Time-Driven Activity-Based Costing (TDABC): An Initial Appraisal through a Longitudinal Case Study

Michel Gervais*
Yves Levant**
Charles Ducrocq*

Abstract

TDABC is presented by its “inventors”, R. Kaplan and S. Anderson as a new method. Their aim is to respond to the criticism directed at the ABC method, mainly regarding the cost and complexity of implementing and maintaining it.

Our study shows that, while TDABC offers a partial solution to these issues, it still has some inherent weaknesses. Apart from the hesitation as to whether to use standard costs or actual costs, the measurement of time, which forms the basis of the method, also appears problematic. Homogeneity and maintaining it over time have not been given much consideration either, in spite of their importance for obtaining reliable costs. There is nothing new about calculating the cost of capacity and the deviation revealed by TDABC is only a deviation in business volumes. The quality of the data processing applications remains an essential factor in alleviating the complexity of the method. When it comes down to it, the real purpose of TDABC could be to monitor labour time.

Keywords

Cost Management
Idle Resources
Aggregation Error
Measurement Error
Homogeneity
TDABC

Introduction

The ABC method, presently the preference among full costing methods, has been the subject of much criticism with regard to the methodology used (Anderson, 1995; Malmi, 1997; Gosselin, 1997; Krumwiede, 1998; Byrne, et al., 2009) and some users have even abandoned it (Ness and Cucuzza, 1995). Kaplan, himself one of the main initiators of the ABC method¹, acknowledged this criticism and the fact that the method was being abandoned (Kaplan and Anderson, 2007: pp. 5-7).

With Anderson, he proposed a change to the method, the first traces of which could be found in 1998 (Cooper and Kaplan, 1998: pp. 292-296). From November 2004, a name was officially given to the method: Time Driven Activity-Based Costing (TDABC) thus presenting this new version as a method in its own right². Kaplan and Anderson referred to the previous versions of the ABC model as “Rate-Based ABC”³ (Kaplan and Anderson, 2003), “Traditional ABC” (Kaplan and Anderson, 2004) or “Conventional ABC” (Kaplan and Anderson, 2007). In their 2004 article, TDABC is presented as a completely new approach (Kaplan and Anderson, 2004). There followed a book Kaplan and Anderson (2007) in which any relationship of TDABC to existing practices of the ABC method was denied. One paragraph entitled “Time-Driven ABC: Old Wine in New Bottles?” (Kaplan and Anderson, 2007: pp. 17-20)⁴ is even devoted to denying any relation with ABC in the use of time drivers. The authors justify the difference

¹For a history of the development of the ABC method, see: Jones and Dugdale (2002).

²Kaplan and Anderson (2007, p. XV) state that this name dates from 2001. Previously they referred to it as the “transaction-based ABC method”. We can however find documents that use the name TDABC in promotional presentations of the method (Kaplan and Anderson (2003)).

³Kaplan and Anderson (2003) justify the name “Rate-Based ABC” by the fact that the unit costs per driver (or rate) serve as a basis for costing cost objects.

⁴This question refers to the issues raised in the articles by Shank (1989) and Davidson (1963).
between the two methods by the fact that in the ABC method employees are asked how long they spend on different activities in order to link costs with the activities, while in the TDABC method, the time taken to perform elementary tasks is simply estimated and multiplied by the number of tasks and then by the hourly cost.

The main advantages of TDABC put forward by its designers are that it provides an answer to the shortcomings of the ABC method: long time to collect data, complex updating of the system necessitating repeat interviews in order to allot time to the activities, multiplication of the number of activities as the only way of dealing with its complexity, high data processing capacities and statements of time that never show idle capacity. It was also presented as a quick and easy costing method for determining the ‘Whale curve’ of customer profitability and a natural complement to the balanced scorecard (Kaplan and Anderson, 2007, p. XI). The TDABC method now seems to be mainly used by one consultancy, Acorn, of which Anderson is founder and director and Kaplan is a board director. It is reputed to have been put in place in over 200 companies (Kaplan and Anderson, 2007, p. X).

The concept of TDABC however remains unexplored in academic research. Apart from some presentations by its designers, there have been few academic studies of the method. We may only quote the articles by Bruggeman and Everaert (2007); Levant and de la Villarmois (2007a, b); Tse and Gong (2009) and Ratnatunga and Waldmann (2010). There are even fewer case studies, except for the ones by Pernot et al. (2007) on the case of a university, Bruggeman et al. (2008) on the case of a Belgian logistics company, McDonach and Mattimore (2008) that deals with a small services company in Ireland, and Ratnatunga and Waldmann (2010) who deal with government allocation of research funding to universities. The purpose of this paper is to offer a well-supported answer to the questions surrounding this new method. We will consider three questions: (1) is TDABC easier to put in place and use? (2) Does it enable homogeneity to be respected? and (3) Does it aid in management decision-making? Our analysis will be made by means of a case study concerning one of the rare European companies to have been using TDABC for several years.

We first recap on and critically appraise the advantages of TDABC put forward by its promoters. The methodology and results of the case study are then presented.

Critical Appraisal of the TDABC Model

If TDABC, claims to be “more simple, less expensive and much more powerful than the conventional ABC method” (Kaplan and Anderson, 2007, p. 20), there nevertheless remain considerable doubts about its performance.

Advantages

Simple to use model that takes the complexity of the processes into account: TDABC is a costing method based on equivalences (Levant and de la Villarmois, 2007a; Levant and Zimnovitch, 2008). Equivalences are established in a “resource group” by means of a single driver; i.e. the time needed to perform them. A “resource group” is the aggregation of ABC activities that consume the same resources. The authors of this paper have devised this concept to avoid any confusion with the term ‘activity’ of the Rate-Based ABC method. Indeed, Kaplan and Anderson sometimes use the term “activity” to designate the grouping together of ‘Rated Based ABC activities’ in TDABC and call the latter ‘subtasks’. In addition, failing to give sufficient attention to the problem of homogeneity, they misleadingly assimilate these resource groups to an organizational unit, a department or a section (Kaplan and Anderson, 2007: pp. 49-52). As there are normally less ‘resource groups’ than activities, this makes the method simpler to put in place and reduces errors of measurement. Another advantage of TDABC is that it is no longer necessary to conduct regular surveys to determine the distribution of work time between different activities, which simplifies analysis will be made by means of a case study concerning one of the rare European companies to have been using TDABC for several years.

