

# Serie Research Memoranda

## The Use of Activity-Based Costing Systems in a European Setting: a case study analysis

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# **The Use of Activity-Based Costing Systems in a European Setting: a case study analysis**

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## Abstract

This paper describes the introduction of the Activity-Based Costing concept, as developed by Cooper and Kaplan, in two Dutch manufacturing firms. The two case studies relate to both ABC system design and its consequences.

The following topics will be discussed:

- initial motives to consider changes in the cost system;
- ABC alternatives generated and the criteria for selection and adaptation of the final system;
- the specific problems encountered while implementing the (adapted) ABC alternative.

Special attention will be paid to the integration with the existing cost pool method for overhead allocation, which is relatively widespread in Europe as compared to the USA.

The paper analyzes the finally implemented and proposed ABC systems; the pre-existing cost pool method, strategic organisational choices and alternative applications of the system are discussed as part of the changeover trajectory.

Conclusions will be drawn relating to:

- the role of ABC systems in Europe as related to the existing overhead allocation methods and their adaptation to such a European setting.
- the underlying differences in the division of labour, from functional to cell design.
- the reflection of strategic choices in the final, mutant ABC-Cost Pool design.



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## Introduction

The concept of Activity-Based Costing as developed by Robin Cooper and Robert Kaplan has drawn widespread attention. Not only the concept but also the realisation that a cost system is a manageable item and an instrument to pursue strategic advantage, seems to have come as a surprise to many academics and practitioners.

This paper focuses on the changecover aspect. Specifically, the transfer from an existing cost system towards an ABC system within a European setting is the main focus of interest. The continental European tradition in cost allocation and cost management is predominantly based on early German insights in management and cost accounting and as such is thought to differ from American (Anglo-Saxon) theory and practice. Therefore, the design considerations taken into account and the existing situation can differ significantly from the American ideal-type ABC design. In this paper, an attempt is made to point out what these differences can be, how design argumentation can differ and what still stands as strengths of the ABC concept.

First, we present the two ABC case studies. In this first part, we give an account of the redesign cues, the various argumentations and experiences. Specifically, we pay attention to the influence of the existing cost pool method on the final ABC design<sup>1</sup>. In the second section, we broadly sketch the concept of a cost pool method of cost allocation according to European insights and discuss the expected differences when comparing ABC to the cost pool method from the perspective of the two above mentioned case studies.

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<sup>1</sup> Exact figures and some detailed descriptions of actual circumstances are not accessible for publication for reasons of confidentiality.



## I. The case studies<sup>2</sup>

### Situational background

The case studies concern two cases where a full change trajectory is run. Both cases are concerned with manufacturing companies which are tied to the mother company in a business unit relationship. Also, both cases are foreign-owned with an American and a British mother company respectively. Both managements are Dutch. The companies produce for industrial markets.

WOODWARD GOVERNOR Netherlands BV is the Dutch subsidiary of a large producer of fuel regulators. The Dutch company manufactures, assembles and sells mechanical controls and it assembles and sells electronic controls for both the car and aircraft industries as well as for use in refineries and flood-control dams for example (Roozen, 1990).

THOMAS ENGINEERING BV is a daughter of a British multi-national and produces components for the car industry. It is the technological leader in its main product line: car headlights. Its turnover of approximately 200 mln. Guilders (119 mln. US\$) consists of OEM products (Original Equipment Manufacturing) for the car industry and the sale of components to the wholesale trade and large car service organizations. It has about 600 employees in the Netherlands, including the R&D department which is part of the company-wide R&D effort.

### Redesign cues

As regards the competitive environment, the WOODWARD GOVERNOR Company is market leader in manufacturing and selling controls. This market leadership is based on the product's quality and uniqueness. Quality is achieved mainly through manufacturing precision and product reliability. Uniqueness results from customization. In the long run the diffusion of technology will endanger the present market position. In other words, through the distribution of technological know-how competitors will be able to manufacture products with the same high level of quality, i.e. flexibly automated manufacturing processes and process innovations like 'Just In Time' will guarantee high-quality products, even when producing in a small or varying batch size. Because of free access to these technologies other factors will become more important for the competitive position of the company. The factors that have already become more important are delivery performance and cost effectiveness.

WOODWARD GOVERNOR's existing cost information system is focused on generating operating statements for monthly reporting to the mother company. These reports are also used for internal

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<sup>2</sup> Case studies abstracted from A.N.A.M. Boons, H.J.E. Roberts and F.A. Roozen, *Activity-Based Costing: Strategisch Cost Management voor Vernieuwende Bedrijven*, Kluwer, Deventer, Chapters 6 and 7 (forthcoming).

decisions. The focus of these operating statements is on inventory valuation:

"Proper inventory valuation is considered essential for two basic reasons: (1) to provide management with a necessary tool in controlling costs and setting selling prices, and (2) to reflect accurate historical profit in published statements. Thus the valuation of inventories must necessarily follow an approach which will serve both purposes."

The cost system records labour and material usage for each unit produced (registration per process step; job-order costing). Selling, general, administration and design costs are considered to be period costs. Direct or variable overhead is allocated based on direct labour consumption per product.

