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### Quality Quandaries: Improving Revenue by Attracting More Clients Online

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# Quality Quandaries: Improving Revenue by Attracting More Clients Online

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## INTRODUCTION

“A website offers a business ... another avenue to generate revenue by attracting more customers. Unfortunately, not all websites successfully turn visitors into customers” (Chiou et al. 2010, p. 282). Fortunately, websites can be improved, and the quality profession offers some guidelines for improvement. This “Quality Quandary” provides an example of a Lean Six Sigma project with respect to online marketing. Lean Six Sigma deals with improving processes on a project-by-project basis (cf. De Mast et al. 2012).

This specific case study is about improving the sales of a consultancy firm by attracting more clients through its website. The project follows the define–measure–analyze–improve–control (DMAIC) phases, as prescribed by Lean Six Sigma. We first provide a brief background on the case study. Next, we describe how the project has been executed following the five phases. Finally, we conclude.

## CASE STUDY

In 2014, a project aimed at increasing the number of clients was carried out at a consultancy firm. The consultants of the firm give courses and training to professionals within The Netherlands. In addition, they perform academic research in the topics taught. The courses with open enrollment take 8 to 16 days distributed over a period of 4 to 6 months and start in February and September.

The objective of the project was to increase the number of participants (i.e., clients) in these courses by attracting more leads through the website. A project team was formed (a project leader and two team members). The team also hired two web designers from an external agency.

## Define

In the define phase, the project leader described the process to be improved and formulated the project objectives and their potential benefits.

The process to be improved is the acquisition process through the firm’s website. The input to this process is a potential client searching online for a course. The acquisition process can be described in four main steps and is displayed in Figure 1:

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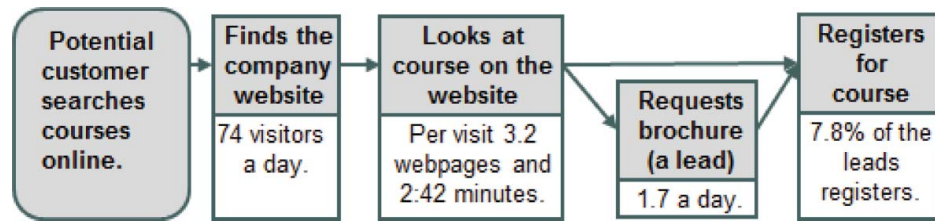


FIGURE 1. Main process steps.

- A potential client has to find the firm’s website. An initial analysis, of September 2013 through March 2014, showed that there were 74 visitors per day. The definition of a “visit” is somewhat arbitrary and will be discussed in the measure phase.
- Secondly, the potential client looks at the website and the courses; an average visit consisted of scrolling 3.2 webpages in 2.42 minutes.
- Next, the potential client has the option to request a brochure through an online form. On average 1.7 persons request a brochure per day and they are added to the firm’s client relationship management (CRM) system as a lead.
- The final step is the registration for a course. On average 7.8% of the leads register for a course.

It was estimated that 50% of the firm’s clients originated from a lead in the CRM system and the other 50% come from preferred supplier contracts and other sources. The goal for this project was to increase the number of clients, originated online, by 15%. This implies a direct increase in revenues for the firm of about €55,000.

## Measure

The first step in the measure phase includes the selection of clearly defined, measurable characteristics, which are called *critical to quality characteristics* and abbreviated by CTQs. We can schematically illustrate how the CTQs relate to the project goal and strategic focal points of the organization by means of a CTQ flowdown (cf. De Koning and De Mast 2007).

A modified version of a CTQ flowdown discussed by De Koning et al. (2010) is used for this project and is illustrated in Figure 2.

In this project, we select two possible ways to improve revenue: by identifying more prospects and by improving the conversion rate from prospect to lead with an online request for a brochure. Hence, the two CTQs in this project are traffic and the conversion rate. Traffic is the number of visitors to the website and the conversion rate equals the number of leads as a percentage of the total traffic. Recall that a lead is a potential client who requested a brochure online and is stored in the firm’s CRM system.