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6Capacity drivers may also be used. Kaplan and Anderson (2007, p. 59) also consider that the method should have been called Capacity-Driven ABC rather than Time-Driven ABC.
maintenance of the method. This is thanks to the use of time standards. All that is needed is to ensure that these standards remain consistent with practices and are regularly updated. The complexity of operations is taken into account using time equations to determine more accurately how much resources each group consumes. Using these equations, the model is easy to update; adding an extra activity (if performed by the resource group), adding variables explaining the time spent, taking into account changes in productivity, etc. no longer present a maintenance problem.

A model that allows the cost of idle capacity to be calculated: It is possible to compare the value of used capacity to the value of available capacity and thereby determine a cost of under-activity (Anderson and Kaplan, 2004, 2007; Tse and Gong, 2009). For each resource group, it is necessary to make the difference between the total cost of the available resources and the total cost of the resources used (equal to the unit cost of the resource group multiplied by the time required to perform the operations performed during the period).

Issues

There are four issues that remain as questions in this method: at a practical level: (1) there seems to be some hesitation between use of standard costs and use of actual costs to determine the unit cost of resource groups; (2) evaluating the cost of under-activity is not so simple; (3) the need to observe the principle of homogeneity remains with this method and finally, and (4) it is not necessarily easy to measure times.

Actual costs or standard costs: In Kaplan and Anderson (2004), the unit cost of a resource group is a standard cost. If we reuse the terms of the 1982 French Plan Comptable, it was the predetermined cost of production that was calculated, which is the cost we would have obtained if we had worked correctly at this level of activity. The calculation of under-activity proposed by Kaplan and Anderson and presented as an innovation therefore corresponds to the ‘variation in volume of activity’ of the 1982 PCG. It is in fact equal to the difference between the estimated standard cost of production and the actual standard cost of production; due to the fact that a company has not worked at normal capacity. The authors nevertheless recognise (Kaplan and Anderson, 2007, p. 36) that many companies base their calculations on actual costs. There are several reasons for this: (i) the costs thus determined are not ideal costs, but they are more credible for users as they are directly based on reality; (ii) there is a stronger link between general accounting and cost accounting; (iii) companies no longer have to make forecasts (an increasingly less common practice) in order to use the model. Kaplan and Anderson (2007) however insist on the fact that delays in invoicing or book entry of charges can skew the calculations. Use of periods that are not too short and the technique of spreading charges across the financial year were ways of solving this problem. When using actual costs, there are two alternatives for calculating the unit cost of a resource group, as follows:

(a) The actual charges are related to the normal time for the actual level of activity (this is the view of Bruggeman, Éveraert and Levant, 2005, which we call perspective 2 in this paper). Following this reasoning, the cost of idle capacity is integrated into the various resource groups. It is therefore no longer possible to isolate it and idle capacity can only be taken into account in terms of time (by comparing actual times with standard times).

(b) The actual charges are related to the time corresponding to normal capacity (perspective 3). The cost of idle capacity can again be costed. Its cost is a percentage of the actual charges.

Limitations of the calculation of the cost of idle capacity: TDABC is presented by its designers as having the advantage of

7The authors have the same attitude in their article.

8Since 1942, French companies are bound by law to prepare their accounting documents according to standards contained in the Plan Comptable Général (PCG), of which there have been several successive revisions. The 1982 PCG modified accounting rules in depth. It was the last Plan Comptable to deal with management accounting (see: Standish, 1997).

9For a full demonstration, see: Gervais, 2009: pp. 238-239.

10For more details, see: Gervais, 2009: pp. 240-241.
introducing the measurement of the cost of under-activity. This is not specific to TDABC. Kaplan and Anderson are only repeating the arguments in favour of calculating the cost of capacity sometimes suggested in ABC (Cooper and Kaplan, 1991a, b; Robinson, 1990). Furthermore, outside of studies of ABC irrespective of the version, processing the cost of idle capacity is not a recent discovery\(^{11}\). After the work by Church (1901), Gantt presented this principle in its present form as early as 1915. According to Garner however (1954, p. 235), there was nothing new about it. Gantt himself said at a congress that he had studied the question “not because the ideas were absolutely new, but because they are of such great importance to manufacturers, and are apparently so little understood by many of them” (Gantt, 1915, p. 9). In addition the IFRS 2 standard recommended taking the normal level of activity of the production tools into account for stock evaluations.

A normal level of activity is not simple to define. Is it the theoretical capacity, the normal capacity, the budgeted capacity or practical capacity?

“Considerations of a strategic nature (need to economize materials today in order to meet the forecasted needs of tomorrow), of a social nature (activity times are dependent on social policy) or of an organizational nature (bottlenecks owing to the impossibility to separate certain production equipment or to poor organization of the workstations) are confused with purely technical aspects (the potential indicated by the manufacturer of the plant)” (Gervais, 1994, p. 76).

Kaplan and Anderson (2003, 2004) propose a practical capacity in the order of 80 % of the theoretical capacity for labour hours. This figure, which is unsupported, is the same as the one used by the management of General Motors in the 1920’s, considering it as the maximum rate of use of capacity in the long term (Bouquin, 2006, p. 1).

**The problem of homogeneity:** Kaplan and Anderson (2007, p. 49) themselves insist on the fact that the ‘activities’ or transactions performed in one resource group should consume resources in the same proportions (condition of homogeneity) (Gervais, 2005, p. 230). They give as an example an operating theatre in a hospital which has special equipment for open-heart surgery. In this case, the open-heart surgery process must be separated from other types of surgery, as the resources used and the rate at which they are used are not the same.

The critics and users of the method do not appear to be aware of the importance of this condition. To show the consequences of neglecting this condition, an illustration is given in appendix 112. As in other full costing methods (ABC, sections homogènes\(^{13}\)), for the calculation to be correct, the time consumption of products must remain proportional to the average consumption of the cost pool. The times used being standard times, any major changes to the production process and productivity gains must be carefully monitored, as these changes could alter the proportionality between times and thus break the homogeneity. Rigorous maintenance and regular revision are thus necessary. These conclusions are not conducive to a simplification of the method.

**Problem of measuring time in a time-based model:** Use of the labour hour as a rate was much criticized by the supporters of the ABC method. The direct labour hour as a means of sharing indirect charges was no longer in keeping with changing production technology and the value creating process of organizations (Johnson and Kaplan, 1987; Lebas, 1995; Lorino, 1989; Mévellec, 1993). In saying this, the authors were referring to considerably automated industrial activities. The problem is not the same when we consider service activities where labour remains an essential resource. TDABC sets out in particular to give

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\(^{11}\)For the history of the development of costing idle capacity, see: Bouquin, 1997; Lemarchand, 1998 and McNair and Vangermeersch, 1998.