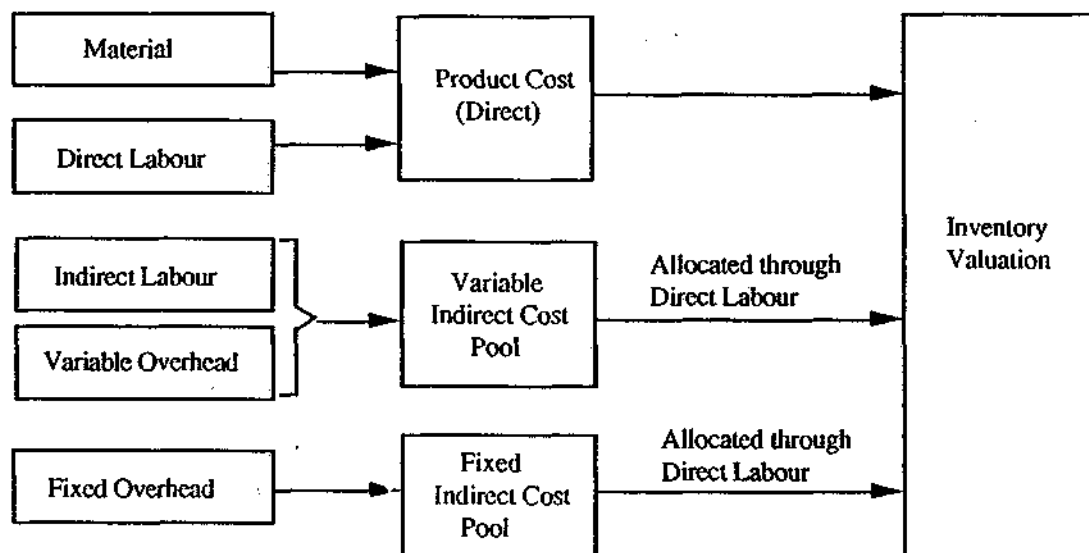


Figure 1: Cost system WOODWARD GOVERNOR

Indirect production overhead, consisting of depreciation, insurance, utilities, etc. is allocated only once at the closing of the fiscal year. This ensures that inventory is valued at full production costs. Allocation of indirect production overhead is also based on the consumption of direct labour per product (see Figure 1).

To ensure its market position given the physical problems it now faces, WOODWARD GOVERNOR increasingly focuses its attention on process rationalization. Process rationalization allows for improvements in delivery time and cost effectiveness without making concessions to quality or uniqueness of the products manufactured. Pilot projects have been started in order to instigate a process of continuously improving the total production process (these projects focus on the cell concept as the future structure of the manufacturing process).

Continuous improvement can be defined as a never-ending strive for higher added value for

customers. Firstly, this requires a more integrated approach of primary activities influencing the manufacturing process. For example, tuning the design, production and selling activities. Up until now these efforts have been focused on the throughput time of the design and manufacturing processes. Both aspects are considered to have a major impact on delivery time and cost effectiveness.

THOMAS ENGINEERING'S profitability is under pressure, notwithstanding the switch to a JIT production mode and the expanded product assortment. Although turnover has increased throughout the last couple of years, margins remain the same because of the steady increase in overhead. The direct labour part of total costs is decreasing, which is partly due to recent investments in new technology, and now amounts to 10%. Material costs and overhead are 58% and 35% respectively of total operating costs.

Due to the pressure on margins THOMAS ENGINEERING faces problems generating enough cash-flow to:

- 1.) finance internally considerable investments in R&D in order to maintain its technological advantage and,
- 2.) to provide a satisfactory return for outside investors.

Furthermore, the OEMs (VOLVO, NISSAN) indicate that selling prices are generally too high compared to identical foreign companies. Also, the OEMs themselves want to pick up their products within their own JIT schedules which in their opinion should result in lower prices. Therefore, the calculation of selling prices is the subject of a fierce debate between the Sales and the Financial departments.

Present product cost calculation is carried out using the costing module of a traditional MRP system. In this system, first costs per cost pool are established after which the total costs of the indirect cost pools are charged to the production cost pools. Subsequently, a manufacturing tariff per production cost pool is set using budgeted hours. Finally, costs are assigned to products on the basis of the throughput times and the materials/components present in the MRP routings and the Bill Of Materials respectively (see Figure 2).

In the present cost allocation system all indirect costs are allocated to products on the basis of throughput times (the amount of time it takes to complete a work-order or batch). The situation as depicted in Figure 1 is a simplification of actual circumstances; in reality there are 25 manufacturing cost pools each with its own shop floor rate. The indirect costs burden rate is almost 200%.

