# Quality quandaries: Improving a customer value stream at a financial service provider

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#### Introduction

In the wake of the financial crisis, the financial sector had to make tremendous efforts in being more transparent and cost efficient (Blom and Kuenen 2009). As a consequence, over the last decade, various financial service providers have embraced a range of methods for improving their customer processes. A method that has proven to be of great value for structurally improving customer value streams is Lean Six Sigma (LSS).

This case study is about a customer value stream at a large Dutch financial service provider. A value stream is an end-to-end process within a company. For confidentiality reasons, the exact nature of the service is not disclosed. Examples are handling requests for loans or mortgages, processing insurance claims, or transferring a pension.

This "Quality Quandary" discusses two projects that have been executed within the customer value stream. The first project was focused on a mid-office (MO), where the quality of information from the front office (FO) was improved (dependability). The second project was performed from the viewpoint of the front office itself, where processes were further improved, resulting in an altogether more efficient and effective customer value stream.

Both projects were carried out using the LSS methodology, which is known for its definemeasure-analyze-improve-control (DMAIC) phases (Schroeder et al. 2008). These phases induce a stepwise procedure for process improvement, based on measurements and evidence-based intervention. The stepwise approach and quantitative analyses originate from Six Sigma. On the other hand, Lean offers a collection of best practice and tools (see, e.g., Womack et al. 1990), which are integrated in the activity plan of Six Sigma (cf. De Mast et al. 2012). The combination of Lean and Six Sigma has proven to be a sound method to organize process improvement. Since the start of LSS in industry in the 1990s other sectors have also adopted the methodology and have achieved substantial benefits; see De Mast et al. 2012.

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In LSS terminology, project leaders are called "belts." Black belts run the larger projects, supported by green and orange belts. Green belts can also run projects independently, but these projects often have less impact on the organization as the monetary benefits are smaller. Orange belts usually run small improvement initiatives driven by the work floor that only take a few days, which is in contrast to black belt projects that typically take up several months (cf. De Mast et al. 2013; Akkerhuis et al. 2015). The projects discussed in this column were led by two black belts who are managers in the MO and FO of the financial service provider.

#### **Project selection**

In practice, the success of improvement projects greatly relies on the organizational complexity, in terms of a project leader's span of control, politics, and stakeholders. In the organization under consideration, the integration of LSS is in an advanced stage (for an overview of integration and its stages, see De Mast et al. 2013). To illustrate this, competencies in LSS are named

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Figure 1. SIPOC of the customer value stream.

explicitly in specific job profiles. In such an organization, where improvement is part of normal work, a project leader rarely improves an entire value stream in one project. Improvement of a customer value stream usually involves different improvement projects that focus on different aspects of the value stream.

Lean Six Sigma practitioners can deal with complete value streams by dividing it into subprocesses and sequentially optimizing them. Another approach is very much related to the theory of constraints, as proposed by Goldratt (1984). The success of a first project brings to light problems in other areas of the value stream. These problems were hidden by the daily troubles before the improvement. In Goldratt's terminology: the bottleneck in a process is addressed until a constraint somewhere else in the process becomes the bottleneck. Then the focus is on the next bottleneck. The two cases covered in this "Quality Quandary" are an example of this approach.

Despite the fact that these projects were executed consecutively, we will describe, for readability and conciseness, both projects as one. Note that both projects were focused on different aspects of the value stream. The first project was based on the performance of the MO, and the second project was scoped to the performance of the FO.

#### Define

Lean Six Sigma projects are aligned with the organization's strategy. Organizations are often continuously trying to excel in relevant key performance dimensions (see Slack, Chambers, and Johnston 2010) to outperform competitors.

As such, LSS has evolved into a widely studied and applied robust business improvement initiative (Schroeder et al. 2008). LSS is a methodology focused on improving operational efficiency and effectiveness for service and manufacturing companies (George 2003). Lean Six Sigma prescribes that projects are chosen from a strategic perspective; that is, one should select projects that are likely to be a good investment of time and money. After selecting a project, the project owner (the champion in LSS terminology) and the belt are appointed. The belt draws up a contract, defines the goals for the process, and selects the project team.

In this case, two black belt projects were performed on the process as depicted in the supplierinput-process-output-customer (SIPOC) diagram in Figure 1. A SIPOC is a macrolevel process description that explicitly specifies the suppliers who bring in inputs for the process and the customers who receive the outputs.