\(^{12}\)See also: Gervais, 2009: pp. 242-243.

\(^{13}\)The French *sections homogènes* method is a full costing method which deals with indirect charges through cost centres. It resembles the German methods, see: Cauvin and Neuman, 2007 and Lebas, 1994, for a detailed presentation.
greater consideration to the variety and complexity that is encountered in the production of services. The examples provided in the work of Kaplan and Anderson (2007) are all based on service activities. Labour times are difficult to measure. Kaplan and Anderson (2003, 2004, 2007) are critical of a common practice whereby employees are asked to estimate the percentage of time spent on their various activities. The total of these percentages is often equal to or greater than 100%. Since there are some idle capacities, the costs of the drivers are therefore most often than not biased. Kaplan and Anderson prefer to determine the time necessary to perform tasks by means of a direct estimation in minutes or hours based on in situ observation, interviews and comparative information.

Cardinaels and Labro (2008) show via an experimental analysis\(^{14}\) that an evaluation of time in minutes results in considerable overestimation of the time spent and that an estimation in terms of percentages of time appears to be preferable, which contradicts what Kaplan and Anderson say. The overestimation error may be as high as 35%. The order in which the tasks are proposed on the task list may be significant: the subjects found it more difficult to know the time spent when the activities are given in a different order to that found on the shop floor. Allain and Gervais (2008) show that in service activities\(^{15}\), a more or less reliable standard time is only possible if the customer has little influence on output. Downtime which is generally not insignificant, although not always unproductive, tends to be masked. The use of computers to facilitate self-observation does not aid the recording of the total time spent in a day’s work. Hoozée and Bruggeman (2007) observed that, in the Belgian division of an international company that uses TDABC, the errors in time equations were 49% due to the incorrect specification of the equation (variables explaining time spent were omitted), 30% due to imprecise evaluations of the time spent on certain tasks and 21% due to the lack of updating further to significant process changes.

The Case Study

After explaining the methodology adopted by us, we will present the case of a distribution company.

Methodology

The case study was conducted longitudinally (in 2004 and 2008) on a company called Sanac, based on observation from outside and open interviews. The reasons for choosing this company were multiple. In 2004, Sanac was one of the first companies in continental Europe to have put a TDABC model in place. At the time of the first interviews, the company had been using the model for over a year. We conducted an initial case study (Bruggeman et al, 2008) on how the method was put in place. This aspect had also been the subject of two case studies presented in the work “Time Driven Activity-Based Costing” by Kaplan and Anderson (2007) and by Moreels (2005). We returned to the company in June and July 2008 to observe how the TDABC model was being used four years after it had been put in place.

The data was collected in different ways. The general manager, controller and consultant who put the Time-Driven ABC method in place had been interviewed in 2004. In 2008, we only questioned the controller and information systems manager as the company had been bought out by a group that does not use TDABC and the previous managers had left. Owing to the fact that existing literature does not at present deal with all aspects of the model, we used open ended interviews in order to highlight any unidentified or as yet unsolved issues. The direction taken in each interview was therefore unique. Other documents such as annual reports, videos and PowerPoint slideshows were used. These sources were complemented by unlimited access to the model, and in particular to the company’s time equations and database.

We adopted an illustrative approach. As our knowledge about this innovation is still limited, illustrative case studies can be useful at this stage to support future research (Ryan et al, 2002; Scapens, 1990; Spicer, 1992; Yin, 1984). There has indeed been a demand for this with

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\(^{14}\)The people involved in this experiment performed a series of tasks for which they later gave the estimated time spent. The exact time spent on each task was recorded by computer.

\(^{15}\)The test concerned a call centre.
regard to control: Otley, Broadbent and Berry (1995) and Otley and Berry (1998). While it is sometimes difficult to differentiate between “consulting” type research and “academic” research (Lukka and Granlund, 2002), we consider that we are in the second category, seeking to explain why and how and with what results a company in a specific environment uses a cost management model and thus make a contribution to practical knowledge.

On the basis of already existing literature, our research had several purposes. We first sought to determine why the company observed had adopted the Time-Driven ABC model, while the academic literature on the subject always advocates the conventional Rate-Based ABC model.

Four years later, it was also interesting to observe what had become of the model put in place, in order to provide some answers to the questions of methodology raised by TDABC.

Sanac, the Company

Sanac is one of the main Belgian wholesalers supplying plant health goods for agriculture and horticulture. Its strategy is based on three key competencies:

Customer support: Sanac in fact consider that the services and advice offered by its technicians on its products maintain the level of sales. For example, in large and medium-sized specialized retail stores, Sanac takes care of the sales area. This saves time for stores and avoids having to train their personnel; stores generally do not have the structure or the time to manage technical products and advise customers on how to use them.

Marketing and market research: The markets on which Sanac operates are governed by a need for high productivity. Feedback from the technical and sales personnel or truck drivers is therefore a precious source of information for keeping in touch with customers and avoiding unsold goods.

Logistics: This is important as the customers are either in the retail trade, where any late deliveries can result in lost sales, or farmers and horticulturalists for whom fast delivery is essential in order to keep their production going.

The Situation in 2004

In 2004, Sanac was an independent family business. In the previous 10 years, its turnover (62 million Euros in 2003) had increased by 10% per year. It employed 129 people, of which 40 were technical sales personnel and 57 were employed in logistics. It had its own fleet of 25 trucks and warehouses with a capacity of 22,500 pallets. It did not sell any products under its own name. It only distributed known brands to a clientele that could be divided into two types (professionals and private individuals). Professionals who were supplied directly included: agriculture, horticulture and green maintenance sectors. The sale of products designed for private individuals for the upkeep of their gardens was via specialist DIY stores and small garden centres and via non-food retailers. In 2004, Sanac was confronted with a difficult environment, being positioned on:

Professionals: Declining professional markets where competition was strong and the margins low There were many players in these markets, in particular a number of small independent firms whose immediate objective was not profitability but to increase their turnover;

Garden Centres: The garden centre market, which was a high growth sector but in which customers are very demanding in terms of prices but also in terms of the consumption of resources.

All of these markets are unstable and change rapidly, with periods of low activity. Sales are highly seasonal (80% turnover in 4 months with a great drop in sales during the winter season).