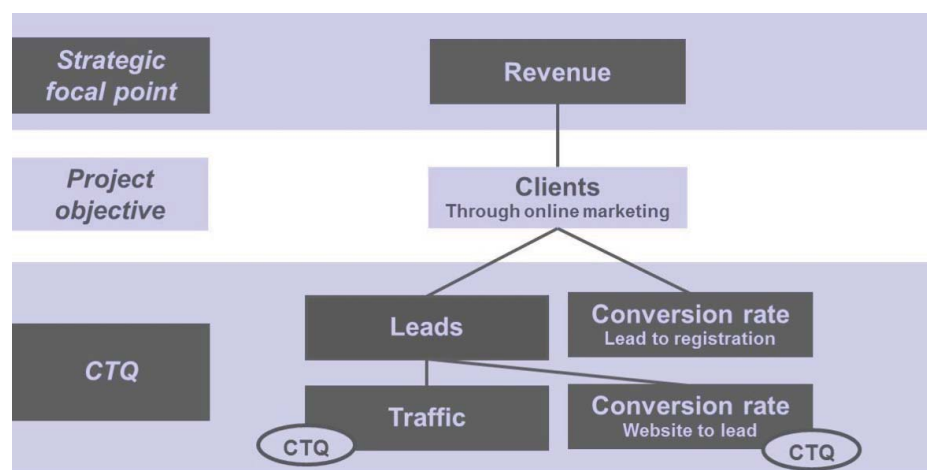


FIGURE 2. CTQ flowdown of the project.

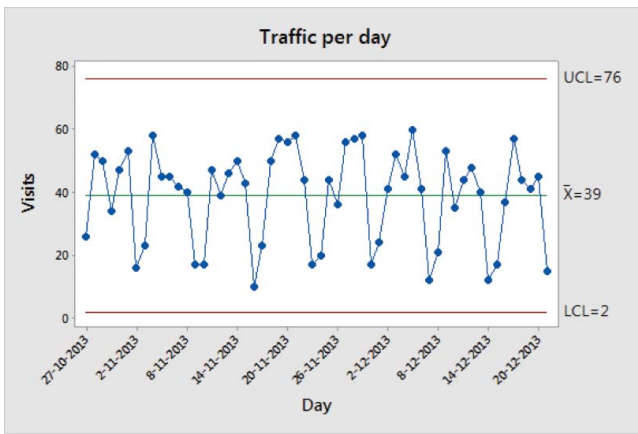


FIGURE 3. Control chart of traffic per day.

For both CTQs we need operational definitions. For the CTQ traffic we define a prospect as a single user who has a number of interactions on the website within a given time frame. An interaction can be a page view, a brochure request, or even registration for a course. Clients from the latter category will be handled differently (cf. Figure 2). A visit ends if the user is inactive for 30 minutes. The CTQ traffic is defined as the total number of visits of single users in a given time frame.

Data on traffic were retrieved from the web analytics program of the website and the number of leads was obtained from the CRM system. Initially, the CTQs were measured per day. However, it was discovered that traffic displays a weekly pattern: on the weekend traffic is lower than during the week. Figure 3 shows this pattern for traffic in November and December 2013. Because the project leader was not interested in this weekly pattern, she decided to measure the CTQs on a weekly basis.

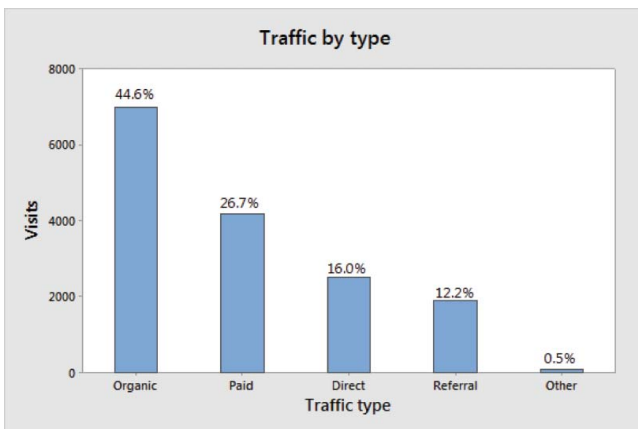


FIGURE 4. Bar chart of the types of traffic.

