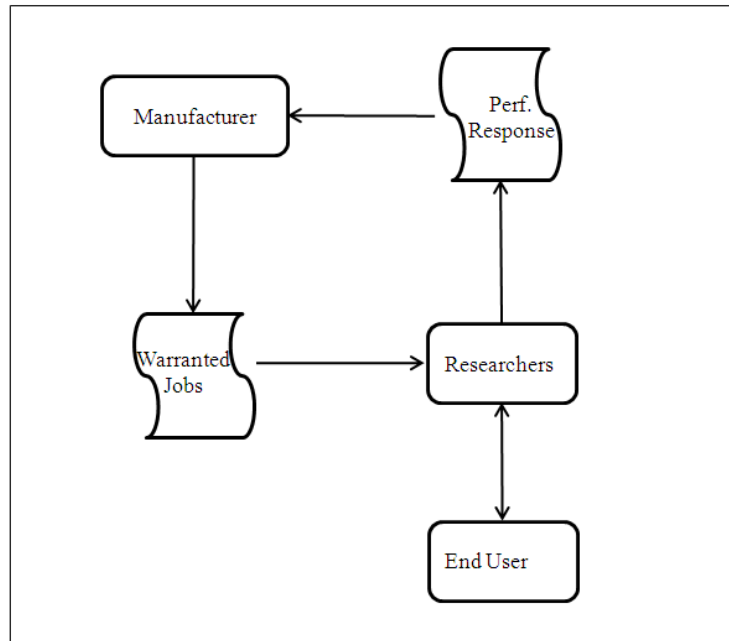
The questionnaires for the warranty process were developed jointly by the researchers and the manufacturer that would provide the appropriate information needed to differentiate and minimizing risk. Along with end user buyer satisfaction rating for their product, contractors installing the product, their representative present on the job site, leaks on the job site and customer retention rate was also measured. The researchers agreed that these are the critical elements for a successful roofing job and would help the manufacturer to clearly identify the unsatisfied end users and mitigate the problems proactively.

Upon completion of the satisfaction check, the performance response (performance information) is reported back to the manufacturer. This proactive risk

minimization system enables the manufacturer to identify and resolve problems upfront, rather than becoming reactive to them as they materialize in the future.

Figure 1

Warranty Tracking Program Process



The two manufacturers also had different objectives in the implementation of warranty tracking program and had different survey questions which are outlined as below.

Manufacturer 1

The survey questions for Manufacturer 1 were:

- Customer Satisfaction of the Applicator (1 lowest– 10 highest)
- Would you hire the applicator again? (Yes / No)
- Customer Satisfaction of the coating system (1 – 10)
- Would you purchase the system again? (Yes / No)
- Overall Customer Satisfaction (1 – 10)

Along with the warranty tracking program Manufacturer 1 also wanted to:

- Create the elite contractor program for Sprayed Polyurethane Foam (SPF) roofing known as the Alpha Program
- Implement a licensure process that checks the past performance of the contractors before getting licensed to install Manufacturer 1 products

Manufacturer 2

The survey questions for Manufacturer 2 were:

- Satisfaction rating of the roofing system (1 lowest – 10 highest)
- Would you purchase the manufacturers product again? (Yes or No)
- Is the roof currently leaking? (Yes or No)
- Satisfaction rating of the contractor (1 – 10)
- Would you hire the contractor again? (Yes or No)
- Satisfaction rating of the manufacturer's representative (1 – 10)
- Satisfaction rating of the value relative to the overall roofing project cost (1 – 10)
- Overall satisfaction rating of the roofing project (1 – 10)
- Have you used manufacturer's product more than once? (Yes or No)

CHAPTER 3

ANALYSIS & RESULTS

The analysis and results are broken down by Manufacturer 1 and Manufacturer 2.

Manufacturer 1

Table 1 shows the performance information of all manufacturers systems over the last six years. The total job area surveyed was 36.1 million square feet. The clients were satisfied with manufacturer's product and the applicators who installed the product. The overall customer satisfaction rating was 9.0 with 1,412 warranted jobs surveyed.