In the 1990’s, the company’s main control instrument was its turnover, without considering the profitability of its various customer groups. By the end of the decade, the sales policy had focused on garden centres, a new sector, while tending to abandon the other sectors. The company did not however know the cost of this new activity, nor the resources invested in it. In spite of a high increase in turnover (almost 70% in 4 years) and stable gross margins, the global profits were seen to decrease. To solve this problem, Sanac was seeking to calculate its profitability per sector in terms of full costs. The existing cost
accounting only allowed the margin on direct costs to be calculated. The unallocated indirect charges (2.5 million Euro in 2000) were however high, and these costs, normally considered as fixed, were increasing. An approximate calculation of these costs showed Sanac that the garden centre and horticulture sectors were unprofitable, while agriculture was profitable. The sector where there was the most growth and on which Sanac wished to focus on was the least profitable. Sanac changed its focus, but this new focus was not financially controlled either. The aim of the company was therefore to improve its profitability, i.e. to switch from logic of growth (keeping a wide range of goods in stock so as to deliver all its orders as quickly as possible to all customers irrespective of the quantity for a fixed price) to logic of profitability. Sanac thus wanted to know its costs per product, per customer and even per delivery. All these efforts aimed to improve the service rendered and to favour customers that generated value. To achieve this, it was necessary to have a reliable system to measure costs and performance.

Sanac started with a conventional Rate-based ABC system, but quickly realized that this system could not work. There were several reasons for this:

- The manager wanted to have real monthly data per segment, per product, per customer and per invoice. This was only possible if he hired 10 employees;
- The rapid growth of the garden centre market meant that Sanac had to adapt immediately to customer requirements. These particularly concerned price and service moderations. In this type of dynamic environment, maintenance of the cost model is complex. With the existing human resources in the control department, it was impossible to update quickly enough;
- The great diversity of customers and products generated too much work to ensure the traceability of costs. Sanac had 7,000 customers, a portfolio of 7,000 products in stock and 20,000 on catalogue, received 298,000 orders per year and raised 69,000 invoices. There was a great diversity of cost prices according to the products (packaging, type of product, etc.) and according to the customer (delivery method, advice, terms of payment, etc.). A small farmer does not generate the same gross margins or the same costs as the gardening department of a large retailer. A Rate-based ABC system required too many activities.
- The highly seasonal sales made it difficult to allot idle capacity.

The implementation of TDABC took approximately 3 months. The 200 activities required by Rate-Based ABC, were reduced to 150 resource groups (delivery, picking\(^{16}\), invoicing, etc.). Overall, the TDABC model contained 106 time equations\(^{17}\). 61 % of the time equations contained several drivers (they represent 53 % of the resources), 31 % contained interactions between drivers (they represent 21 % of the resources)\(^{18}\).

By way of illustration, we have given the time equation for the ‘deliveries’ resource group. The times required in this group depend on numerous variables or time drivers: the type of customer, type of delivery, by appointment or not… The standard unloading time is thus 5 minutes per delivery to farmers. When the delivery is being made for the first time, an extra 5 minutes are required (interaction between ‘delivery to a farmer or not’ and ’first time delivery or not’). If there are goods to be returned, this will take another 5 minutes, etc. \(^{16}\)This involves taking the goods from the shelves according to the order form and thus forming the lot to be dispatched.

\(^{17}\)There are some equations which are not time-based. For example, the cost of the use of trucks for delivery rounds depends on the number of kilometres travelled. The cost depends on the type of truck used multiplied by the number of kilometres travelled in the delivery round.

\(^{18}\)Interdependence between drivers is often a problem (Thomas and Gervais, 2008).
are possible cases. From 2004, use of TDABC at Sanac was beginning to reap some benefits. Among these were: reduction in the number of customers and number of products, renegotiation of selling prices and encouraging certain customers to change their behaviour in terms of payment terms and service demands.

**Time equation for the ‘delivery’ resource group:**

Delivery time = 5 X₁ + 5 X₁ X₂ + 5 X₁ X₃ + 10 X₁ X₄ + 20 X₁ X₅ + 2 X₁ X₆ + 15 X₁ X₇ + 10 X₁ X₈ + 30 X₁ X₉ + 60 X₁ X₁₀ + 30 X₁ X₆ X₁₁ + 3 X₁ X₆ X₁₂ + 2 X₁ X₈ X₁₁ + 10 X₁ X₅

Where:
- X₁ = farmer (1) / non-farmer (0)
- X₂ = first time delivery: yes (1) / no (0)
- X₃ = returned goods: yes (1) / no (0)
- X₄ = return of reusable containers: yes (1) / no (0)
- X₅ = cash payment: yes (1) / no (0)
- X₆ = retailer or garden centre (1) / non-retail or non-garden centre (0)
- X₇ = number of pallets
- X₈ = number of packs
- X₉ = garden centre: yes (1) / no (0)
- X₁₀ = large distribution centre: yes (1) / no (0)
- X₁₁ = hypermarket: yes (1) / no (0)
- X₁₂ = appointment made for return code: yes (1) / no (0)
- X₁₃ = empty pallets to return: yes (1) / no (0)

The Situation in 2008

Sanac was bought out by a group which is Belgium’s main supplier to the farming and horticultural sectors. It operates in the retail trade and owns the largest chain of garden centres in Belgium. It employs 1,600 people and in 2007 made profits of 14 million Euros for a turnover of around 900 million Euros, which puts it among the top 100 Belgian companies. The buyout was due to the retirement of the former manager who did not leave a successor and who considered that an independent family business such as Sanac could not continue alone in the current environment, the trend being to eliminate small retailers from the sector. Under its new ownership, Sanac’s turnover dropped owing to the withdrawal of part of its technical activities, and part of its “garden centre” customers. Its activity is now focused on the professional market (80%). The remaining 20% are attributed to garden centres (15% in DIY shops and 5% in other stores). Sanac’s turnover however stabilized in 2007 to the same levels as in 2006 (around 50 million Euro), while its payroll and logistics capacities remained unchanged. After the downturn of 2005 and 2006, its profitability improved and the firm now distributes products from a fertilizer and compost manufacturing group. Sanac now raises 67,000 invoices for 98,000 orders and 322,500 order items. It has 6,800 articles in stock and 15,000 on catalogue. In 2007, 8,770 customers placed orders.

Further to the buyout, the group left Sanac in charge of its costing system. It only had reporting obligations. Three people are now in charge of TDABC: the controller, an agronomics engineer and business analyst who are in charge of analyses and reporting, and a computer engineer. The present team is not the same as when the system was launched. The tool put in place in 2004 however continues to be used, with some updates. These updates are facilitated by the fact that the business analyst is a trained engineer, has been with the company for some time and sits on the company management committee. He cannot however be informed of all the changes that can take place in the firm’s organization.