The measurement period was set from September 2013 to March 2014. This period includes 30 weeks and the start of a training cycle (September) when acquisition efforts are low, as well as the buildup period toward a new training cycle (February) when acquisition efforts are high.

The last step of the measure phase is the validation of the data in the system; that is, ensuring that the data reflect the definitions. This was done by checking the definitions as used by the web analytics program and by checking the firm's CRM system again.

## Analyze

In the analyze phase, the current performance of the CTQs is determined. A thorough analysis leads to a diagnosis of the problem and a list of potential influence factors.

The CTQ traffic equals 520 visits a week on average, with a standard deviation of 209. Figure 4 shows the total traffic split up by type: 44.6% of the traffic originates from a search engine (organic); 26.7% of the traffic comes in through online advertisements (paid); 16% of visitors use the URL to go to the website (direct), 12.2% comes from links in mailing, news items, and links on other websites (referral); and 0.5% are from other sources.

The team was surprised by the large standard deviation but realized that this could originate from a time effect; traffic depends on the online advertisement budget, which varies according to the intensity of the acquisition process. From this budget, online advertisements are bought to attract people to the website. The line plot in Figure 5 shows that online campaigns double the number of visits per week.

The current performance of the CTQ conversion rate is on average 2.4% with a standard deviation of 1.0%. A control chart of the conversion rate is shown in Figure 6. It shows that the conversion rate was around 3.2% before the online campaign and then dropped to 1.9% during the online campaign and stayed at that level until March 2014. Note that during the online campaign the number of visits per week was around 800 and when there was no online campaign it was around 400 (see Figure 5).

To find relevant influence factors for the CTQs, the project leader performed a brainstorm session with the project team, asked for advice from the web designers,

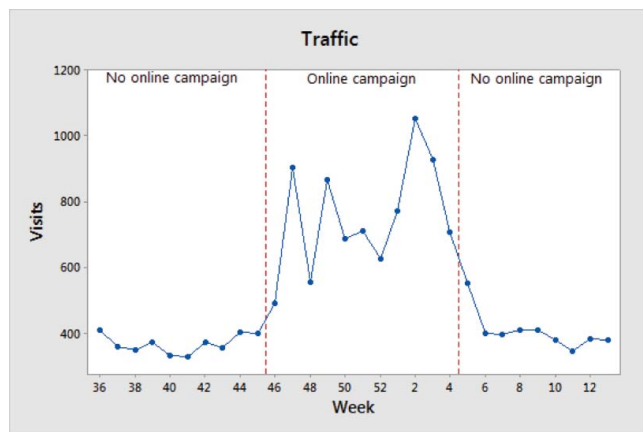


FIGURE 5. Line plot of traffic per week.

searched the literature, performed a failure modes and effect analysis, benchmarked with websites from competitors, and spoke to clients about why they chose this course. This resulted in a long list of potential influence factors.

## Improve

In the improve phase, the project team selected the most important influence factors and provided evidence of their effects on the CTQs. Based on these influence factors, they designed improvement actions that would result in large improvement of the CTQs. The team used a so-called priority matrix to categorize the influence factors based on effect size and changeability. Influence factors that were thought to be large in both effect and changeability were the following:

- Design of the website
- Content quality

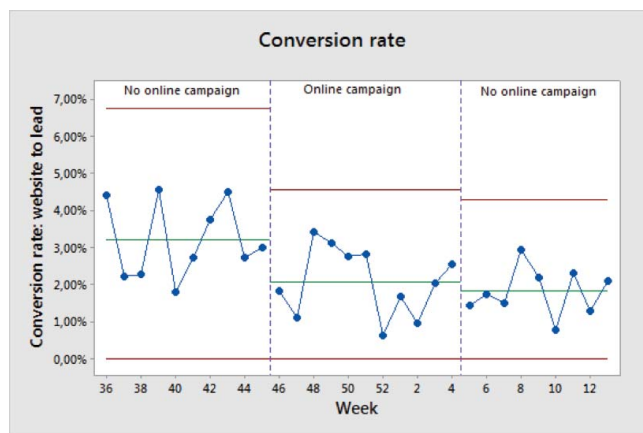


FIGURE 6. Control chart of the conversion rate per week.

- Accessibility
- Online marketing budget

An overview of these factors is presented in Table 1.

A core principle of Lean Six Sigma is evidence-based improvement actions. Every influence factor was studied, and evidence was gathered, in order to understand the effect of the influence factor on the CTQs. Next, the project team designed a number of improvement actions. In the following we discuss the evidence for each influence factor as well as the related improvement action.

The first influence factor “design of the website” influences the conversion rate. Design is a creative process and it is difficult to provide strong evidence for the effect on the CTQs for something so broad as design. The team decided to redesign the old website and hired two professional web designers to help. To focus the redesign process the team proceeded according to the following steps:

1. Using a so-called sitemap, navigability was made as easy as possible. Ranganathan and Ganapathy (2002) pointed out that ease of navigation of the website is an important principle for business-to-customer website.
2. A Pareto analysis revealed which webpages, from the old website, were visited most often. Using this knowledge the team decided that four so-called wireframes were needed. A wireframe is a functional layout and design of a webpage. In order to save time, and resources, the less popular webpages would not get their own wireframe design and would be made to fit the standard frame.
3. An analysis of the traffic data showed that 32% of the traffic comes from tablets and mobile devices. Therefore, it was decided that the website would be optimized for all possible screen sizes—so-called responsive web design.
4. The web designers made a new design for each wireframe and built the new website.

To show the effectiveness of redesigning the website retrospectively, the team studied the bounce percentage: the percentage of paid visitors already leaving the website on the entry page. Assuming that the bounce percentage is a proxy for interest and ultimately also conversion ratio, Figure 7 shows that people engage more on the new website.

**TABLE 1** Influence Factors that are Large in Both Effect and Changeability

| Influence factor        | Evidence   | Effect on CTQ traffic                                 | Effect on CTQ conversion rate |
|-------------------------|--|---|-------------------------------|
| Design of the website   | Client and expert interviews, literature                         | No effect   | Positive effect               |
| Content quality         | Literature, clients  | No effect   | Positive effect               |
| Accessibility           | Expert interview, literature on SEO (search engine optimization) | High ranking on the keywords has a positive influence | No effect                     |
| Online marketing budget | Analysis of proces data  | Three visitors per extra euro                         | No effect                     |

Another proxy used to evaluate the effect of redesigning the website is the duration of a visit. Data analysis showed that the average duration of a visit for organic traffic increased from 2.42 minutes to 3.07 minutes after the redesign of the website, an increase of 15%.