As can be seen from the SIPOC, the FO can execute almost all tasks in this value stream. However, some cases need to be assessed by the MO. In particular, a case qualifies itself for assessment by the MO if the FO is unable to handle it or if it satisfies certain criteria.

Invoking the MO to handle requests is more expensive in terms of time because it requires an extra step. Unfortunately, in the current situation, many requests are incorrectly specified as an MO request. One of the goals is to reduce the number of incorrectly classified MO cases at the expense of the FO, which could lead to potential savings of €150,000 per year.

Another problem in the value stream is the communication in the process. In many instances, requests are not accompanied by the correct information, and information is often missing in the first place. In the FO, this can be handled directly by contacting the client again. For the MO, these problems are more urgent because requests have to pass through the FO to complete missing or incorrect information of the client. The rework costs were estimated at €100,000 per year.

Finally, the processing time of handling the customer request by the FO is long, due to rework. It is believed that the amount of time employees spend on each case can be decreased by an average of 2 hours per case, leading to savings of about  $\notin 1.25$  million per year. In total, the benefits are estimated to be around  $\notin 1.5$  million per year for the complete value stream.

# Measure

In the measure phase of the project, a belt defines measurable performance indicators, called critical to quality characteristics (CTQs). Project definitions, whereby strategic objectives are related to operational project goals, can be operationalized with a balanced scorecard (Kaplan and Norton 1992) or a CTQ flowdown. A CTQ flowdown encourages project leaders to link strategic focal points to the project goals and performance metrics; that is, the CTQs (see De Koning and De Mast 2007). These CTQs are the metrics that have to be improved during a project.

The strategic focal points of the organization under consideration are cost, dependability, and speed. Often the main cost in a service-oriented organization is personnel cost. For this project, the CTQs that affect the personnel cost are processing time (in the FO) and percentage of MO cases (%MO cases). The quality of the cases received by the MO is linked to the goal of increasing the delivery quality of the service, which is called "dependability." For example, poor delivery quality often leads to extra client contacts because it is not right the first time, affecting both customer satisfaction and operational cost. For this project, the quality of a case for the MO was split into completeness and correctness of the documentation that was attached to a request. The "throughput time," which is the sum of processing and waiting time, is the indicator for the speed of the process and is an important aspect of customer satisfaction in a customer value stream. The resulting CTQ flowdown is found in Figure 2. Not surprisingly, the flowdown is a combination of the generic CTQ flowdowns that are formulated for financial services by Lokkerbol et al. (2012).

After finishing the CTQ flowdown, a belt develops a measurement plan and validates the proposed measurement procedures, because the data should reliably reflect the current performance. To make the study repeatable, a belt should explicitly mention the observational unit of the measurements. In this project, the observational unit is a week for the CTQ: %MO cases (i.e., percentage of MO cases per week). For the input quality, processing, and throughput times, the observational unit is a case (number of minutes/hours/days per case).

First, we describe the validation and measurements of the CTQs that were measured by the MO. The %MO cases could be retrieved from management information. In order to validate these data, the definitions in the management information system were checked. The historical database contained roughly 50 observations of %MO cases in the past year. Additionally, the belt wanted to find out why a case was sent to the MO (MO trigger). In the current process, these triggers were already recorded by the FO personnel. An agreement study showed, however, that the kappa of this measurement system was only 65 percent (cf. Cohen 1960). Hence, the historical data were not reliable enough to draw any conclusive conclusions. Fortunately, the intrarater kappa was 87 percent. The belt concluded that employees are able to determine the MO trigger consistently for themselves but maintain different definitions among each other. In order to retrieve valid results for the rest of the project, the current forms were made uniform and accompanied with clear instructions. This resulted in reliable measurements of the MO triggers.

Secondly, the correctness and completeness of MO cases, both binary variables, were tracked in a newly designed digital measurement form. This digital measurement form was accessible online. To make sure that the measurement form was used correctly, definitions were discussed with the employees and there was an extensive period of test measurements. After this phase, the actual data collection started. As a result of having two binary CTQs, about 300 observations had to be collected for reliable analyses in the following DMAIC phases. Therefore, in addition to continuously monitoring the data collection process, the progress was tracked and in about 3 months sufficient measurements had been collected.

