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ENHANCING VALUE-ADDED PROCESSES FOR PACKAGING RELATED PRINTING INDUSTRIES IN THAILAND

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Abstract:
Quality enhancements for packaging-related printing manufacturers are routine achievement in the B2B (Business to Business) market in Thailand. All of the printing businesses are almost identical in terms of products and service, therefore the key point to win over the customers is not the price but the quality of the service and satisfaction of customers. Most of the printing industries are applying the typical concept of value-added process control from the basic idea of optimal organizational performance. However, value-added processes optimization can be adjusted to fir packaging-related industries in achieving better performance measures while reducing specific wastes. Improving the performance and consistency of quality will develop both short term profit and long term competitiveness. The application of Quality Functional Deployment (QFD), Six Sigma, and Correlation statistical analysis to the Medium-Size printing industries in Thailand help in the determination of improvement to enhance the customer satisfaction by 1.9%. The higher satisfaction of customers will then lead to the increment in sales order in the competitive market such as Thailand.

Keywords: printing industries, quality enhancement , Sig Sigma, QFD, customer satisfaction, correlation statistic

1. INTRODUCTION

Have you ever did something desperately but ends up ridiculous or worthless? That is frequent in daily business in manual decision making without making the right effort on value-added activities. "Pricing is actually pretty simple... Customers will not pay literally a penny more than the true value of the product." (Ron, 2014). Quality enhancements for packaging-related printing manufacturers are routine achievement in the Business to Business (B2B) market. Typically value-added processes are to be identified initially as to enhance quality bottlenecks. Dr. W. Edwards Deming (1986) once said, "94 percent of most troubles belongs to the system (responsibility of management), 6 percent special". Therefore, doing the right things with the right time from the right people are the ideal management. Every business institutions can applies the concept of value-added process control for optimal organizational performance. Value-added processes optimization can be adjusted to fit packaging-related industries in achieving better performance measures while reducing wastes. Improving the performance and consistency of quality will develop both short term profit and long term competitiveness.

2. OBJECTIVES AND PROBLEM

Value-added processes are activities producing product or services that would enhance customer satisfaction. This research aims to investigate the packaging-related printing manufacturers in Thailand to define and measure quality and lead-time bottleneck problem for root caused process relationships. Moreover, this research also seeking to analyze processes affecting quality and lead time bottleneck problems for better management and to purpose partial solutions to each processes causing quality and lead time bottleneck problems for improved outcome.

Six Sigma is the process management tool that has yielded the greatest results and it is ranked much higher than other Process improvement techniques as shown in Table 1 and Table 2 (Dushmare, 2006). Six Sigma can also be defined as a business process improvement approach that seeks to find and eliminate causes of defects and errors, reduce cycle times and cost of operations, improve productivity, better meet customer expectations and achieve higher asset utilization and returns (Diana, 2011).

Researcher claimed that the financial results and cultural transformation of SMEs that stem from six-sigma willbe developed more quickly through a smaller organization (Mittal, 2008). However, they do have constraints that limit their ability to initiate a largescale Six Sigma implementation (Rojas, 2010). More than just DMAIC process, developed quality inspection and receiving procedure also establish quality stability in reducing variances. Therefore, procedures of essential processes are also required for mistake prevention as well as best result outcomes.

Table 1: Rating of Process Improvement Techniques

Process improvement tool	Impact (%)
Six Sigma	53,60
Process mapping	35,30
Root cause analysis	33,50
Cause and effect analysis	31,30
ISO 9001	21,00
Statistical process control	20,10
Total quality management	10,30
Malcolm Baldridge criteria	9,80
Knowledge management	5,80

Source: Diana Bratic (2011)

Table 2: Six Sigma Strategies, Principles, Tools and Techniques

Strategies and principles	Tools and techniques
Project management	Statistical process control
Data-based decision making	Process capability analysis
Knowledge discovery	Measurement system analysis
Process control planning	Design of experiments
Data collection	Robust design
Variability reduction	Quality function deployment
Belt system	Failure mode and effects analysis
DMAIC process	Regression analysis
Change management	Analysis of means and variances
	Hypothesis testing
	Root cause analysis
	Business process mapping

