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Improvement of Ready To Pay Cycle Time Through The Application of Six Sigma Within Business Process Management

KEYWORDS: Business Process Management, Cash Conversion Cycle, Continuous Improvement, DMAIC, Ready to Pay Cycle Time, Six Sigma

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ABSTRACT *Organisationsin general and especially in the service industry face customer pressures for improving performance and returns while optimizing costs.The paper investigates the opportunity of implementing Six Sigma within Business Process Management in order to drive improved performance and business impact within an outsourced accounts payable process. The research is looking into the service industry, business process outsourcing in particular, assessing the opportunity of impacting the cash conversion cycle, the ready to pay cycle time, through the application of Six Sigma and the DMAIC methodology thus determining continuous improvement on the Business Process Management.*

1. Introduction

The Service industry has noticed some remarkable developments in the last couple of decades, however we can't state that research in the area of quality in services followed a similar trend as opposed to most quality research that is targeting manufacturing. The same is found as valid when it comes to quality research that is focused on the application of Six Sigma, concept that was developed in manufacturing that displayed only some mild interest when it comes to services.

Considering empirical evidence that borrowing constraints have important implications for firm growth and survival, Clementi etHopenhayn (2006) expose that borrowing constraints emerge as a feature of the optimal long-term lending contract, thus such constraints relax as the value of the borrower's claim to future cash flows increases. This optimal contract is seen as the main element impacting borrowing, cash flow, working capital and company growth. With this research we assess the impact that Six Sigma and the application within Business Process Management can have on the invoice processing cycle time affecting cash flow, working capital, elements that determine company's growth and survival.

This research is not focused on promoting outsourcing and the impact on cost savings and profitability, as there is extensive research on the area both describing the effects on large corporations, small and medium size enterprises and even on national economies (Basu, 2008 ; Haskel et al., 2012 ; Grossman et Helpman, 2005). Outsourcing offers just the landscape for the research as it was carried out within the outsourced Accounts Payable of a Life Sciences Organisation that was facing pressures with regards to performance, accuracy, and a need for improving financial key performance indicators as ready to pay cycle time. Considering the outsourcing contract relationship and the obligations that derive from it (Aghionet Holden, 2011), the ready to pay cycle time represents also an element of liability and thus its criticality.

The ready to pay cycle time is impacting the cash conversion cycle which represents the time for selling inventory and collecting receivables less the time necessary for issuing payment on payables.

Cash Conversion Cycle	=	Days Inventory Outstanding + Days Sales Outstanding – Days Payable Outstanding

The Days Payable Outstanding are determined mainly by the agreed supplier payment terms, but also by the invoice processing cycle time and the payment run schedule. This research is targeting improvement on the invoice processing cycle time, that is determined by the invoice receipt and scanning cycle time, query resolution cycle time and the actual invoice processing.

2. Research methodology

For the moment we can identify a reduced level of empirical research concentrated on Six Sigma's application within Business Process Management in the Service Industry and thus we conclude the research presented by this paper as being exploratory. Due to the fact validated knowledge on the assessed topic is scarce and quantitative investigation can't take place, a qualitative analysis is approached.

This research is assessing Six Sigma's application in Business Process Management, thus a company using the DMAIC improvement methodology has been selected in order to assimilate the required qualitative data that enables analysis on Six Sigma's application in services.

Previous research on the topic of innovation (Bresnahan et al., 2002) is considered, especially the complementarities that derive from combining improvements in the area of information technology (IT), workplace reorganization, and new products/services and their impact on demand and productivity regressions.

3. Six Sigma and Business Process Management

There is extensive research available on the benefits of Business Process Management advocating how organisationswould benefit from improved efficiency and effectiveness, reduced reaction times to market pressures and improved customer satisfaction (Pritchard et Armistead, 1999 ; O'Neill et Sohal, 1999).Bartel et al. (2007) research the impact of the information technologies (IT) on productivity, emphasizing that IT improves product customisation processes, manufacturing processes (setup times, run times, and inspection times) and improvement in the skill requirements of machine operators, development in tech-

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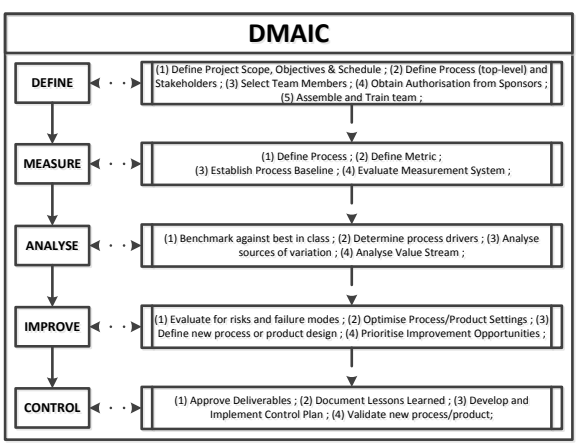
nical and problem-solving skills, and the need for new human resource practices to support these skills.

