Public abstract

Applying Time-Driven Activity Based Costing in International Mail

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Introduction

In the framework of completing my master Industrial Engineering and Management, with a specialization in Production- and Logistics Management at the University of Twente, I perform research at PostNL in Mechelen (Belgium). This research focuses on applying Time-Driven Activity Based Costing to the situation at hand. Due to confidentiality reasons, this public summary describes the main issue of the research briefly, but as thorough as possible.

The summary below is divided into a number of sections, starting with the company profile. After this we introduce our research and present our research questions. These will be answered in the following separate sections. This summary is concluded with conclusions, limitations and recommendations following from our research.

Company profile

In 2001, Spring Global Delivery Solutions (Spring) was founded. Spring provides mail, parcel, and return solutions to businesses worldwide. Spring operates as an autonomous broker, and can thus offer cost effective postal solutions to its customers (PostNL, 2016). This specific research will be conducted at BRT, one of the two big hubs in which the operational activities of Spring are centralized. This research will focus on the Mail services that are offered here. This is a complex process, where mail from different countries comes in at differing times and has to be processed and sent out again within one day (PostNL, 2015).

Research

Spring is currently operating in a market where volume rates are declining and where they are competing with other postal operators for the remaining volumes (PostNL, 2014). For Spring to stay competitive it is thus imperative to be able to offer high quality for competitive prices. In order to do so it is crucial to organize processes efficiently on every level and to have a clear insight into costs associated with processing (types of) products from pick-up at the customer all the way to delivery at the addressee. This led to the following research objective:

The objective of this research is to develop a clear insight into the composition of costs associated with processing different products at BRT in order to be able to adjust prices charged and to identify and improve inefficient processes.

Based on this objective, we formulated a number of research questions, which are:

1. How is the mail process at BRT organized and how are associated costs settled?

2. Which processes and products are interesting to research further, taking the existing structures and stakeholder preferences into account?

3. Which cost models are known in literature and which of these is most suitable for the situation at hand?

4. What are the costs per product and how are they composed?

5. How should prices of products be adjusted in order to better reflect the costs associated with processing them?

6. Which processes are operating inefficiently and might be improved and which processes have a high expense compared to the added value?

In the sequel of this summary we will try to answer all of these questions. However, due to the involved confidential information we will not be able to give detailed answers to all questions.

Current situation

In terms of the current situation, we first briefly elaborate on some key concepts related to the process, after which we briefly describe the actual process.

Key concepts

First of all, there are a number of ways to classify post and postal services. As these come back throughout the process, we briefly treat them here first.

The first way to distinguish postal items is based on size. Here, we have three main categories: petit (P), grand (G) and, encombrant (E). P are the small letters, G are the big letters and E are small parcels (max. 2 kg). In addition to these, we also have m-bags and no size material. M-bags are mail sacks that are used to contain bulk mail directed to one addressee (United States Postal Service, 2016). No size material may be either P, G, E or a mix of these. This classification, of course, influences how items will be processed and sent.

The second way to distinguish items is based on the required service. Here, we have three options, namely premium (P), economy (E) and registered (R). The distinction between P and E is the speed at which the item should be delivered and thus this has an impact on the required speed of processing. R is the service where a customer receives proof of mailing and receipt, and where the item is individually tracked throughout the process.

Process description

Once material arrives at BRT, it is checked-in. Here operators determine where the material has to go exactly. Most material will move to Revenue Protection, where the data as filled out by the customer will be checked. Once this is checked, material moves to the CSC, where it will be sorted depending on the destination and size of the material. After this material will be sent to the TaNaT, where it is franked, after which it is prepared for shipment to its next destination.

In our research, we focus on determining the costs related to all CSC and TaNaT activities.

Literature

In our review of literature related to our problem, we first focus on comparing different cost models and applicability to our research. After having chosen one model, we further deepen our knowledge of this model.

Cost models

From literature we have found a number of cost models, these are Traditional costing models (Siguenza-Guzman, Van den Abbeele, Vandewalle, Verhaaren, & Cattrysse, 2013), Activity Based Costing (ABC), Time-Driven Activity Based Costing (TDABC) and Lean Accounting (Monroy, Nasiri, & Peláez, 2014). Traditional costing systems attribute direct costs directly to the cost objects and indirect costs are allocated to each cost object using a single or a few volume-based cost drivers. ABC traces costs from resources to activities and then from activities to specific products, TDABC is a simplification to this model, in which one directly estimates, based on interviews or observation, the resource demands imposed by each transaction, product or customer. Lean accounting supports the lean organization by supplying visual management, value stream management and continuous improvement.

Comparing these models, we see a number of clear differences between the different models. This mainly relates to the ability to account for overhead costs and on which level(s) the different models provide insight. In the end this lead us to choose TDABC as the model to continue with.