Maintenance mainly concerned the following items:
- Some errors in the activity times were noted. The time calculated using a standard seemed wrong compared to the time available. This observation also entailed changes to certain times in the equations. Approximately 5 to 10 equations are habitually changed each year;
Changes were also made to take into account the reorganization of the logistics process. Orders are now transmitted to suppliers via EDI. The grouping of orders was restructured. A new system to manage deliveries is currently being tested; an on-board computer indicates the activity of the drivers in real time. In addition, a number of charges considered up to now as indirect charges and evaluated according to the time equations will become direct charges related to each customer per delivery;

The number of equations was reduced by joining up processes that were in continuity with each other. For example, picking and repackaging were merged in the depots;

Some equations were also simplified or the number of equations reduced, by using standard times resulting from averages. Thus, for the ‘picking’ resource group in 2004, each of the company’s four warehouses (Wervik, Roesalaere, Lochristi, Mechelen) still had its own time equation, of the type \( a + b X_1 + c X_2 \); where \( a \) is the time to prepare an order line in the warehouse, \( b \) and \( c \) the standard times due to time drivers \( X_1 \) and \( X_2 \) again in warehouse \( a \). We now have a single equation of the type \( a + b X_1 + c X_2 \). The standard times specific to each warehouse have been replaced by a weighted average time (\( a, b \) or \( c \)) calculated from the data from the four warehouses.

The characteristics and organization of the warehouses are however very different (see Table 1). Specific equations had initially been used in order to benchmark the warehouses according to the types of customers. This analysis having been completed, they now serve to avoid a customer appearing unprofitable because it is delivered from a warehouse that is less efficient.

### Table 1: Characteristics of the Four Depots

<table>
<thead>
<tr>
<th></th>
<th>Wervik</th>
<th>Roesalaere</th>
<th>Lochristi</th>
<th>Mechelen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surface</strong></td>
<td>13 000 m²</td>
<td>1 000 m²</td>
<td>1 000 m²</td>
<td>1 000 m²</td>
</tr>
<tr>
<td><strong>Warehouse staff</strong></td>
<td>15</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Articles in stock</strong></td>
<td>5 800</td>
<td>2 100</td>
<td>1 100</td>
<td>1 210</td>
</tr>
</tbody>
</table>

In total, the number of equations was reduced by one third. In spite of this maintenance, evaluated at one week per man per year, the company questioned the pertinence of the time equations put in place in 2004, and whether they continued to be valid in 2008. Uncertain costs may entail errors in commercial or strategic decisions. The question of the cost of the increasing complexity of the system in relation to its reliability was however raised. Costs are obtained at eight different levels of detail (see Figure 1 below). The level ‘Main categories of client (professional, non-professional)’ which is not shown in Figure 1 is little used. The costs per supplier and per article are the most used. The resulting actions rarely involve abandoning a product, but are more likely to be pricing policy changes, alongside changes to the sales policy and more follow-up of customers.

The TDABC system does not serve to draw up budgets or to analyse investment projects. There is a threat to the system. An ERP is to be put in place in the group in coming years. This may entail a need for uniformity in the costing system, while Sanac is the only company in the group to use TDABC.

**Actual costs or standard costs:** Actual costs are related to normal time for the actual level of activity, which does not allow the cost of idle capacity to be calculated. The company does not consider this a problem. The main issue for them is to appreciate the degree of occupancy of their capacity in terms of time.

**The problem of homogeneity:** Activities were grouped together to make the work quicker and easier. As we have already said, the number of equations was reduced by one third. The activities were grouped in two ways:
Process extensions. In particular, the ‘picking’ resource group was grouped with the ‘delivery’ resource group. The equations are now longer but there are fewer of them;

Identical resource groups. Identical resource groups with different cost structures were grouped together, variety still being taken into account in the time equation according to whether a task exists or does not exist.

This second grouping was especially the case for the warehouse resource groups, the main reason being that customers should not be penalized because their products come from one warehouse rather than another. In this way, the unit cost of a resource group that corresponds to an average route (that of all the warehouses on average) is multiplied by a time defined by a specific route (which uses explicative variables specific to a particular warehouse). Here an error is introduced, e.g. the building costs are not the same from one warehouse to another. The orders cannot be encoded in an EDI system at the Mechelen warehouse because Mechelen does not have such a system. In the time equation for Mechelen, the EDI encoding time is therefore zero, which is added to the other times to determine the total order registration time. But in the average unit cost of order registration, there are costs corresponding to the EDI system. Homogeneity is no longer respected and biases are introduced into the calculation. Speed is not always compatible with relevance.

Evaluation of times: In the warehouse, all data is processed using scanners and bar codes and the trucks are equipped with an on-board computer. Therefore, it is possible to say with great accuracy as to how many orders, boxes, stores outwards operations, etc. have been processed in one day by a particular operator. Each change of activity involves scanning a bar code. At the end of a period, we can have accurate information on how the time of a particular storekeeper is shared between his or her various activities. These actual times are used to distribute the accounting costs (operator’s salary) over the activities. But to link the unit cost of the activity to the cost objects, we still have time functions that use standard times.

When we compare actual times with standard times, the difference between them is far from negligible (as much as 20% difference). These time functions are mainly updated when there is a fundamental organizational change or when the difference between actual times and the times of the model is found to be over 20%. Standard times are determined through interviews or timing operations. Many of the warehouse tasks are timed. As regards deliveries, the basis used is the actual work time of the drivers over a year and the number of deliveries made. As for the administrative work (for example, entering an order on computer), interviews are conducted and the plausibility of the times stated is checked. As regards short times which will always be approximate, the effect of this inaccuracy on the calculation was analysed. Certain employees (the sales representatives in particular) were highly opposed to accurately stating their work time, and some of the more senior members of staff still refuse to do this. In the delivery time, the relations between the supplier and customer were taken into account, since the time is counted between the arrival of the delivery man at the place of delivery and his departure. In the case of pesticides for example, it is necessary to take the products to a special place; the first time they are delivered, someone has to be found and asked where to put them (the customer is often out in the fields); the standard times used take all this into account.

Validation tests were conducted at the outset but there have been little verification since then. “I realize that there are a lot of controls that we no longer do. We no longer have the know-how either for this” admitted one person we spoke to.

Organization of the calculation: Up until 2007, the costs were calculated each quarter; since 2008 this has been extended to every six months. The software used for this calculation is based on a database management system with single entry of data. The order line delivered to the customer is an essential item in the data flow and aggregation system; it is from this level of detail that groupings will be made. On one side, the order line refers to an order, a customer and a division; on the other side, the order line refers to an article which itself refers to a supplier (see Figure 1).
To these levels at which data is obtained there correspond as many calculation items. The route from the entry of data in the order lines to the calculation of the margins generated at these various levels of aggregation is however a long one. The process in fact reprocesses the data several times in order to make it interpretable by both the time equations and by the controller. Figure 2 shows the main steps of this route.