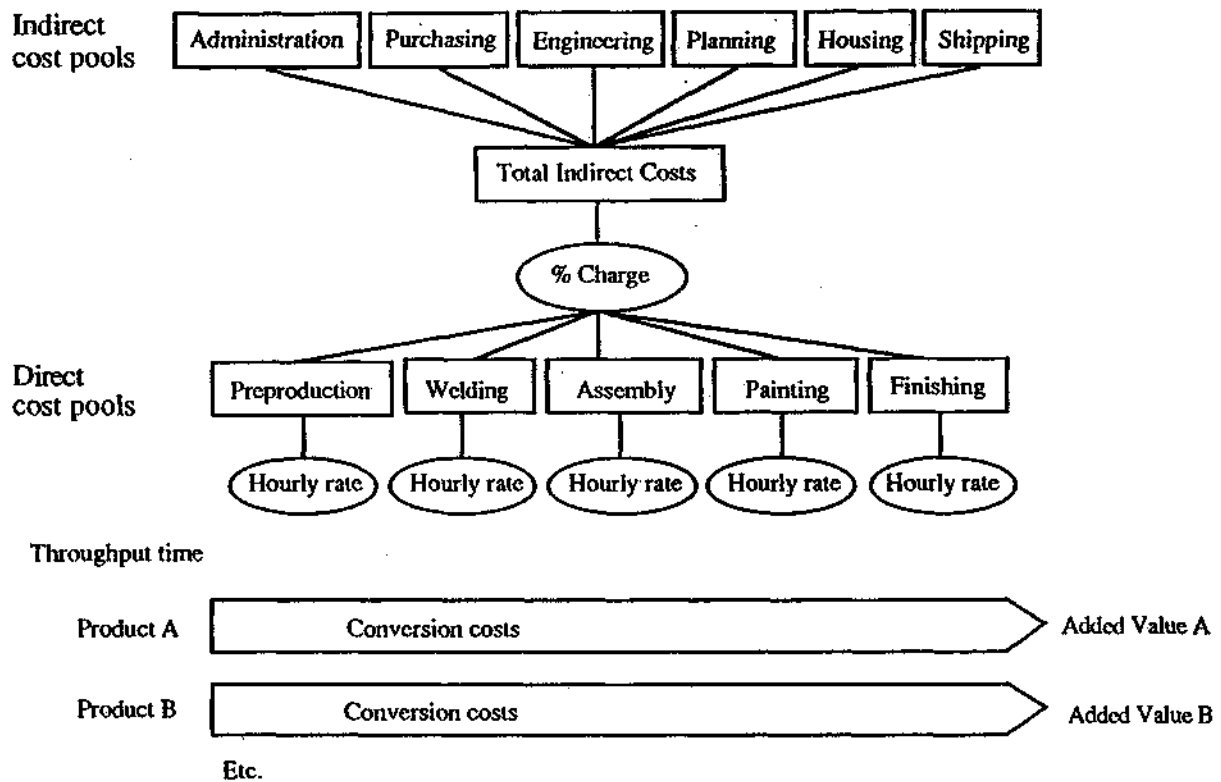


Figure 2: Build-up of THOMAS ENGINEERING's added value

Meanwhile, the allocation methods in use are 5 years old and have not been adapted to the new JIT system. Information comprised in the MRP routings and the BOM have been neither checked nor updated for the last few years. Resulting material and throughput variances are roughly allocated back to product groups. All in all, management of THOMAS ENGINEERING is confronted with several policy questions. The increasing overhead is instinctively thought to be caused by the large product variety. In order to meet the required price reductions and the profitability demands of the shareholders, overhead will have to be reduced with approximately 30%.

The question is which products to eliminate from the product assortment. Unfortunately, the management information system of THOMAS ENGINEERING does not indicate where possible answers can be found. A possible alternative action considered is outsourcing of low-volume products. However, it is unclear in what way this will lead to savings in indirect costs. Management has objections to the absolute size of the indirect costs but has no leads as to how to push back these costs. In order to make well-founded policy decisions management decides to initiate a special study. The objective of this study is twofold:

1. to obtain insight into the costs and profits of products and orders and,
2. to reduce costs to improve returns (including cash-flow).

The objectives are coupled to the strategic goal which is to maintain competitive advantage by means of technology and an efficient organization.

**Redesign proposal WOODWARD GOVERNOR: shortcomings of the existing cost information system**

The existing cost information system calculates product costs by adding a surcharge for variable manufacturing overhead, based on the amount of direct labour per product, to direct labour and material costs. On top of this, there is a surcharge for fixed manufacturing overhead, which is using the same direct labour basis. For some products, this surcharge is slightly adjusted because it is suspected that allocating costs in this manner does not represent actual cost burdening. The company thereby implicitly recognizes that the very diverse and complex product mix results in extra costs: costs that predominantly arise from the extra coordination effort needed for a diverse output. This aspect is not considered at all in the existing cost information system. In fact, a large amount of these costs are considered fixed (fiscal) period costs and are not taken into account at all.

Furthermore, it is unclear to what extent separate products or product groups consume resources. It is, for example, questionable whether different products consume the same number of engineering and planning activities. The existing allocation of costs not only disregards a large amount of costs but also disregards differences among the resources that products consume. Because of the above-mentioned complexity of the production process, and under the assumption that there are differences in the consumption of resources among products, it is expected that product costs show significant distortions. A closer look at what really drives costs seems necessary from this point of view.