Six Sigma is a complex approach that drives organisationsin improving and attaining business objectives, improved customer service and optimised business processes. (Pande et al, 2000)

Six Sigma research is published mainly by practitioners, interest from academics being scarce (Brady et Allen, 2006 ;Aboelmaged, 2009), however some developments are noticeable in the last couple years.

Six Sigma's improvement methodology, DMAIC, describes the steps that should be followed in from project definition to process analysis, solution investigation, implementation and control. DMAIC is viewed as a systematic, robust, data-based approach used to improve quality and basically solve issues/problems (CarreiraetTrudell, 2006). To the same extent DMAIC can be viewed as a meta-routine (Schroeder et al, 2007), as it can be defined as a routine that is used to modify routines or to implement new routines.

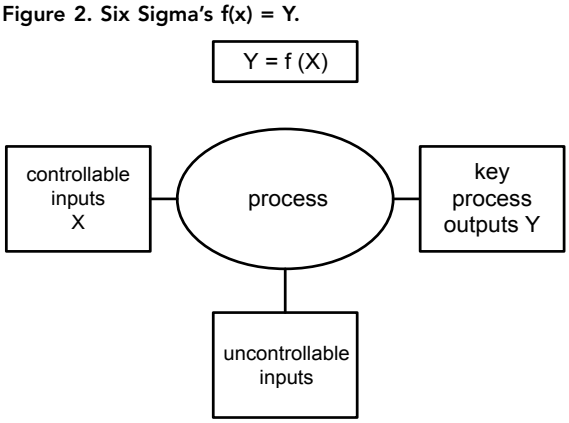
Figure 1. Six Sigma project methodology - DMAIC



Source : adapted from Pyzdek et Keller (2009)

DMAIC's objective is to identify the link between process inputs and the desired outputs ; looking a solution for the function f (x) = Y, where x reflects the inputs and Y is the desired output – the Voice of the Customer.

Figure 2. Six Sigma's f(x) = Y.



Source : adapted from Gotro (2003, p. 14)

DMAIC viewed as the methodology for solving f(x) = Y, implies that in Define, Y is being understood together with the measurement methods. During Measure, the measurement system is validated, the measurement on x vs Y takes place. Analyse has the role of identifying the relevant x's based on tests on the relationship between x's and Y. The relevant x's are being targeted in Improve and thus the implementation of the solution takes place followed by the Control phase where Y and the relevant x's are monitored.

Carreira et Trudell (2006) acknowledge Six Sigma's role in driving improved customer satisfaction, the elimination of waste and non-value added activities, improvements on flow, velocity, throughput, lead time and financials as cashflow.

Stamatis (2003) exposes the potential benefits of Six Sigma, impact it can have on the bottom-line and likewise on the top-line, and various considerations that finance professionals would need to incorporate in order to operate in any industry.

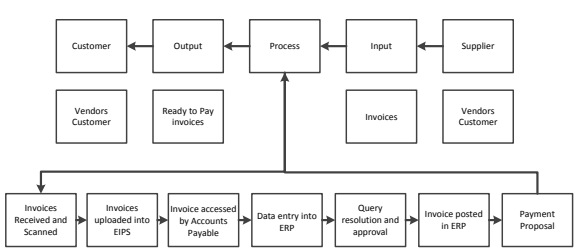
4. Application of Six Sigma within Business Process Management

4.1. Define

This case study reflects a Six Sigma Project executed in an outsourced accounts payable process for a global pharmaceutical and medical device company. Paid on time enables accurate reporting and vendor satisfaction, being influenced by agreed payment terms ; payment schedule and invoice processing cycle time. The latter is a critical Accounts Payable key performance indicator that is influenced by the invoice receipt, query resolution and processing time.