In the FO, the throughput time and the processing time had to be measured. This was a challenging process, because the FO is spread out over many offices throughout The Netherlands. There is a database containing some relevant information. For example, it contained the aggregate processing times as people could write time on servicing a request. Unfortunately, it was not possible to recover the distribution of the total throughput times over all process steps, and the database did not give any insights into the reasons for



Figure 2. CTQ flowdown of the customer value stream improvement project.

rework. Therefore, additional measurements were collected.

The additional measurements were collected by an extensive study among 20 FO employees at four different locations. They were asked to keep track of individual cases with the help of a travel sheet. In a travel sheet, employees denote for each process step the time of receipt and the time of finishing. This allows calculating processing times and waiting times (and thus throughput times) of the subprocess steps. Additionally, the sheet offered room for explicitly stating the reason for rework. The measurement period was one month and led to a sample of about 560 measurements of process steps, which corresponded to about 70 unique cases. As a check, the newly collected data were compared to the historical data from the database. No anomalies were found.

## Analyze

The goal of the analyze phase is to determine the current performance of the process. This is done by a thorough analysis of the collected measurements. Then, the belts look for potential influence factors that affect the CTQs.

In the first place we focus on the processing times of the front office. The result is a detailed account of how processing and throughput times were built up. An effective way to illustrate this is by means of a value stream map, which is shown in Figure 3.

It is striking that the aggregate processing times equal about 8 h. Furthermore, the total throughput time from start to end is estimated to be about 40 days. This is a throughput efficiency of 3 percent (total processing time divided by total throughput time). Furthermore, a Gemba study (see Womack 2011) helped to identify various forms of waste in the process. Examples are excessive waiting times (represented by the clocks in Figure 3), loops, and rework, such as retrieving missing documents (both represented by a triangle of arrows in Figure 3). Finally, the offer process step is considered too complex (represented by the knot in Figure 3), which is possibly one of the causes of extra iterations with the client.

Another waste is the excessive use of mid office capacity. The value of 46 percent in Figure 3 comes from the analysis of the CTQ %MO cases measured per week. This CTQ is measured for 50 weeks and we have applied a control chart to visualize the CTQ behavior in Figure 4.

A control chart distinguishes patterns from normal variation. What catches the eye are the signals (marked by a square box by Minitab) indicated by a 2, 5, or 6. These numbers point out that there are drifts and trends in the data. We concluded that the process is not in statistical control. In other words, 46 percent of the cases are indicated as MO cases, which is believed to be too high. Moreover, we see that %MO cases rises toward the end of the year. There were no direct explanations for this seasonable pattern. Possibly, at the end of a year, the workload of the FO is higher, which results in more cases being sent to the MO. The goal is that %MO cases is about 20 percent (80 percent therefore being handled by the FO), which was agreed upon in the first place when this process was designed. Note that this goal has not been reached for a single week, indicating that the organization has to put in significant efforts to drive this CTQ down.

Secondly, we focused on the input quality of the MO requests. In total, 619 MO cases were measured; 37



Figure 3. Value stream map of the process with focus on the front office. PT stands for processing time and TPT for throughput time.

percent of these were complete. From these 259 cases, only 42 percent was also correct. This means that only 16 percent have reached the MO with sufficient quality. The value stream map in Figure 5 illustrates this.

The belt also noted that the final approval was sent both by e-mail and by post to the FO. Only the one by e-mail was being used by the FO.

The number of missing or incorrect documents per case was also analyzed. It was striking to observe that many requests miss multiple relevant documents and if they are complete there also numerous errors in the documentation. The extra time to complete and correct clients' requests is considered a major inefficiency. The belt's goal was to increase the completeness and correctness rates. Based on this analysis, the belt can redefine the project goals in terms of the CTQs. This is the formal go/no-go point of the project. The aim of the belts was to reduce %MO cases to 20 percent, reducing the number of MO cases from 3,000 to 1,400, resulting in  $\notin$ 230,000 of savings per year. Furthermore, increasing the quality of the MO cases to only complete and correct documentation will lead to savings of  $\notin$ 30,000 and  $\notin$ 35,000, respectively. Reducing the processing time in the front office by 2 h per case will lead to savings of  $\notin$ 1,150,000 based on 7,000 requests a year and  $\notin$ 75 per man-hour. The monetary benefits are summarized in Table 1.