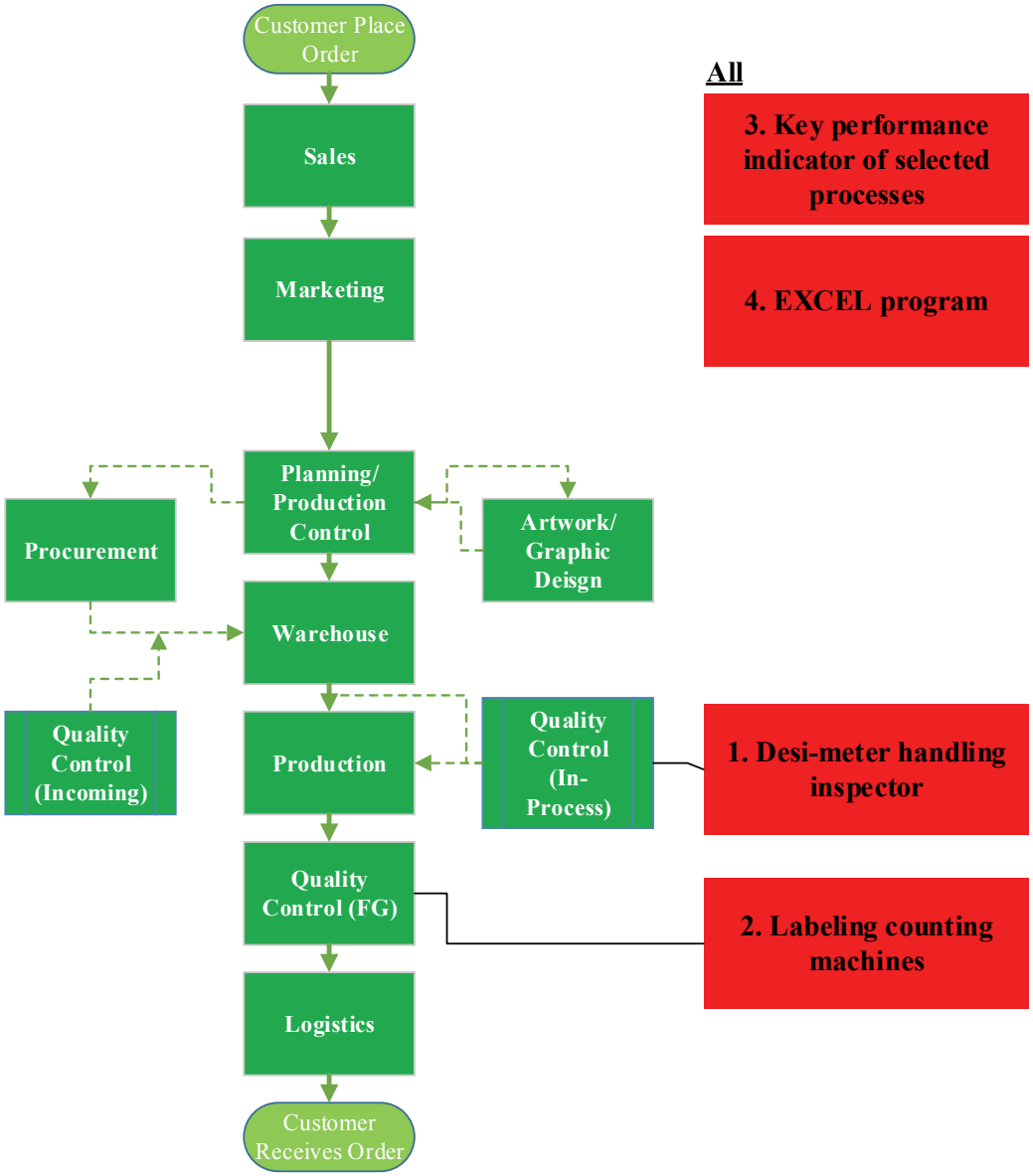
Source: Diana Bratic (2011)

LLC (Leader Label Company Limited) under RLU (Rainbow Leader Universe) Group with other 3 packaging-related printing factories will be selected as representative of label packaging-related printing factories in Thailand. LLC is a privatized factory that prints UV (Ultra-Violet) ink onto label papers for label usage. It is one of the biggest and well-known label printing factories with more than 13 machine facilities in Thailand. The overview of flow process is shown in figure 1 along with the machines and equipments required for the work flow.

3. METHODOLOGIES

The main source of analysis is the historical performance data of LLC since the entire fiscal year of 2010 to 2013. These documentary data are being collected with several departments and is examined by ISO9001 (2008) certification auditor teams. Each data performed from the bottleneck processes would put to further statistical analysis. On the other hand, the historical documentations of corrective and preventive actions are taken for the value-added process considerations. From that the statistical data of each processes of selection would then be defined and investigated.