Table 1

Product Performance Information

Criteria	Unit	Overall	Floor	DB Roof	Foam Roof	Wall Coating	Water-proof
Overall customer satisfaction	(1-10)	9.0	8.5	9.1	9.4	9.2	9.0
Oldest job surveyed	Years	10	5	7	6	7	9
Average age of jobs surveyed	Years	4	3	4	4	4	3
Customer Satisfaction - Coating System	(1-10)	9.1	8.3	9.2	9.5	9.2	9.0
Percent of customers that would purchase the product again	%	98%	90%	98%	99%	98%	98%
Customer Satisfaction – Applicators	(1-10)	9.0	8.4	9.0	9.3	9.2	9.0
Percent of customers that would hire same Applicator again	%	96%	87%	96%	95%	97%	96%
Total job area (of job surveyed)	SF	36.1 M	0.3 M	3.6 M	3.2 M	2.8 M	26.2 M
Total number of jobs surveyed	#	1,412	31	191	111	63	1,016

Table 2 shows the performance information for jobs that hold potential risk. Jobs that have satisfaction rating below seven or clients that would not purchase the product again were categorized as risky. The data shows that 97% of jobs have no customer complaints and would purchase the product again. However, the risky jobs have a lower satisfaction rating of 4.1 for the coating system and 4.5 for the applicator. The risky jobs constituted only 4% of the total job area installed. The researchers send a quarterly report with a list of all identified “risky” jobs to the manufacturer customer service department. The customer service then contacts the client for further investigation and the actions that need to be taken to satisfy the customer.

Table 2

Risky Job Performance Information

Criteria	Unit	Risky Jobs
Total number of jobs surveyed	#	1,412
Number of risky jobs	#	70
Percent of jobs that are risky	%	5%
Satisfaction rating- Coating	(1-10)	4.1
Satisfaction rating- Applicator	(1-10)	4.5
Percent of customers that would purchase the product again?	%	0%
Risky job area	SF	1.5 M

Table 3 differentiates high performing applicators from low performing applicators. Applicators that have either a satisfaction rating below seven or a client that

would not hire the applicator again, are deemed as low performing contractors. The data shows that approximately 10% of the applicators that install the manufacturer’s product are low performing applicators. Low performing applicators installed 5% of the total job area of manufacturer coating. Upon publishing the results the manufacturer decided to stop selling their coating systems to the low performing applicators.

Table 3

High Performing vs. Low Performing Applicators (Manufacturer 1)

Criteria	Unit	High Performing Applicators	Low Performing Applicators
No. of Contractors	#	268	29
Satisfaction rating- Coating	(1-10)	9.2	7.4
Satisfaction rating- Applicator	(1-10)	9.3	6.1
Percent of customers that would hire the applicator again	%	100%	69%
Total Job Area	SF	17.2 M	1 M

High Performance Roofing Program

In order to attract high performance contractors a pilot program in the SPF roofing sector was created. A performance based SPF roofing program known as Alpha program is developed for the manufacturer to motivate contractor performance and accountability. The program is the first contracting performance program that is established by the manufacturer that qualifies and disqualifies applicators on performance measurements determined by the end users. The Alpha program minimizes the risk of the

manufacturer by attracting and using high performing contractor which eliminates rework and minimizes the risk for the end user by providing a quality product installed by a high performing contractor. The Alpha program succinctly curtails litigation that is caused by improper application, motivates contractors to take accountability for their work and increases and creates a competitive market for ensured quality performance (Kashiwagi, et al. 2010).

The performance requirements for the Alpha Program are:

1. Have a “good financial standing” and “be licensed” with the manufacturer
2. Roof inspections once every two years of a minimum of 25 roofs by a third-party inspector
3. Annual submission of newly installed SPF roofs over 5,000 SF to Arizona State University
4. 98% of roofs being tracked cannot currently leak.
5. 98% of surveyed roofs must have satisfied customers.
6. Attend the annual educational presentation

Applicators can be eliminated from the program if they do not meet the requirements of the Alpha program. There are currently 11 applicators that are a part of the Alpha Program. The data reveals that all of the applicators are high performing applicators with 100% satisfied customers and 100% of jobs that are not currently leaking.

Table 4 shows the overall performance line of the applicators since the inception of the Alpha program. The data shows that the overall satisfaction rating of the applicator is 9.4 out of 10 with 100% of jobs that are leak free and 99% of the customers satisfied

with the job. The total roof area that have been surveyed and inspected since the beginning of the Alpha program is 80 M SF.

Table 4

Overall Performance Line – Alpha Program

Criteria	Unit	Overall
Overall satisfaction rating of the applicator	(1-10)	9.4
Oldest job surveyed	Years	33
Average age of jobs surveyed	Years	8
Age sum of all projects that never leaked	Years	10,144
Age sum of all projects that do not leak	Years	14,166
Percent of customers that would purchase again	%	100%
Percent of jobs that do not leak	%	100%
Percent of jobs completed on time	%	99%
Percent of satisfied customers	%	99%
Total job area (of job surveyed and inspected)	SQ	80 M

Performance Based Licensure Process

Almost every manufacturer in the construction industry has a special license program that allows certain advantages for the contractors that are licensed. However, the licensure requirements are solely based on technical data like insurance requirements, credit, etc. which does not correlate to the actual performance of the contractor.