Uniqueness is of utmost importance to WOODWARD GOVERNOR. Alternatively, the relevance of cost effectiveness and throughput time increases. The pilot project shows that an improvement of both cost effectiveness and delivery time while at the same time maintaining product uniqueness is achievable. The changeover to a cell-structured process configuration reduces the throughput time. However, the effectiveness of such a changeover depends on the level of diversity among the parts to be processed. This level of diversity stems from the customization and therefore uniqueness of the controls manufactured. This uniqueness/customization in turn restrains the firm from the successful application of the cell concept. The pilot project tells us that it is successful when the parts to be processed are more or less standardized. In other words, if the cell concept is to be applied successfully, the use of standard parts and modules in product designs has to increase, while specific features are added only in the final stages of production. In this way, uniqueness of products can be maintained, despite a reduction of the diversity level of the parts processed.

Given the impact of uniqueness and the possibilities of a more extensive usage of standard parts and modules, product as well as process engineers could have an important impact on the success of the



cell concept and, subsequently, in achieving better results in cost effectiveness and delivery performance. However, the existing cost information system nowhere motivates towards a more extensive use of standard parts or modules and thus does not support this rationalization process.

The shortcomings of the existing cost information system (CIS) can be summarized in two ways:

- 1) CIS gives an incorrect representation of the actual production process/environment and,
- 2) CIS is an impediment to continuous improvement efforts.

Given these shortcomings there is a need for:

- accurate cost information that better reflects the 'true costs' of customized production, and
- useful cost information that supports a process of continuous improvement in both Engineering and Manufacturing (in terms of cost effectiveness and throughput time or delivery performance).

A strategic cost structure analysis<sup>3</sup> confirmed the assumption that complexity within the overall manufacturing process is responsible for a significant part of indirect costs. Complexity proved to be related to the uniqueness of the product range, and consists of three elements:

- the number of different parts/materials purchased;
- the composition of the product, i.e. the number of parts/components which a control is composed of;
- the number and type of orders processed (including both sales and machine shop orders);

In addition to these three factors, the throughput time of a part or control proved to be an explanatory factor for the indirect costs connected with primary activities like 'Parts production' and 'Assembly'. It was assumed that parts or controls characterized by longer throughput time cause higher costs than actual processing costs account for. Parts and controls with a long throughput time indicate more transportation, handling and inspection, and are usually characterized by more rework due to quality problems. In other words, parts and controls characterized by a longer throughput time consume more activities, both capacity and labour-related. Actual processing time, however, suggests otherwise. Furthermore, those products usually require more management attention. Finally, products characterized by a longer throughput time obstruct the process, and are therefore more responsible for capacity shortages.

#### Redesign proposal WOODWARD GOVERNOR: Activity-Based Costing system

The company formulated two related constraints for the ABC system to be developed:

1. clearness and,
2. limited complexity.

The system ought not be too complex. A complex cost system increases the costs of gathering and

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<sup>3</sup> A strategic cost structure analysis is an activity-based cost analysis of indirect costs in order to establish the factors (in terms of cost drivers) that determine the level of indirect costs.



processing information (system costs) while at the same time decreasing its acceptance (clearness and thus acceptance are negatively correlated with complexity). Because of these constraints the number of cost pools and cost drivers had to be as limited as possible, that is as limited as possible within the required level of accuracy.

A factor that plays an important role in selecting cost drivers is the possible behavioral impact of a cost driver. The selection of cost pools and cost drivers provides the company with an instrument to influence product and process engineers. Viewed from the competitive position of WOODWARD GOVERNOR, the behaviour of engineers must be focused on continuous improvement of the process in terms of limiting process complexity. From a strategic point of view, process and product engineering determine the long-term effectiveness of the overall manufacturing process. The ABC system should therefore not only result in a more accurate representation of manufacturing reality, but also motivate product and process engineers towards reducing complexity without limiting customer demands for uniqueness.

The strategic cost structure analysis resulted in a classification of indirect costs into 16 cost pools, divided into 4 types of cost pools. The 4 types are:

- 1) unit level or volume-related cost-pools, including the activity cost pools 'cell-costs parts production', 'cell-costs heat-treat', 'cell-costs assembly', and 'limited production'.
- 2) product or order related cost pools, including the activity cost pools 'subcontractor parts', 'other purchased parts', 'components/parts per control', 'repair orders', 'spare orders', 'digital control orders', 'other electronic control orders' and 'mechanical control orders',
- 3) batch related cost pools including the activity cost pool 'machine-shop orders', and finally
- 4) plant sustaining cost pools including the cost pool 'general overhead'.

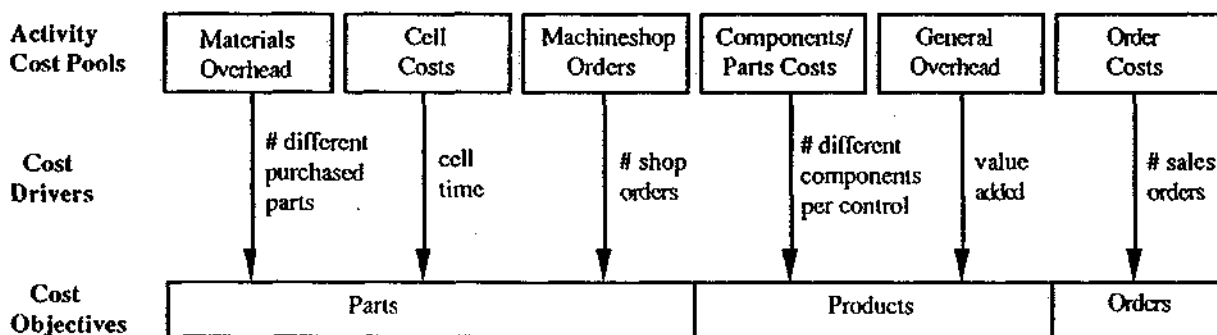


Figure 3: Structure of the ABC system

Given the cost pools and cost drivers it is now possible to calculate the costs of a control. As Figure 3 shows, this procedure takes several steps. The first step is the calculation of the costs per part/component. Subsequently, the costs of the distinctive parts/components which a control is