As a next step, the belts identify potential influence factors. The value stream map for both the FO and



Figure 4. Control chart of the CTQ %MO cases.



Figure 5. Value stream map of the process with focus on the MO.

MO has resulted in identification of various process inefficiencies. To find more influence factors, a common method is to inspect the collected data, looking for salient details. Another fruitful approach is a brainstorming session in which the team is challenged to come up with ideas for influence factors. A detailed analysis showed that, in most cases, an MO case is the result of company policy (71 percent). A Pareto analysis was made to find out which policy rules were the causes of the most MO triggers. As a rule of thumb, based on the Pareto principle, focus should be on the 80 percent that was caused by roughly six rules out of a total of 23 policy rules.

The remaining 29 percent are cases that should have been handled by the FO. We see that if we want to reduce the %MO cases, we should redefine current policies. From this analysis, the belt found that important control variables were employee behavior, IT system limitations, and company policy.

To get a better understanding on factors affecting completeness and correctness, a brainstorming session was organized. To structure the brainstorming

 Table 1. Business case with current performance of the CTQs and for each CTQ its goal and the corresponding montetary benefits.

СТQ	%MO cases	% Com- pleteness of the cases	% Cor- rectness of the cases	Processing time	Throughput time
Performance	46%	37%	42%	8 h	40 days
Goal	20%	80%	90%	6 h	30 days
Benefits	€230,000	€25,000	€30,000	€1,150,000	(unknown)

session, a fishbone (or Ishikawa) diagram was used. Such a diagram helps to see the problem from different perspectives, thereby assuring that no relevant influence factors are forgotten. The relevant categories were employee, computer, information, working method, customer, and external factors. It was found that on an employee level, there was carelessness in protocol obedience. In addition, there was no feedback loop on mistakes (incompleteness of incorrectness) after sending in documentation.

On the other hand, for the processing and throughput times, a list of influence factors was composed using the value stream map in Figure 3. It was found that a lack of communication gave insufficient information about the workload and the amount of work in process, which makes it difficult to aim for lower throughput times.

#### Improve

In the improve phase, the most relevant influence factors are chosen. After that, improvement actions are determined based on these relevant influence factors.

The influence factors are classified along the dimensions of impact and changeability. Impact is estimated using experiments or historical data. Changeability depends on the span of control of the belt, political force fields, and resistance to change. Only influence factors with high impact and high changeability are selected to be used as a basis for improvement actions.

In a service-oriented organization it is often hard to measure the impact of an influence factor, because historical data are limited and experiments are often not feasible. An approach is that the belt chooses to implement improvements and remeasure the CTQs after implementation, as this case study demonstrates. To improve the collaboration between the FO and MO, affecting the CTQs: %MO cases, correctness, and completeness, there were four directions for improvement: client, employee, IT, and policy,

- Client. It was found that instructions and deadlines were not clear to clients. The vagueness of requirements in terms of personal documentation caused incorrect and incomplete documentation. With the newly designed forms and clearer instructions and deadlines, this was improved.
- Employee. Suggestions were given that FO personnel had insufficient knowledge to handle all FO requests. By extra training and sit-ins, their ability to handle FO requests was improved. New work instructions were written. To stimulate the new way of working, a feedback loop from the MO to the FO was implemented. Poor quality is personally addressed to the responsible employee by the team manager and good quality is rewarded in the daily team meetings. We will zoom into these loops, as part of controlling the new process, in the next section.
- IT. The IT system was updated with a checklist of required documents and corresponding conditions for correctness. The information management system was modified to make clearly visible which documents had already been sent in.
- Policy. The company policy rules were reconsidered based on the Pareto analysis of MO triggers, such that the 20 percent goal for %MO cases became possible to achieve.

To improve the CTQ processing time, the value stream map was used and for each process step improvement actions were formulated.

- Orientation. By eliminating the non-value-added step in the orientation phase, 50 min of processing time per case could be saved.
- Advice. The advice phase contained redundant checks. The extra work, and the mistakes that were made while doing it, led to another hour reduction in the processing time per case.
- Preapproval. A checklist was introduced such that the FO is better able to get all of the required documentation from clients directly. In the current situation, a lot of time, about 75 min per case, is

unnecessarily spent to get all of the required documents from clients. It seems that this could be reduced to 45 min per case in combination with the next improvement action.