The manufacturer in this case study had a similar licensing program where the contractors that were licensed received “joint and several” warranty. Joint warranty contracts state that the responsibility to uphold specifications of the warranty is equally shared by the applicator and the manufacturer. The manufacturer identified that even some of the licensed contractors were not performing and needed a way to attract high performing contractors in the licensure program. The researchers proposed a license system that would severely minimize their risk by disqualifying low performing applicators to receive joint warranty options. By creating a system that filters out low performing contractors, it mitigates its risk of failing warranties and litigation.

Following licensing requirements were proposed:

1. Submit a minimum of five references that validates their credibility as a high performer. (One of the jobs must include the use of the manufacturer’s product)
2. Survey responses from the references answering the following questions:
 - Customer Satisfaction of the Applicator (1 lowest– 10 highest)
 - Would you hire the applicator again? (Yes / No)
 - Customer Satisfaction of the coating system (1 – 10)
 - Would you purchase the system again? (Yes / No)
 - Overall Customer Satisfaction (1 – 10)

The installed warranty tracking program showed that 10% of the manufacturer’s applicators were low performing. Table 5 shows that seventy two percent of the applicators that applied did not get licensed after the introduction of the license system. Many of the applicators were disqualified due to non-experience of using the manufacturer’s product.

Table 5

Applicator Licensure Analysis

Criteria	Data
Total number of applicators applied for licensure	271
Number of applicators licensed	77
Percent of applicators that did not get licensed	72%
Average satisfaction rating of licensed applicators	9.5

Manufacturer 2

The research for Manufacturer 2 was conducted in two steps:

- Pilot Study
- Final Implementation

Pilot Warranty Tracking Program

Before advancing any further, researchers recommended the manufacturer to conduct three pilot tests in order to test the ability of the warranty process to accomplish the desired goal of differentiating subject manufacturer from other competitors and minimize the risk. The three pilot tests were:

Pilot 1 - Warranty process on largest and oldest fifty projects

Pilot 2 - Warranty process on randomized one hundred and fifty projects

Pilot 3 - Warranty process on fifty different end user projects

Table 6 shows the performance information of three pilot tests. The data reveals that the overall satisfaction rating of the manufacturer is 9.2 out of 10. The customer satisfaction rating of the roofing system is 9.1 out of 10 and 98% of the customers would

purchase the manufacturers product again. There are 99% of the projects with no leaks. However, the customer satisfaction rating of the applicator is below 9.0 indicating it is essential to identify low performing applicators i.e. contractors to minimize manufacturer's and end user's risk.

Table 6

Performance Information for Pilot Test

Criteria	Unit	Overall	Pilot 1	Pilot 2	Pilot 3
Overall customer satisfaction	(1-10)	9.2	8.9	9.1	9.4
Oldest job surveyed	Years	3	3	2	2
Average age of jobs surveyed	Years	1	1	1	1
Customer Satisfaction - Roofing System	(1-10)	9.1	8.9	9.1	9.3
Percent of customers that would purchase the system again	%	98%	100%	97%	100%
Percent of roofs with no current leaks	%	99%	98%	99%	100%
Customer Satisfaction – Contractor	(1-10)	8.8	8.7	8.9	8.7
Percent of customers that would hire same Contractor again	%	95%	98%	97%	100%
Customer Satisfaction – Manufacturers Representative	(1-10)	9.5	9.2	9.6	9.5
Customer Satisfaction - Value relative to project cost	(1-10)	8.9	8.7	8.9	8.9
Percent of repeat customers (surveyed)	%	N/A	N/A	N/A	77%
Total job area (of job surveyed)	SF	4,942,175	3,202,636	1,125,333	614,206
Total number of jobs surveyed	#	127	31	76	20
Total number of surveys	#	250	50	150	50

Table 7 shows the percentage of end users that can be contacted and the reason if the researchers were unable to contact the end user. The research revealed that only 52% of the end users could be contacted.

Table 7

Survey Responses Analysis

Criteria	Unit	Overall	50 Projects	150 Projects	50 Diff Projects
Bad/Missing Information (No contact info, wrong #, etc.)	%	28.4%	34.0%	26.0%	30.0%
Refusal to Complete	%	2.0%	2.0%	0.7%	6.0%
Jobs cannot be contacted	%	15.4%	2.0%	22.6%	24.0%
Surveys Returned	%	51.8%	62.0%	50.6%	40.0%

Since end users play a critical role in the warranty process, it is essential that the response rate of the end users be increased. Manufacturers and the researchers agreed that the warranty process needed to be adjusted in order to meet its purpose to increase the response rate of the end users.