Figure 1: Process Flow with Equipment Application for LLC



Methods of data collection and indicators selected of each critical parameters to quality processes are then determined for further statistical output. The critical to quality processes performance indicators are set up defective (D1μ), work in process defective (D2μ), finished goods defectives (D3μ), color stand difference (ΔE), color standard thickness (ΔY), artwork output (Aoμ), artwork defective (Adμ), rotary excess stock (SRμ), letterpress excess stock (SLμ), pumping excess stock (SPμ), total finished goods excess stock (SFGμ), job waiting time (Mijμ), set up time (Misμ), cleaning time (Micμ), maintenance time (Mimμ), total machine idle time (Mitμ), working time (P1μ), productivity time (P2μ), job amount (P3μ), speed (P4μ), input in meters (P5μ), output in meters (P6μ), and efficiency (P7μ)respectively.

Value-added process typically is a customer perspective that needs to be further analyzed. By understanding the value added process of a company is necessary first step in diagnosing potential of a firm for achieving a competitive advantage in the marketplace (Michail 2011). On one hand, customer needs and values are being determined with a semi-annual customer survey provided in Table 3.

Table 3: Customer Importance corresponding to Company Performance

	Label Quality	Label Market Competitiveness	Correct Amounts	Lead Time	Service Politeness	Min	Max
Total	87.04%	83.05%	89.27%	91.00%	93.55%	83.05%	93.55%
Difference from Min.	4.00%	0.00%	6.22%	7.96%	10.51%	n/a	n/a
Customer Importance (Max. of 5)	4.76	5.00	4.63	4.52	4.37	n/a	n/a

QFD (Quality Functional Deployment) is a useful transformative tool that can shift customer needs and customer values into our product features, product service, or any business offerings. Technical importance of all the five customer needs are then rates according to the ten most frequent usage or the product specifications With QFD as shown in the following figure 2 and figure 3, concerned criteria are then transferred to concerned product features and services in level one. It is clear that Thai label usage firms demands exact volume, lead time, die-cut quality, and color quality as product features and specification respectively.

Figure 2: QFD from Customer Importance to Technical Importance

Strongly Related 9 Moderate Related 3 Weak Related 1 Unrelated 0	Product Usage	Color Quality	Die-Cut Quality	UV Resistence	Water Resistence	Glue Adhesive	Freezing Resistence	Boiling Resistence	Printing Usage	Under Volume	Lead Time	Customer Importance
Customer Need		1	2	3	4	5	6	7	8	9	10	
Label Quality	1	⊕	●	⊕	⊕	⊕	⊕	◢	⊕			4.67
Label Competitiveness	2	●	●	●	⊕	◢	⊕	◢	⊕	●	●	5
Volume Correctivity	3									●		4.63
Lead Time	4										●	4.52
Service Attitudes	5											4.37
Technical Importance		78	87	73	68	58	58	29	63	87	86	

The concerned product features and services are then transferred to CTQ (Critical to Quality) processes whose average score exceeding scoring of 2,000in level two. The selected processes also known as the critical to quality processes are artwork edition, machine printing, machine pumping, machine slitting, raw material checking, work in-process checking, and finished goods checking, with the score of 2084, 3127, 2081, 2081, 2338, 2581, and 3448 respectively.

4. DISCUSSION

It is necessary to reduce duplications and narrow down the indicators within the twenty-two critical to determine process indicators. This research paper will perform two methods as demonstrated in this section.

Correlation statistical provided in table 4 showed that five sets of two to three processes duplicated. They are process indicator artwork revise (Arμ) to artwork output (Aoμ) and artwork defective (Adμ)

with a correlation level of 76.11 percent, total machine idle time (Mitμ) to job waiting time (Mijμ) with correlation level of 85.34 percent, input in meter (P5μ) and output in meter (P6μ) to machine set up time (Misμ) 76.78% and 73.88%,job amount (P3μ) to machine maintenance time (Mimμ) with correlation level of 72.56 percent, speed (P4μ) to job waiting time (Mijμ) with 84.74 percent correlated, and set up defective (D1μ) to efficiency (P7μ)with 94.55 percent correspondingly.