composed of is added up. On top of this sum, assembly costs (based on the standard throughput or cell time for the control), a surcharge for component overhead, and a surcharge for general overhead are added. To attain full product costs, a final surcharge for order costs is added. This is a fixed amount per order, despite the size of the order (see Figure 4).

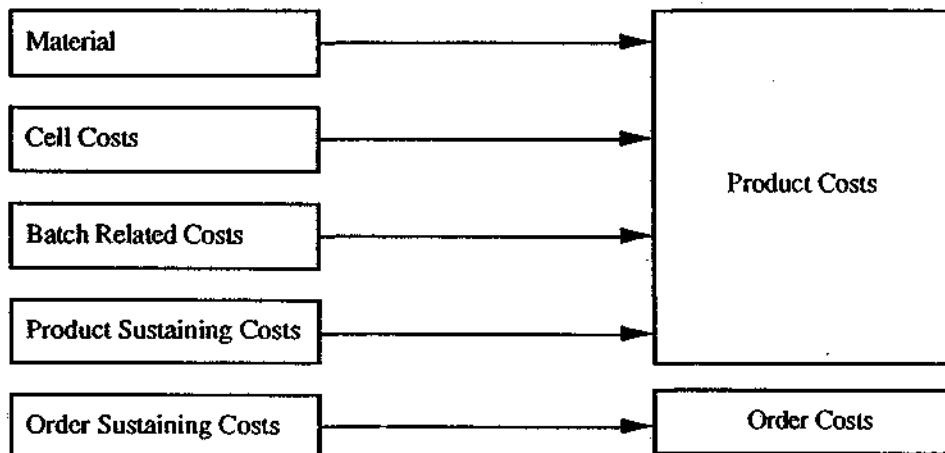
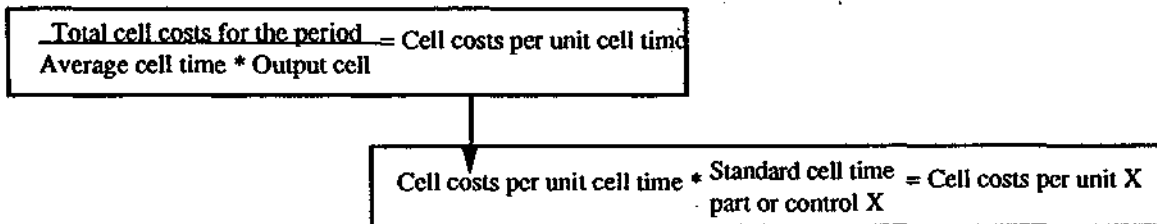


Figure 4: Calculating the costs of products and orders

**Redesign proposal WOODWARD GOVERNOR: using the ABC system**

Materials overhead is assigned to purchased parts based on the number of different types of parts used (this procedure holds true for subcontractor parts as well as other purchased parts). To calculate the unit costs of a purchased part, total costs of the cost pool are divided by the number of different types of purchased parts used. Subsequently, the overall cost per type thus calculated is divided by the annual usage of a type to obtain the unit costs per type.

Cost drivers related to the number of components and the number of orders can more easily be determined in comparison. Total costs of a cost pool are divided by the annual number of cost driver units. In the WOODWARD GOVERNOR case, we use the annual number of components/parts used and the annual number of sales/machine-shop orders. This results in a surcharge per component and per order. For allocated costs based on cost drivers related to the number of orders, this means that the size of an order has no influence on the cost assigned to the order. In other words, the relative effort per activity group (and thus the size of the activity cost pool) is independent of the size of an order.



Note: Total cell costs consist of direct labour, other cell labour, social security, machine and tool depreciation, surcharge for housing, utilities and supplies.

Figure 5: Assigning cell costs based on cell time

The cost driver 'throughput' or 'celltime' is applied to both parts and controls in manufacturing and assembling respectively. For each different part and for each type of control, a standard cell time is estimated. In addition to this, an average cell time for each separate process (each cell) has to be determined. Based on these outcomes, total cell costs can be allocated to parts and controls. Figure 5 illustrates the use of cell time as a cost driver.

#### Redesign proposal THOMAS ENGINEERING

THOMAS ENGINEERING'S redesign proposal can be divided into two phases:

- Phase 1. Company and costs analysis,
- Phase 2. A. Cost model for decision support.  
B. Formulating profit improvement possibilities.