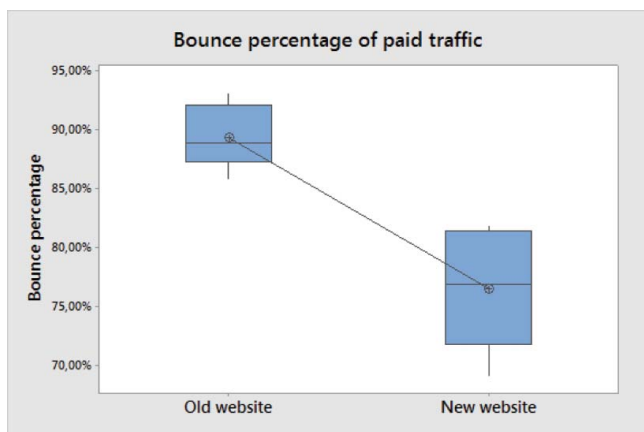
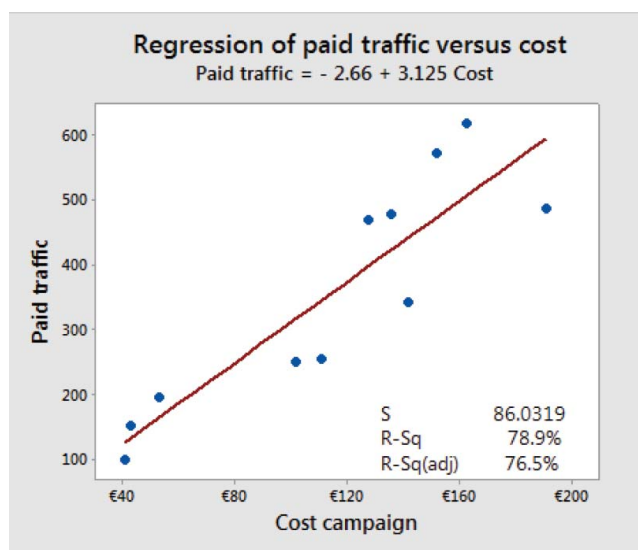
The second influence factor, “content quality,” concerns the relevance of the information provided by the firm on the website (Hernández et al. 2009). The team discussed the position of the firm in the market and talked to clients to ask why they chose this course. Furthermore, the unique selling points of the firm were discussed. A conclusion was that the combination of research and consulting is an important strength. This was accentuated on the new home page. Furthermore, some of the texts on the old website were reused in condensed form.

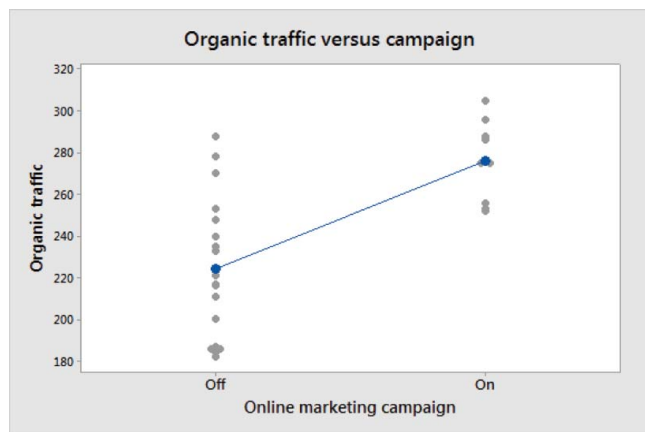
The third influence factor, “accessibility,” mostly has an effect on the CTQ traffic; the higher the position on search engines, the more potential customers will find the firm’s website; that is, the higher the traffic will be. Accessibility is also one of the recommendations by

Hernández et al. (2009). As an improvement action the team first defined five keywords for which it is important that the firm is found. In December 2013 the ranking of the website, on all five keywords, was in the first 10 hits on Google. To ensure that this ranking would be maintained the new website was designed according to search engine optimization rules (cf. Su et al. 2010).

Finally, for the influence factor “online marketing budget,” the project leader used regression analysis to study the effect on the CTQ traffic. The results are graphically displayed in Figure 8 and show that the budget spent on online campaigns strongly determines (paid) traffic; every euro spent yields on average three extra visitors. This effect is statistically significant.

Furthermore, the online marketing budget has a statistically significant effect on organic traffic. Figure 9 shows a rise in organic traffic of 52 visitors if the online marketing is used. It can be concluded that some paid traffic returns to the website through the search engines later that week.

**FIGURE 7.** Box plot of bounce percentage, old versus new website. Connected symbols are the group averages.**FIGURE 8.** Fitted line plot of paid traffic versus cost.