Time-Driven Activity Based Costing

In their introduction of TDABC, Kaplan and Anderson (2004) identified what information is needed in order to apply TDABC. The first point is to estimate the cost per time unit of capacity, in order to do so, we first need an estimate of the practical capacity, this usually is about 80-85% of theoretical capacity. Based on this capacity, we determine the cost per minute (or other time unit) of supplying capacity. A second important point is to estimate the unit times of activities, this is the time it takes to carry out one unit of each kind of activity, one can do so based on interviews or on direct observation. In both steps precision is not critical, and one thus should be careful not to overdo this. Once these two are known, it is time to derive cost-driver rates, this entails multiplying the two input variables just estimated. These cost-driver rates can from now on be used for different purposes, they can for example be used to assign costs to individual customers as transactions occur, or they can be used in discussions on pricing (Kaplan & Anderson, 2004).

In doing this, TDABC enables us not only to analyze and report costs, but it also reveals time spent on activities and highlights the difference between capacity supplied and used and thereby enables us to take action to reduce costs of supplying unused resources in subsequent improvement efforts. At the same time, the model can be easily updated to reflect changes in operating conditions. Changes in cost driver rates can be due to changes in the prices of resources supplied or due to a shift in the efficiency of the activity, therefore updating of costs should be done based on events and not on the calendar (Kaplan & Anderson, 2004).

In their disquisition, Kaplan and Anderson (2004) also stress that TDABC can easily accommodate the complexity of real-world operations by incorporating time equations. Time equations allot processing times to products based on order- and transaction-specific data. In doing so, the model can be easily applied to and customized for other plants and companies.

Based on the information that Kaplan and Anderson (2004) identified as being needed, Bruggeman and Everaert (as cited in Monroy, Nasiri, & Peláez, 2014), identified a number of steps that need to be taken in order to apply TDABC, these entail the following:

- Identifying resource groups and the activities for which they are used

- Defining the costs of each group
- Estimating the practical capacity of each group
- Calculating costs per time unit
- Determining the required time units for each activity
- Calculating costs per transaction

Santana and Afonso (2014) analyzed multiple researches that applied TDABC to a specific situation. Based on the findings of these investigations, they come up with a number of difficulties that were encountered during implementation of TDABC (Santana & Afonso, 2014). One of the main difficulties relates to the formulation of the equations of time, as a large volume of data is required for validation. At the same time, the applicability in an unstable environment in which the activities are not routine, or where no regular working hours exist, is also very challenging. The main issue however, is mostly related to the estimations of execution times, the existence of possible distortions in time allocated to activities, possible sources of waste and the degree of subjectivity that is inherent to using this methodology. It is, however, important to point out that despite problems encountered, most users still believe that the model contributes to the management of costs and to management decision making (Santana & Afonso, 2014).

Measurement

In the measurement phase of our research, we applied the steps entailed in TDABC to the situation at hand. We thus first identified resource groups employed in the process and then determined costs related to this group. Having also determined the practical capacity of 85%, we were able to come to a cost per time unit per resource group. Having done so, we had to determine required time units for each activity. In doing so, we first determined the activities for which we would have to determine required time units. Per activity we also identified a number of characteristics to be recorded, these were the time spent, weight and number of items processed, the size of the material processed and degree of sortation of the material supplied, this includes (i)sorted material, (ii) unsorted material and (iii) a group in between these two with material that isn't sorted entirely but also isn't all mixed up.

Per activity, we first determined events entailed in this activity. For a simple sorting station this for example could entail a grabbing step, a sorting step, and a checking step. Once we have these, we apply direct observation. After this, we analyze the data obtained to not only come to a processing time per item per characteristic but also judge the reliability of our measurements.

These processing times per item are then multiplied with the cost per item we found earlier on, such that we come to costs per item, depending on different characteristics.

Conclusion and recommendations

Comparing the costs we found to current prices, we first of all see that introducing the degree of sortation in prices, better reflects the costs related to processing. Besides this, we compared prices to costs we found, but due to confidentiality we can not further elaborate on these results.

With regard to the process improvements, we found that people try to make their jobs easier by making small adjustments. This means that people may not entirely oversee the consequences of these adjustments and good adjustments are never standardized. More consultation in this sense, would benefit the overall and not only the local performance of the process.

What we furthermore see in the results of all our measurements is that the larger volumes are relatively cheaper to process than little volumes. This applies on a batch level, but also on the total level. Trying to increase volume levels at BRT thus might yield overall savings on the long term.

Limitations to our measurements are mostly related to determining the processing times per activity. These measurements might show some deviation from reality for a number of reasons, the main one being people might be disturbed by the direct measurement. Another possible limitation is that we disregard some of the more general tasks, such as distribution of trolleys or crates, by measuring single activities.

In addition to the conclusions on process improvements, we also identified some recommendations that do not follow directly from our research. Important in this sense is to point out that the model we developed should be reviewed every time the process is altered, such that there always is a topical overview of processing times and costs. Another possible improvement is for supervisors to have a more accurate image of volumes that can be expected on the short term, such that they can adjust the workforce to match the expected workload.

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