Figure 2: Flow of Data: From Data Entry to Interpretation

The production database is backed up by an IBM AS400 management system. Most of the data is entered at the firm's main office; when entered remotely (in the warehouses, at suppliers'); the firm has several data exchange systems (EDI). In addition, each truck has an on-board information system. Certain time drivers can be directly obtained from the production database, such as the number of receipts of articles, the number of pallets to be unloaded, the number of sales order lines to be entered; others however need to be calculated by means of a small transition calculation database. The calculations to be made concern for example the composition of batches of pallets to be returned: a batch of fifteen forms a unit. The costing system uses the Acorn software package from Accord Systems19. This

19 Acorn Systems was founded and is directed by Anderson who, along with Kaplan, co-wrote some books on the TDABC method.
software package is based on TDABC methodology and is run on a Microsoft SQL Server database management system. The system core combines various types of data:

- Tasks or sub-activities, for which a time driver and standard time are determined;
- Resource groups, combining several tasks and corresponding to the functions performed in the company (administration of sales orders, management of article references and stocks, etc.); there are around one hundred resource groups, but as some of these are duplicated in each of the four warehouses, the total nears 150.20
- Support departments (IT, Management) and operational departments (stores, etc.) to which are allotted real expenses according to their nature; the expenses of the support departments are charged to the operational departments; the actual times of the operatives serve to share the expenses of the operational departments between tasks and resource groups;
- Time equations, determining for each of the 150 resource groups a standard time21 by combining the various tasks and their unit standard time,
- Cost items (customers, articles and the various groupings that can be formed from these),
- Periods of analysis: the tool is designed to operate over one year or a shorter period; it is reset at zero each year,
- Weight equations used to allocate certain expenses or spread others among the resource groups and various calculation items it is thus possible to redistribute a direct cost per customer between its order lines and to calculate the average remuneration of the sales reps in order to smooth this cost, etc.

The results are presented using the Business Objects decision help computer tool. The calculations are based on a multi-dimension grid whose two main axes combine order lines (322,000 in 2007) and resource groups (150 in 2007), with other analysis axes for customers, articles, etc. At the outset, the production data and calculated data was restored in a Microsoft SQL Server database, whose settings unfortunately depended on a single chart, resulting in a gigantic spreadsheet like a worksheet without the formulae. In this worksheet, each order line was reproduced as many times as there were resource groups.22 In the columns were displayed the data regarding the TDABC, as well as any other methods of analysis that could be envisaged. An illustration of this architecture is given in Appendix 2.

Presented in this way, all the data and all the levels of analysis were contained in the same chart and there were very few indexes.23 It however lacked a chart for the years and a table for each type of aggregation. The software could calculate the costs at a great number of levels using this one file. This made the program very complex and explained the long response times. It gave all the data, even if the users did not need such at a particular level. In addition, the calculation was divided into several steps and sometimes users had to wait for an answer from one step before being able to continue. To overcome these drawbacks, an indexed database was set up, still in the Microsoft SQL Server. Now, at each level of aggregation, a program transfers the necessary data to a database containing around twenty charts which are correctly indexed and therefore easy to exploit in a multidimensional analysis according to several calculation objects. When everything was contained in the same file, it took a week to process. It now takes 10 hours to transfer the data to the new database and 15 hours to make the calculations which activate around 25 million resource group-order line combinations. Aggregation calculations are made in parallel, while previously the calculations were made in sequence. This technological development shows that to be efficient, the system for

20 For certain activities, the present trend is however to constitute a mean value rather than a value specific to each warehouse.

21 Through grouping of activities and simplifications, there are less than 100 time equations for around 150 enabled resource groups.

22 In 2007, we thus had: 322 000 lines × 150 resource groups, that is almost fifty million lines.

23 An index serves to access the records very quickly without having to scan the whole chart (just like the index of a book allows you to find the page containing the word looked up).
evaluating times and costs with TDABC cannot exist without an information system structured around a dedicated database. This configuration is an absolute prerequisite and Sanac suffered from the lack of such a configuration for several years.

There remains the problem of the highly sporadic use of the system. The database is not used for six months and then suddenly it has to work overtime. Nobody actually manages the operating routes on a daily basis. When the users want to use the program again, they need to ask what has changed. They have to check that all the data is available. Sometimes they do not know how certain articles are packaged, and as some time measures are impossible to estimate when distributing costs, the operator has to be interviewed to know the percentage of his/her time devoted to a particular resource group, etc. This preparatory work takes around one week to complete.

Discussion and Conclusion

The aim of Kaplan and Anderson (2003, 2004, and 2007) was to propose an update of the Rate-Based ABC method in order to quell the criticism that had sometimes led to the method being abandoned. What is presented as the main advantage of TDABC is that it offers a solution for reducing the complexity of operations using time equations that take into account, simply and inexpensively, the complex issues affecting costs. Our analyses show that the tool has some much more subtle advantages. We will look at our results again, focusing on three aspects: is the TDABC method simpler to put in place and implement than the Rate-Based ABC method? How reliable is the TDABC method, and how can it aid in the decision-making process?

To put in place the TDABC method necessitates precise and elaborate analyses that make this phase more lengthy and costly. On the other hand, use of standard times and even standard costs reduces its complexity. The Rate-Based ABC method is complicated because most of the time we consider real costs. With the TDABC method, using standard data as a starting point as well as a basis for the calculations reduces the amount of data to be collected. If the economic context of the firm remains stable, with use of standards the system becomes acceptable. At Sanac, with limited human resources in its finance department, use of a Rate-Based ABC model was therefore impossible; i.e. owing to the strong diversity of customers and products, it involved too much work to ensure that all costs could be tracked.

Like any method based on standards and equivalence coefficients (Barrett, 2005; Gervais and Levant, 2007) however, the TDABC method requires regular maintenance. Kaplan and Anderson agree with this point (Kaplan and Anderson, 2007: pp. 5-17): any significant change must entail an update of the method. TDABC obliges the controller to work close to the shop floor and understand the processes. A minimum of knowledge of the trade is necessary, as is on-going communication with the operatives, together with good compatibility between the accounting and other management software. As the tool remains complex, the organization of the information system it is used with is an important factor in its success.