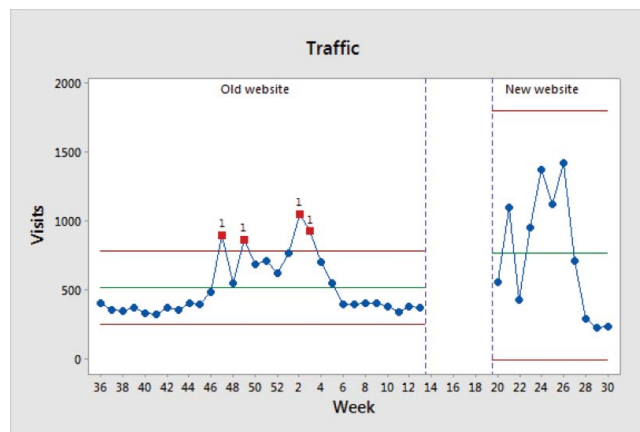
**FIGURE 9.** Individual value plot of organic traffic split by online marketing campaign. Connected symbols are the group averages.

Online marketing might increase both paid and organic traffic, but that does not guarantee that it also increases the number of clients. To be able to provide better data for decisions regarding the marketing budget, a special piece of software was programmed into the website. This software tracks all paid traffic and registers if a paid visitor requests a brochure; that is, becomes a lead. In an 11-week period after the new website was launched, 68 brochures were requested, of which one was a paid visitor. Based on the data from September 2013 through March 2014 we have an average conversion rate of 2.4% and know that 7.8% of the leads register for a course. The average fee for a course is €7,100. Hence, an extra lead and the additional organic traffic if the online marketing is used resulted in an expected return of €8,157. The cost in this period were €1,079. This implies a return on investment of 756%; it was decided to keep the campaign budgets at the current level.

## Control

The improve phase resulted in improvement actions that aim to change processes for the better. In the control phase the project team created a control plan to deal with irregularities in the process and organized continuous improvement and assigned roles and responsibilities. Furthermore, the benefits of the projects were calculated and, finally, the project was closed.

In the control plan an important part is monitoring. Monitoring can lead to insights and is useful for detecting changes in performance and understanding the CTQs' behavior over time. It can also be used to quantify the extent to which improvement initiatives have



**FIGURE 10.** Control chart of traffic split for old and new website.

been successful. The team set up monitoring tools for both CTQs. The data from the analyze phase were combined with 11 weeks of data starting a month after the new website went live. This initial period of one month was ignored in the data because the data were contaminated by all of the work on the website done by the team in the first weeks.

It is not possible to look at the average traffic before and after the launch when quantifying the effect of the new website. This would give a distorted conclusion because traffic is very volatile and is dependent on other factors apart from the website, as can be seen in Figure 10.

The project team used regression analysis to control for the factors influencing traffic in order to find the effect of the new website on traffic. It was found that there are four statistically significant factors to explain traffic:

- Cost of advertisement
- Number of referral visits
- Old or new website
- Trouble with the server host

These four factors are explained below. The results of the regressions analysis are displayed in Table 2.

The estimated transfer function equals

$$\text{Traffic} = 232 + 3.4 \times \text{Cost} + 2.2 \times \text{Referral} + 123 \times \text{Newsite} - 206 \times \text{Server} + \text{Residuals}.$$

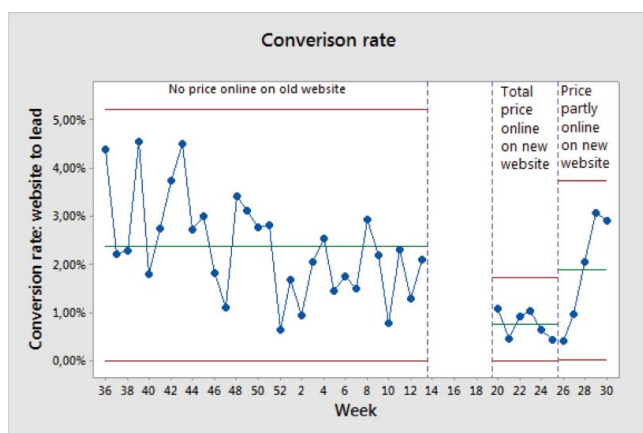
The cost of advertisement has a coefficient of 3.4, which is approximately equal to the effect determined in the analyze phase (see Figure 8). Referral traffic has a