Figure3: 2QFD from Technical Importance to Critical Processes to Quality

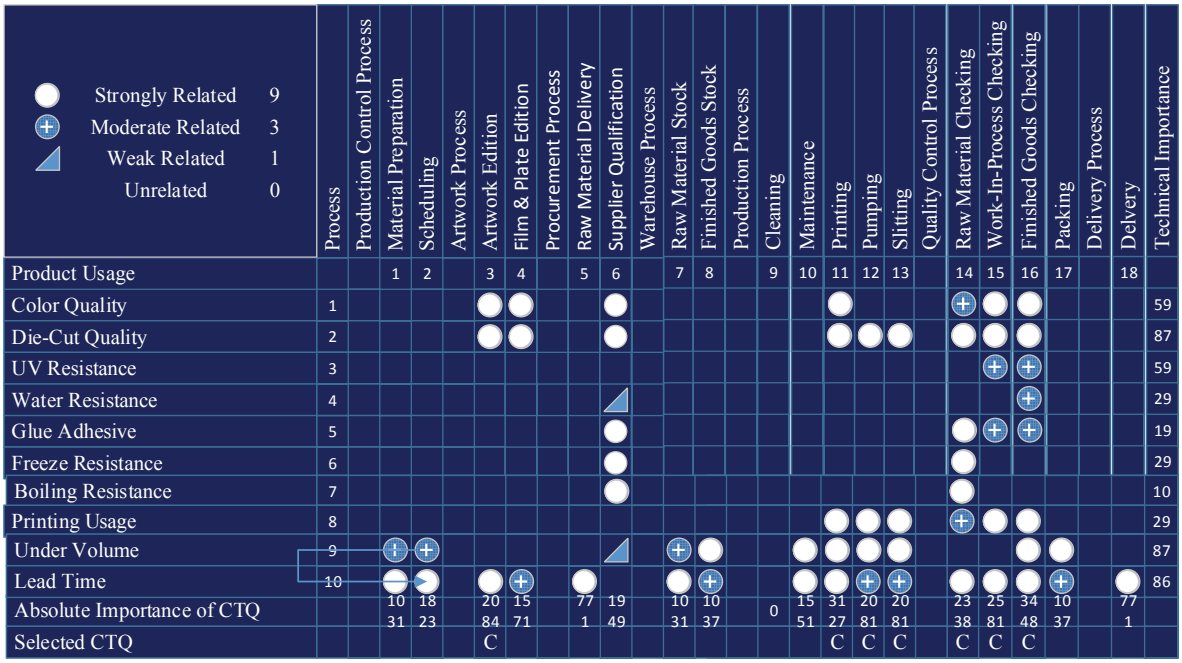


Table 4: Summary of Correlation Statistics for LLC Process Performance Indicators

Process Selected	D1μ	D3μ	Adμ	SFGμ	Mijμ	P2μ
Process Duplicated	P7μ	n/a	Aoμ/Arμ	n/a	Mitμ	n/a
Correlation Results	0.9455	n/a	0.7611	n/a	0.8474	n/a
Regression Results	n/a	n/a	n/a	n/a	1.41×10^{-17}	n/a

On the other hand, there are also regression statistical output between thesepre-selectedprocess indicators demonstratedcustomer valuesaffecting customer satisfaction, which provided the same results as that of correlation, are shown in table 4.On the other hand, process indicator work in process defective (D2μ), color standard difference (ΔE), color standard thickness (ΔY), and productivity in terms of time (P1μ) are used for instant inspection for quick decision rather than historical data collection. Leaving the main six critical to quality process indicators set up defectives (D1μ), finished goods defectives (D3μ), artwork defective (Adμ), finished goods excess stock (SFGμ),job waiting time(Mijμ), and productivity in terms of time (P2μ).

5. CONCLUSION

With knowing which value-added processes to improve or manage, LLC can now put efforts on five s to improve them. It will enhance the customer satisfaction with efficiency since LLC has a direction of focus for development. This is a typical example of how identifying value-added processes benefits business institutions. In fact, the customer satisfaction improves 1.90 percent from 88.14 percent previously to the current 90.04 percent shown in table 5.

Table 5: LLC Customer Evaluation Results

	2010-2013	2014 Jan-Mar	Improvement
Overall Customer Satisfaction	88.14%	90.04%	1.90%

6. RECOMMENDATION FOR FUTURE WORK

There are plentyof opportunities for further development of analysis. The recommendations for further investigation and analysis are DMAIC Cycle, Six Sigma Process, and controlling tools.Six sigma process and its significant DMAIC cycle will make a breakthrough improvement on value-added activities for both quality and lead time perspectives. It will not only improve the results but also the consistency or the variance of the process performance.There are still numerous methods or ways to improve the value-added processes of Thai label packaging manufacturers. Fish bone analysis would be a helpful tool for instance. These yet to be improved and controlled processes will brings a definite improvement to the costs and quality of the label printing manufacturers in achieving better profitability.

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