The reliability of the method is far from certain however. The accuracy of its time estimations is debatable, as it proposes to use the times stated by the operatives when it is not possible to observe these directly. According to Kaplan and Anderson (2004, p. 133), approximations in the order of 5 to 10%24 may be used. They nevertheless rely on managers noticing these inaccuracies and correcting them. Reliable results are sometimes difficult to achieve in practice, that is, if 100% reliability is actually the goal. At Sanac, times known to have a margin of error of less than 20% are considered as acceptable. Furthermore, incorrect data may also be used intentionally to give coherent signals to the sales managers. The time equations for the various warehouses are therefore identical, even though the processes are not the same. Behaviour management can sometimes be more important than costing reliability (Zimmerman, 1979; Hiromoto, 1988, 1991).

24 In their critique of the ABC method in 2004, Kaplan and Anderson considered that times declared as a percentage often generate 20% error and thereby 25% inaccuracy on the unit cost, which is much too much.
The principle of homogeneity in TDABC is only briefly mentioned in the work of Kaplan and Anderson (2007, p.49), which means that they do not explore all the consequences of this problem which also sometimes appears to be ignored in practice. Time equations are nothing other than a condensed way of presenting different operating routes. They remind us that we can only calculate relevant costs if we have good control of the technical input. Indeed, it is tempting when putting in place a cost accounting system, to shorten the study phase and try to save on resources by paying little attention to operating routes and overusing approximate cost breakdowns.

This in-depth knowledge of the production process, which is in itself a positive factor, does not however mean that the various production routes included in a time equation for a particular resource group do not need to be an acceptable reflection of the average route which lies behind the total cost of the resource group in question. If this is not the case, the unit cost of the resource group will include costs that certain routes do not consume or that they consume in different proportions to the average route. The cost of these routes (or cost objects) will be biased, as we will multiply their standard time by a unit cost containing costs that do not pertain to the route or that are over or under-represented in relation to what the route actually consumes. If homogeneity is respected, there are no more breakdowns than in the Rate-Based ABC method, as the resource group may be a very small sub-set. When the company attempts to use larger categories, it no longer has total homogeneity; thus over-simplification can result in loss of relevance.

The main use of TDABC appears to be to calculate costs with a view to determining the operating results via a comparison of selling prices, in spite of the attempt of its authors to put the cost of idle capacity in the perspective of a Lean Management approach (Kaplan and Anderson, 2007: pp. 123-148). The case of Sanac confirms these assumptions. The TDABC method is designed to be used to draw up a ‘whale curve’ or ‘Kanthal curve’. Sanac was thus able to refocus its activities by reducing the number of customers and products deemed to be unprofitable and renegotiating the terms of sale with many others.

Costing idle or unused capacity is nothing new. It was already featured in certain presentations of Rate-Based ABC (Kaplan and Cooper, 1998, chapter 7). To calculate the cost of under-activity, the authors use the concept of practical capacity, but do not give any indications of how to determine it. If the calculation is based on actual costs, it is impossible to determine (see above). This is the case of Sanac, but it is not a problem for it. In the services sector, the capacity provided corresponds to the estimated demand; this demand may however be unpredictable and irregular. The problem is how to manage these variations, and to do so, it is sufficient to know the degree of occupation of capacity. Seen from the angle of cost management, putting a value on under-activity is not necessarily a decisive advantage.

In the end, TDABC may be nothing other than a traditional costing method based on standards and equivalence coefficients to which its designers have tried to add idle capacity costing, which cannot always be used in practice. While TDABC may not be a new method in itself in relation to Rate-Based ABC, Rate-Based ABC and TDABC are not mutually exclusive (Barrett, 2005; Levant and de la Villarmois, 2007b). A Rate-Based ABC model may in effect use a TDABC model for part of its activities only, such as for example homogeneous and repetitive activities.

Furthermore, because the driver is almost exclusively work time, we may nevertheless ask if the real issue is not about controlling employee time. In guise of cost management, we are actually essentially controlling labour time. This more or less brings us back to “Bedaux points”26. This can be accentuated if technical progress allows us to replace standard times with actual times. This could be the case with Sanac where the information systems put in place allow the activity of the sales personnel, drivers and picking staff to be monitored in real time. Even if the controllers consider that replacing standard times by actual times in accounting tools is not yet with us, they are still aware of this eventuality and

25 See the firsthand accounts by Barrett, 2005 at Unilever and HSBC.

26 See Levant and Nikitin, 2009.
the consequences such a change could have on human relations.

References


Appendix One: An Example of How Sensitive TDABC is to the Problem of Homogeneity

Let us suppose that the total cost of an order processing department over a given period is $51,170. This department is broken down into two homogeneous activities: order entry, which is done manually, and order processing which is automated.

The consumption of resources per type of customer is as shown in Table 1A.

The cost of the time driver for each activity is $0.21 per minute of order entry time and $0.31 per minute of computer time for the automatic processing of the orders, which allots the activities to the costs of the different categories of customers is as shown in Table 1B.

Table 1A – ABC Type Presentation. The Data

<table>
<thead>
<tr>
<th>Type of customer</th>
<th>Order entry time</th>
<th>Order processing time</th>
<th>Number of orders</th>
<th>Minutes of entry per product</th>
<th>Minutes of processing per product</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Proportion</td>
<td>Proportion</td>
</tr>
<tr>
<td>Customers A</td>
<td>20,000</td>
<td>30,000</td>
<td>10,000</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Customers B</td>
<td>42,000</td>
<td>42,000</td>
<td>14,000</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>Customers C</td>
<td>25,000</td>
<td>20,000</td>
<td>5,000</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Customers D</td>
<td>12,000</td>
<td>6,000</td>
<td>1,000</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>99,000</td>
<td>98,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1B – ABC Type Presentation. The Calculation

<table>
<thead>
<tr>
<th>Type of customer</th>
<th>Manual entry</th>
<th>Automatic processing</th>
<th>Total cost allotted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers A</td>
<td>4,200</td>
<td>9,300</td>
<td>13,500</td>
</tr>
<tr>
<td>Customers B</td>
<td>8,820</td>
<td>13,020</td>
<td>21,840</td>
</tr>
<tr>
<td>Customers C</td>
<td>5,250</td>
<td>6,200</td>
<td>11,450</td>
</tr>
<tr>
<td>Customers D</td>
<td>2,520</td>
<td>1,860</td>
<td>4,380</td>
</tr>
</tbody>
</table>