Average cycle time for invoice processing over last 12 months was found to be 30 days ; this is leading to a large number of vendor queries ; productivity loss and dissatisfaction. Payment delays lead to service disruption and where the paid on time is 80% (paid on time being calculated as due date + 7 days) ; thus the project goal is to improve the average ready to pay cycle time to 23 days.

Figure 3. SIPOC diagram.
(visual tool documenting business process end-to-end)



A project charter was developed to define the project, business case, problem statement, goal, project scope, project team and milestones for the Define, Measure, Analyse, Improve and Control..

4.2. Measure

With the Project Y clearly stated, defect, units and defect opportunities per unit understood, and targets set a fishbone root cause analysis was drafted in order to enable an understanding into the levers that affect project Y.

Figure 4. Ishikawa (Fishbone) diagram Causes impacting

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Project Y.

Afterwards the data was collected to enable a better understanding of the current performance and the measurement system was likewise analysed for accuracy, repeatability and reproducibility.

4.3. Analyze

The product performance was established and performance objective defined considering the measurements from the previous step and the project Y.

Process Sigma is a measure used to reflect normal distribution by comparing disparate measures like task completion and time on taskusing the following formula :

Figure 5. Calculation for Z-score – Process Sigma

Where standard deviation :

Figure 6. Calculation for standard deviation

In this application the process sigma calculation is assessing the average cycle time.

Figure 7. Product Performance – prior to implementation

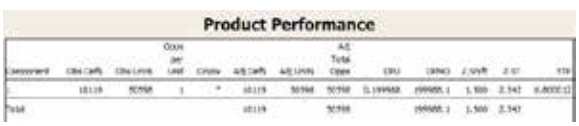


Table 1. Initial cycle time, defects and opportunities vs target

	Opportunities	Defect	DPMO	Sigma zst	Average Cycle Time
Initial	50598	10119	199988	2.342	30 days
Target	?	?	?	?	23 days

Brainstorming was carried out by the project team to generate ideas about possible causes that affect the number of items/hour. The causes that were identified were collated together with causes previously identified by observation or data collection and depending on the type of the concerned data, the hypotheses where tested.

Table 2. Summary of identified causes (X's)

X's	Operational Definition	P-Value	Significant	Test Used
Invoice Receipt Time	Date/Time of invoice receipt	0.000	Y	Regression Analysis
Document Type	PO/Non-PO invoices/Credit Memos	0.000	Y	Mood Median
Queried invoices	Invoices where extra processing is carried out due to various queries	0.000	Y	Mood Median
Agent Productivity	Cycle time per agent processing	0.214	N	Regression Analysis

4.4. Improve

Once the causes for the variation were identified and tested, improvements have been proposed in order to generate the targeted improvements.

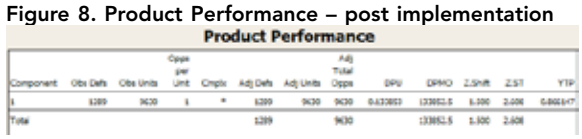
Table 3. Improvement directions on causes(X's).

X	Root Cause	Proposed Solution
Invoice Receipt Time	Delay in receipt of invoices through mail	1. Generic email ID created to enable receipt of invoice soft copies 2. Communication sent out to vendors informing that invoice can be dispatched to the email ID
Document Type	Non-PO invoices routed through locations for scanning	1. Tighter controls on GRN 2. Procurement to request vendors to reference PO n° on invoices 3. Procurement to drive improved Price Control and Compliance
Queried-invoices	Delay in goods receipting ; PO not on invoice ; Price discrepancy.	1. Defined timelines for coding and approval process

4.5. Control

After the improvements have been implemented the product performance was measured in order to assess the impact and verify the effectiveness of improvement actions and thus we can notice an improvement in DPMO together with a move of ZsT from 2.34 to 2.61.

Figure 8. Product Performance – post implementation



Comparing the initial data with the data gathered after the implementation of improvements, it is evident that the Cycle time was improved due to the implementation of this project.

5. Conclusions

This research investigates whether Six Sigma's implementation within Business Process Management is suitable. The case study provides reasonable considerations that enable us to suggest that Six Sigma's application within an Accounts Payable process is found to be suitable and DMAIC enables continuous improvement within business process management.

The research is considered to be limited and additional validation on the application of Six Sigma in Business Process Management is required so that the outcomes exposed by this exploratory research could be sustained.

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