Final Warranty Tracking Program

Upon addressing this issue to the manufacturer, it was evident that the contact information was provided by the regional managers on the field and that they did not realize the importance of accurate contact information in the warranty process. In order to ensure the highest response rate the following was identified as crucial:

1. Educating the regional managers within the organization
2. Warranted jobs to be submitted monthly to minimize the time gap between job completion and customer satisfaction check

3. Provide a list of jobs where the end users cannot be contacted to the regional managers and request the accurate contact information

The difference if compared to the previous pilot warranty tracking program is that if the end user cannot be contacted, regional manager is responsible for providing the accurate contact information. After the accurate contact information is received, the end user is contacted again for the performance response.

The warranty tracking program is being implemented approximately for four years with the total of 2,254 jobs (42.3 M SF). Table 8 reveals the overall performance information after the implementation of the warranty tracking program. The average applicator customer satisfaction is 8.9 out of 10 (lowest of all categories). Satisfaction of the roofing system is 9.3 out of 10 and percentage of customers that would use the manufacturer's product again is 98%. The overall customer satisfaction rating is 9.2 out of 10 and the percent of customers that would purchase manufacturers product again was 98%.

Table 8

Overall Performance Information

No	Criteria	Unit	Overall
1	Overall customer satisfaction	(1-10)	9.2
2	Oldest job surveyed	Years	37.2
3	Average age of jobs surveyed	Years	3.0
4	Customer Satisfaction - Roofing System	(1-10)	9.3
5	Percent of customers that would purchase the system again	%	98%
6	Percent of roofs with no leaks	%	96%
7	Customer Satisfaction - Applicators	(1-10)	8.9
8	Purchase of customers that would hire same Applicator again	%	91%
9	Customer Satisfaction - Representative	(1-10)	9.5
10	Customer Satisfaction - Value relative to project cost	(1-10)	8.9
11	Percent of repeat customers	%	85%
12	Total job area (of job surveyed)	SF	42.3 M
13	Total number of jobs surveyed	#	2,254

Differentiating contractors

The warranty tracking program was also able to identify high-performing contractors from low-performing. Customer satisfaction rating for the contractor of 7 or below out of 10 was considered as low performing. Table 9 shows that 51 out of 882 (5.8%) applicators are low performing. The low performing applicators have installed a total of 200 jobs and 4.2 M SF.

Table 9

High Performing vs Low Performing Applicators (Manufacturer 2)

No	Criteria	Unit	All Applicators	Low Performing Applicators
1	Customer Satisfaction with Applicator	(1-10)	8.9	5.4
2	Total Job Area Installed	SF	42.3 M	4.2 M (9.9%)
3	Total # of Jobs Installed	#	200	2,254 (8.8%)
4	Total # of Applicators	#	51	882 (5.8%)

The manufacturer had no previous documentation that identified low-performing applicators. Moreover, it was documented that over 50% of the leaks and customer dissatisfaction was caused due to low performing applicator.

CHAPTER 4

CONCLUSION

The two manufacturers were successfully able to implement the warranty program and measure the performance information of their systems and applicators. Having a proof of documented performance of their systems differentiated the subject manufacturer from other competitors through performance measurement. The research revealed that the product of the two manufacturers in this study is a high performing product.

The warranty program provided the manufacturers a tool to minimize the risk not only for the manufacturer, but also for the end users by identifying

- End users that are not satisfied
- Applicators that are low performing
- Jobs that have current leaks
- Having a running log of satisfaction rating for every warranted job

The manufacturer was able to mitigate the risk proactively by identifying the unsatisfied end users and leaking jobs in the warranty process. The manufacturers are able to report these jobs to their respective managers that are responsible for their region within two weeks of notification.

The author proposes the warranty tracking program as a shell and can be implemented by tweaking the program for any entity in any industry.

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BIOGRAPHICAL SKETCH

Dhaval is a third generation construction professional and a Ph. D. candidate in Construction Management at Arizona State University's Del E. Webb School of Construction. He is also a researcher at Performance Based Studies Research Group (PBSRG) for 9 years that specializes in Best Value Procurement and Risk Minimization Using Performance Metrics. Dhaval is the lead researcher in roofing performance and risk minimization program. He also works with a local construction company that specializes in the facilities expansion and TI projects. Recipient of 2014 IFMA Karen Marcel Scholarship Award and 2015 IFMA Utilities Council Scholarship Award at WWP. He is certified in FMP and SFP. Dhaval also teaches undergraduate FM/Construction classes at ASU. He has authored several conference proceedings and journals on facilities management and best value concepts. He is currently the President of the IFMA Greater Phoenix Student Chapter and also serves as a mentor for the Obama Scholar Program at ASU.