To arrive at these costs, we need to know the total costs of each activity and the volume of the drivers consumed by each category of customer (that is 2 + (2 x 4) = 10 items of data). We need to add 4 items of data on the number of orders, if we want to know the unit cost allotted to each type of customer. If however the company uses standard operating routines to calculate its costs, it suffices to know the total costs of each activity and the actual number of orders for each type of customer (that is 6 items of data). If we opt to use TDABC, it is tempting to only use one resource group, i.e. the order processing department. In this case, we would only need to collect 5 items of data for each period: the total cost of the resource group (1) and the number of orders per type of customer (4).
Table 1C - Comparison between the ABC and TDABC Calculations (Bruggeman Method)

<table>
<thead>
<tr>
<th>Type of customer</th>
<th>Standard order processing time</th>
<th>Cost allotted according to TDABC</th>
<th>Cost allotted according to ABC</th>
<th>% difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers A</td>
<td>2.25</td>
<td>10,562.6</td>
<td>13,500</td>
<td>-21.76 %</td>
</tr>
<tr>
<td>Customers B</td>
<td>3.45</td>
<td>22,674.4</td>
<td>21,840</td>
<td>3.82 %</td>
</tr>
<tr>
<td>Customers C</td>
<td>5.2</td>
<td>12,205.7</td>
<td>11,450</td>
<td>6.60 %</td>
</tr>
<tr>
<td>Customers D</td>
<td>12.2</td>
<td>5,727.3</td>
<td>4,380</td>
<td>30.76 %</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>51,170.0</td>
<td>51,170</td>
<td>0.00 %</td>
</tr>
</tbody>
</table>

By calculating costs in this way, the cost of idle capacity and productivity gains in relation to the standards cancel themselves out (use of actual costs does not allow these to be costed), as the deviations can only be due to a problem of homogeneity.

We will now consider perspective 3 of the method (calculation of the cost of under-activity). Let us suppose that the department employs 16 people. On average, each employee works for 20 days per month and 6 hours per day (on account of breaks, absences, training leave and meetings). The monthly order processing capacity in the department is therefore: 16 × 20 × 6 = 1 920 hours or 115 200 minutes. In this case, the cost of one minute of order processing is (51.170 / 115 200 =) $0.444184 and the results are shown in the Table 1D.

Table 1D - TDABC Calculation (Gervais-Levant Method)

<table>
<thead>
<tr>
<th>Type of customer</th>
<th>Standard order processing time</th>
<th>Cost allotted according to TDABC</th>
<th>Cost allotted according to ABC</th>
<th>% difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers A</td>
<td>2.25</td>
<td>9,994</td>
<td>13,500</td>
<td>-25.97 %</td>
</tr>
<tr>
<td>Customers B</td>
<td>3.45</td>
<td>21,454</td>
<td>21,840</td>
<td>-1.77 %</td>
</tr>
<tr>
<td>Customers C</td>
<td>5.2</td>
<td>11,549</td>
<td>11,450</td>
<td>0.86 %</td>
</tr>
<tr>
<td>Customers D</td>
<td>12.2</td>
<td>5,419</td>
<td>4,380</td>
<td>23.72 %</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>48,416</td>
<td>51,170</td>
<td>-5.38 %</td>
</tr>
</tbody>
</table>

Not allotting idle capacity to the products does not fundamentally change the skewing of the results due to non-homogeneity. For the calculation to be relevant, two resource groups are necessary, manual entry and automatic processing, and two time equations need to be formulated:

- One equation for manual order entry, based on the labour time which is for example equal to: Basic P (1 min) + Product A specific P (1 min) + Product B specific P (2 min) + Product C specific P (4 min) + Product D specific P (11 min).
- One equation for automatic processing, based on the machine time, which is equal to: Basic P (2 min) + Product A specific P (1 min) + Product B specific P (1 mins) + Product C specific P (2 mins) + Product D specific P (4 mins).

In this case however, there is no reduction in complexity.
Appendix 2: Information System Architecture with Only One Table of Data

Table 2A: Presentation of TDABC Data in a Single Table  
(Details of One Order Item Outlined in Bold)

<table>
<thead>
<tr>
<th>Col. 1</th>
<th>Col. 2</th>
<th>Col. 3</th>
<th>Col. 4</th>
<th>Col. 5</th>
<th>Col. 6</th>
<th>Col. 7</th>
<th>Col. 8</th>
<th>Col. 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource group code</td>
<td>Standard time in mins</td>
<td>Share of activity capacity consumed</td>
<td>Cost in Dollars</td>
<td>Order line</td>
<td>Product code</td>
<td>Order code</td>
<td>Customer code</td>
<td>Salesperson code</td>
</tr>
<tr>
<td>150</td>
<td>1.50</td>
<td>0.0000031</td>
<td>1.10675</td>
<td>1110</td>
<td>246</td>
<td>444</td>
<td>3456</td>
<td>22</td>
</tr>
<tr>
<td>001</td>
<td>3.00</td>
<td>0.0000066</td>
<td>0.33600</td>
<td>1111</td>
<td>5432</td>
<td>444</td>
<td>3456</td>
<td>22</td>
</tr>
<tr>
<td>002</td>
<td>0.00</td>
<td>0</td>
<td>0</td>
<td>1111</td>
<td>5432</td>
<td>444</td>
<td>3456</td>
<td>22</td>
</tr>
<tr>
<td>150</td>
<td>1.50</td>
<td>0.0000031</td>
<td>1.10675</td>
<td>1111</td>
<td>5432</td>
<td>444</td>
<td>3456</td>
<td>22</td>
</tr>
<tr>
<td>001</td>
<td>2.00</td>
<td>0.0000044</td>
<td>0.22400</td>
<td>1112</td>
<td>1660</td>
<td>444</td>
<td>3456</td>
<td>22</td>
</tr>
</tbody>
</table>

The smallest level of data recovery is normally the order line (column 5). Here, it is the 150 resource groups (column 1) that form the highest level of detail, these 150 groups being shown individually for each order line, even if only a minority is used for a given order line\(^\text{27}\).

Each resource group used for an order line consumes a standard time (column 2); the consumption of time is shown as a tiny fraction of the total capacity of this group (column 3) and this time consumption is costed (column 4).

To allow subsequent multidimensional use of this data, each order line (column 5) is related to a product (column 6, with one product per order line) and an order (column 7, with several order lines for the same order); each order is related to a customer (column 8) and a salesperson (column 9).

\(^{27}\) Certain resource groups are presented in each order line, such as the entry of this order line. Other groups are however more seldom used; for example an order line may concern an article that needs special packaging, and therefore needs time for this activity, while most of the other order lines concern an article with no special packaging.