• Advice, preapproval, and offer. In the previous situation, documents were checked four times in the FO process. By rationalizing the process, it was found that this can be reduced to only once: check the documentation only once in the preapproval phase.

Additional measurements provided quantitative evidence of a reduction of the processing times. These measurements were collected at the same four locations as used previously in the measure phase. In total, 2.33 h per case (29 percent) can be gained in terms of processing time at the FO. For each process step, new norm times were developed based on these improvement actions.

Finally, to reduce throughput time, the FO implemented a track-and-trace system that monitors the case in the process. The effect of this system on the throughput time has not yet been measured but will be done regularly as part of the control plan.

# Control

The improve phase led to various improvement actions that were implemented. Evidently, there is still a possibility that the process will revert to its old state. To make sure that improvements last, the belts adapted the process control system such that the CTQs maintain at their new levels. To do so, the belts documented the improved process and created control plans so that line management can act on irregularities in the new process. Additionally, feedback loops were installed so that chronic problems automatically find their way to higher management. The organization of such a loop is a vital element in striving for operational excellence. For each element, roles and responsibilities were assigned. See De Mast et al. (2012) for an explanation. An overview of the control plan for this customer value stream has been drawn in Figure 6.

In operations, the work instructions have been updated and are implemented at the company's intranet, which is accessible to all employees in the FO and MO. From now on, the FO personnel have to use a checklist to ensure that all files are completed at once. Additionally, new standard processing times for the different processing steps were implemented. These



Figure 6. Control plan with assigned roles and responsibilities.

new standards were also adopted in the strategic capacity model, which is the model used for computing the number of employees needed in the front office.

The team manager is instructed and assigned to do sit-ins and to check whether the new procedures are being followed. If there are any deviations, the team manager is responsible for assisting and coaching the employee. Furthermore, in case of a deviation, the team manager is responsible for identifying the underlying reason and organizing a solution.

To organize normal work even further, daily team meetings are being held. In these brief meetings (5 to 15 min), current performance, problems, and actions on the work floor are discussed. To be able to monitor the current performance, additional relevant performance metrics, such as throughput time, input quality, workload, and employee satisfaction, are added to the dashboards. Additionally, in the FO, the employees' workload is managed and planned by means of a weekly team meeting.

The input quality of the MO cases is directly monitored by the MO, which can give direct feedback to the FO (see Figure 6). At the same time, it is the team manager's responsibility to keep track of the number of MO cases that enter the MO. The CTQ %MO cases is reported monthly to senior management. For the long run, reports are kept to detect new chronic problems with the quality of MO cases. These are to be discussed with higher management and can help to find new strategic projects. The first MO project started in Spring 2014 and was finished in Autumn 2014. At that point, it was found that in the value stream the FO experienced high time pressure. A project was started within the FO to reduce processing times and reduce time pressure. This project is now in the final stage of implementing all improvements. It started with four locations that were used as a benchmark for the other FOs. At this point, the new standard processing times are already included in the strategic capacity model.

Altogether, the benefits for the customer value stream were €1,500,000. Due to these projects, the FO has been able to handle a 30 percent increase in market demand this year. In addition, other, nonmonetary, benefits were addressed, such as audit issues, customer experience, and employee satisfaction.

#### Conclusion

This case study shows how LSS contributes to the success of a financial service provider. Key insights are that quantitative analysis in LSS gives focus and leads to evidence-based results. The problems were translated into measurable characteristics with the help of a CTQ flowdown. Data validation and agreement studies ensured reliable data. Value stream mapping for both the FO and MO led to tremendous insight into the value stream and uncovered a lot of inefficiencies. The belts have identified and removed the root causes of these inefficiencies. Additionally, reducing the number of cases that passed through to the MO yielded approximately  $\notin$ 1,500,000 per year for the complete value stream.

To sustain the new process, a process control systems was set up. The combination of both projects has led to a control system for the whole value stream. To be specific, quality control is organized on the work floor and supported by management. Quality improvement is organized bottom-up with top-down control; that is, improvement initiatives are formulated on the work floor and communicated by management to senior management. Senior management decides which initiatives are most beneficial and aligned to the strategic focal points. Then black belts, often in management, carry out these initiatives by initiating projects. The organization of such a quality improvement loop is a crucial element for ensuring operational excellence, as this case study exhibits.

# About the authors

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