Planned and realised timespan for both phases was approximately 24 weeks with the project team consisting of a financial manager, a logistics manager and two consultants. On the basis of the problem formulations, the project team decided to use the activity analysis as primary input for the analysis of indirect costs.

Target of Phase 1. was to obtain better insight into the cost structure of THOMAS ENGINEERING. A mixed team of internal and external specialists carried out the following steps in a workshop approach:

- (a) classifying costs according to the manufacturing process;
- (b) analyzing indirect activities and establishing the costs per activity;
- (c) selecting the cost drivers.

#### Redesign proposal THOMAS ENGINEERING: shortcomings of the existing cost information system

The introduction of the JIT system has led to a considerable reduction of throughput time. Instead of an average 14 weeks, throughput time is reduced to 4.5 weeks. However, production according to the JIT philosophy has also led to increased variety in batch sizes. In the past, products were

manufactured in standard batch sizes to replenish stock. Now, production orders for the OEMs are coupled to customer orders. The administrative registration of Work In Process has not been adapted to the introduction of the JIT system. Each manufacturing department conducts a monthly variance analysis comparing actual throughput time and materials with standard time and usage. The resulting variances are usually considerable.

After studying the existing cost system, the project group concentrated on two weaknesses. First, present product costs do not take into account specific order or batch costs. This results in the 'invisibility' of customer order costs such as planning, order entry, changeover and purchasing, which in turn can lead to overcosted high volume batches and undercosted small volume batches. Secondly, the allocation of indirect costs using a 200% burden rate obscures an accurate picture of product costs. An increase in the product assortment as well as the introduction of the JIT system involves an increase in complexity. The cost system should therefore be based on this complexity rather than production volume.

Consequently, the project group decided to introduce a new concept of cost allocation using various levels of cost aggregation, i.e. product, batch/order, product group and general. The aim of this classification is primarily to separate volume costs from customer order costs or, when producing for inventory, the size of the production batch. All other costs are allocated to a product group or to a general category respectively depending on their relation with the production process.

#### **Redesign proposal THOMAS ENGINEERING: analyzing indirect activities and establishing the costs per activity**

The analysis of the indirect activities used the same four classification levels as mentioned above. All indirect personnel was part of the analysis. The analysis used departmental interviews with 65% of indirect staff and local administrative documents such as the hour registration of the Technical Support Service, the project administration of Engineering and R&D, and the test administration of the laboratory.

Preceding the interviews everyone involved was informed about the goals of the analysis. At the request of the works council a representative was offered to sit in with all interviews. In addition, all indirect personnel received a form asking them to carry out a first assessment of their work as input for the subsequent interviews. After discussing their assessments in the interviews, a final and in most cases adjusted work content was established. The aim of the analysis was to limit the number of activities per person to six, taking into account only activities which took more than 10% of time available.

In order to relate the activities found to the four cost dimensions, the activities were clustered into two predefined categories, i.e. their relation with the cost dimension and the nature of the

activities. The cost relation cluster was subdivided into product (group)-related, process- or machine-related (these costs are also part of the shop floor rate), order-related and a subcategory called 'remaining'. For the data analysis a standard spreadsheet model is used. In the model cost drivers for the product-related and the machine-related categories are selected (see below) which turned out to be specific products or specific machines or operational processes respectively. The 'nature of the activities' cluster was also subdivided into four categories, namely;

- primary activities which could be directly attributed to the goal or objective of a department or organizational unit,
- secondary activities supporting primary activities (e.g. secretarial support, training) of which the costs are allocated specifically or with a percentage to a primary activity,
- added value activities (AVAs), which contribute to the value of a product or service or for a quality level for which the client is paying (e.g. product design, shipping); and finally,
- non-added value activities (NAVAs), which do not add any value to a product or service (e.g. machine repairs, inventory controls, material movements).

For each activity it was indicated whether it was either a primary or secondary activity and whether or not it was adding value. Especially labelling activities such as NAVA generated a lot of discussion, since the standpoint of the project group was that all secondary activities are NAVAs unless proven otherwise. The activity analysis resulted in a matrix with activities on one axis and departments on the other. The matrix helped management to gain insight in both the activities per department and the total of activities across departments.

### Redesign proposal THOMAS ENGINEERING: selecting the cost drivers

Partly based on the interviews and partly on the analysis afterwards, the factor dominating the hours spent is indicated and labelled 'cost driver' for that activity. Using these cost drivers the activities were coupled to the predefined four cost categories which resulted in a general Activity-Based Cost design (see Figure 6).