**TABLE 2** Regression Output for Traffic Related to Cost, Referral, Visits, Website, and Server

|          | S       | R-sq    | R-sq(adj) | R-sq(pred) |
|----------|---------|---------|-----------|------------|
|          | 68.9329 | 95.49%  | 94.98%    | 93.85%     |
| Term     | Coef    | SE Coef | T-Value   | P-Value    |
| Constant | 355.8   | 42.6    | 8.35      | 0.000      |
| Cost     | 3.379   | 0.166   | 20.35     | 0.000      |
| Referral | 2.240   | 0.368   | 6.09      | 0.000      |
| Website  |         |         |           |            |
| Old      | -123.8  | 31.4    | -3.94     | 0.000      |
| Server   |         |         |           |            |
| Yes      | -205.8  | 52.7    | -3.91     | 0.000      |

coefficient of 2.2, meaning that a visitor coming through a link tends to come back a second time. The term “New site” shows that traffic increased 123 on average after the new website was launched. The term “Server” is added because in the last 3 weeks of the data gathering period there were problems with the server host. An unexpectedly changed security setting resulted in a situation where no brochures and forms could be downloaded, quickly resulting in a drop in the search engine rank and thus in the traffic.

A provisional conclusion is that the new website attracts, on average, 123 extra visitors compared to the old website. This is an increase of 23%. Because there are only 11 observations (weeks) for the new website, of which 3 are affected by the trouble with the server host, this conclusion has to be verified when more data become available.

**FIGURE 11.** Control chart of conversion ratio after the launch of the new website.

Regarding the CTQ conversion rate, a Shewhart control chart shows that the rate dropped significantly after the new website was put online (see Figure 11).

The project team hypothesized that the reason for this is that on the old website, potential customers who were looking for the price of the courses had to request a brochure and hence increased the conversion rate. On the contrary, the new website displayed all information on the price of courses. The team decided to experiment with the online prices. Only part of the price information was put online and the conversion rate increased to a normal level. Figure 11 shows this development of the conversion ratio. More data are needed to draw a conclusion about the improvement of the conversion rate. Preliminary results show that the conversion rate is on the same level as in November 2013 to March 2014, which is around 1.8%. As traffic increased by 20% and the conversion rate remained constant, the number of clients from online marketing will increase with about 20%, leading to a €70,000 increase in revenue (as opposed to the original goal of €55,000). Note that the number of participants in the open enrollment courses in September 2014 was 58, which was 13 participants more than in September 2013. The increase in revenue was actually more than €90,000.

## CONCLUSION

This study demonstrates how Lean Six Sigma can help increase revenues through improving online marketing and sales. It illustrates how the DMAIC roadmap helps in providing focus and structure to an improvement project. Core principles of Lean Six Sigma, such as problem structuring with the help of the CTQ flowdown and gathering evidence for proposed influence factors, helped a great deal to manage and focus the process of designing the new website. The project improved the effectiveness of the online acquisition process by approximately 20%, leading to potentially 10% more clients per year. Finally, the visual management system helped to secure that the new website is retained.

## ABOUT THE AUTHORS

Inez M. Zwetsloot obtained her master's degree (MPhil) in econometrics from the University of



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Ronald J. M. M. Does is Professor of Industrial Statistics at the University of Amsterdam; Director of the Institute for Business and Industrial Statistics, which operates as an independent consultancy firm within the University of Amsterdam; Head of the Department of Operations Management; and Director of the Institute of Executive Programmes at the Amsterdam Business School. He is a Fellow of the ASQ and ASA and Academician of the International Academy for Quality. His current research activities include the design of control charts for nonstandard situations, health care engineering, and operations management methods.

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