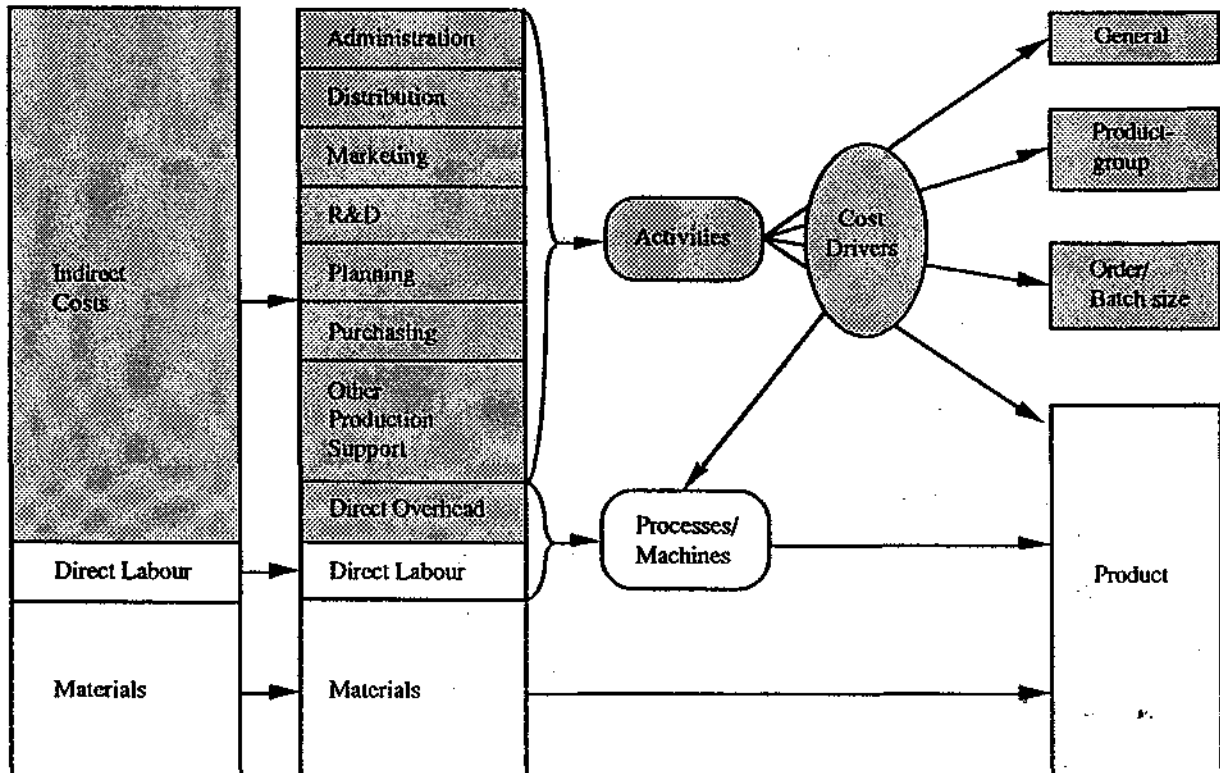


Figure 6: Structure of the ABC design of THOMAS ENGINEERING

At first, the number of selected cost drivers amounted to more than 30. After much debate in the project group this number was finally reduced to 14 (see Figure 7). Main criteria for cost driver selection were the share in total indirect costs which the cost driver represented and the relationship with process and product assortment complexity. Activities with relatively small costs or with a volume relationship were coupled to already existing cost drivers as much as possible. Also, a number of activities have the same cost driver. By grouping activities according to cost driver additional insight was gained into the causal relationships between activities and the costs per cost driver.

Summary Cost Drivers	
# Customer orders	# Volume per product group
# Suppliers	# Machine hours
# Inspections	# Changeovers
# Components	# Material movements
# New Products	# Employees
# Purchasing orders	# Export orders
# Complaints	# Inventory entries

# = Number of

Figure 7: Final number of cost drivers selected by THOMAS ENGINEERING

*help cost plan it on*

Finally, the activities are coupled to costs. Basic starting point for this was the already existing cost pool method in which the costs of auxiliary cost pools are allocated to departments (main cost pools) using relevant allocation criteria (e.g. Housing is allocated using square feet and Utilities using kilowatt hours). In establishing the costs per activity, the labour costs were usually of qualifying importance. All other costs allocated to departments such as housing and travelling are keyed to activities on the basis of labour costs. All costs directly allocated to the production cost pools (e.g. maintenance, depreciation) are entered into the shop floor rate.

#### Final redesign WOODWARD GOVERNOR and THOMAS ENGINEERING

In the case of WOODWARD GOVERNOR, the research predominantly concentrated on costs related to activities which can be classified as product-supporting. This does not suggest that other activities are of no importance. On the contrary, but the complexity of the research didn't allow for a broader scope than the one chosen. Consequently, supplementary research is necessary in which explicit attention will be given to for example sales and marketing activities.

The strategic cost structure analysis led to the following distribution of costs:

- 23% of total costs (excluding materials purchased and subcontractor services) proved to be caused by non-volume-related factors like orders, product composition and product batches. Previously, these costs were labelled overhead.
- 31% of total costs (again excluding purchased material and subcontractor services) are volume-related or unit-level costs. These costs vary with the number of units manufactured. For these costs it is necessary to adjust to the cell concept and allocate costs in a way that will stimulate continuous improvement of the production process. In this way, organizational changes within the firm will be reflected in and by the cost system.
- The remaining 46% of total costs (excluding the costs of purchased materials and subcontractor

parts) concerns 'plant overhead' and 'costs of selling, general and administration'.

We have to make some additional comments concerning 'general parts production overhead' and 'selling, general and administrative overhead'. The significance of these cost categories warrants more research since these two cost categories represent almost half of the 46%. By integrating the cell concept in the cost accounting system, the biggest part of 'general parts production overhead' becomes unit- or volume-related instead of plant-sustaining. A significant part of 'selling, general and administrative overhead' is already assigned directly to orders (job-order costing) and should therefore be excluded from the plant-sustaining category. More research could therefore lead to another significant decrease in plant-sustaining costs while at the same time increasing product/order-sustaining costs. The outcome of the strategic cost-structure analysis is summarized in Figure 8.

Plant-Sustaining Costs 46%
Product/Order-Sustaining Costs 17%
Batch Activities 6%
Unit level Activities (excl. materials) 31%

Figure 8: Cost distribution WOODWARD GOVERNOR

If total 'purchased materials costs (subcontractor parts as well as other purchased materials) for the investigated period were included, the distribution of costs would have been as follows: 22% plant-sustaining, 8% product/order-sustaining, 3% batch level, and 68% unit level costs.



### **Final redesign WOODWARD GOVERNOR: applications**

Based on the proposed ABC system, a full cost calculation for both products and orders is possible. Comparison of these product and order costs with the selling price provides insight into the profitability of individual products and orders. The implications of this kind of analyses must be treated with some reserve. Reserve, as cost information will never be the only factor on the basis of which one decides whether or not to introduce or withdraw products, accept orders, and change prices. This kind of decisions will be taken mainly on the basis of the competitive strategy of the firm, while at the same time considering the side-effects of these decisions on for example the other product offerings.

In connection with the above-mentioned profitability analysis of products and orders, is a more long-term evaluation of the existing make-or-buy policy. The present policy is mainly based on ad hoc decisions caused by shortages in capacity. Presently, it is impossible to evaluate subcontractor quotations, despite the fact that the parts concerned could be, and often are, manufactured in-house. This impossibility originates from the lack of information concerning:

- 1) the extra costs incurred internally by using parts purchased from subcontractors, and
- 2) the full product cost of internally manufactured parts.

The surcharge for purchased subcontractor parts as proposed in the ABC system gives more accurate information on what subcontractor parts actually cost. The same holds true for the calculated costs of internally processed parts (including material cost, cell cost and a surcharge for batch-related costs). This improved accuracy supports a well-considered long-term policy on which to base make-or-buy decisions.

For now, cost management efforts must be focused on a more rational use of the capacity available. Cell time or throughput time is an important element here. A lot of capacity is lost just because of the constipated process. This means that the firm experiences a shortage of capacity and unused capacity simultaneously. This is a result of the fact that a product consumes capacity almost equal to the total time spent in the cell. As long as total time is higher than actual processing time, this ties up capacity that cannot be used otherwise. Experience tells us that the share of actual processing time to total time could be as low as 5%. This suggests that shortening throughput time frees capacity. A decrease in throughput time can be achieved by rearranging the process lay-out (i.e. shortening the distance between processing units means decreasing transport time), a more rational use of available resources (i.e. produce only what is needed now), and improved, more cost effective, product designs.

WOODWARD GOVERNOR has already made some important changes in the lay-out of the manufacturing process by switching to manufacturing cells. Important advantages of the cell concept are reduced planning activities, reduced transportation between processing units, and reduced setup

time. As a result, there is no need for large batches any longer, which ends up in smaller Work-In-Process inventories. In financial terms this means that batch-related costs and volume-related costs decline. The former because less set-up time is required, the latter because capacity costs per unit produced decline when the output of the plant increases without changing the costs of capacity (the capacity of the plant remains constant).

The existing process lay-out can be explained by the very large number of different parts and components used as a consequence of customized product designs. The cell concept and customization are counterparts which can only coexist if customization is achieved by making extensive use of standard components and modules, while adding customer specific features at the latest possible moment. In that case, manufacturing cells can be created for standard components and modules.

The advantages of such process improvements have already been mentioned. In addition to these advantages, we noted a reduction of the inventory level, and thus inventory costs, due to the use of standard components or modules. Other savings can be expected as a result of a reduction in complexity. This manifests itself in a decline of the 'product-sustaining costs'. Such savings are mainly to be expected in purchasing and engineering costs. In short: it is the information about the impact of complexity and complexity-causing factors on costs that guides efforts in the field of product and process rationalization.

ABC profitability analysis and cost management information clearly indicate where possible actions will be most effective. For now, these actions should focus on freeing capacity and increasing the output of the plant. As a consequence, subcontracted work can decrease. In a somewhat longer term, a reduction of complexity will free resources. These resources are predominantly fixed, and should therefore be made productive again. Purchasing activities for example, could be directed both towards achieving more long-term commitments with suppliers and the exchange of information on quality and delivery problems in order to improve supplier performance. Above all, however, it is mandatory that a more integrated or overall view of Selling, Engineering, Manufacturing and Shipping is supported by a fine-tuning of all individual disciplines/departments related to this process, if any action taken to improve cost effectiveness and delivery performance is to be successful. In other words, more and more time should be spent on multifunctional team work.

#### **Final redesign THOMAS ENGINEERING: applications**

For THOMAS ENGINEERING the goal of Phase 2 A. was to formulate a cost model which could be used by the management team on a Personal Computer. Starting point for the model definition is the wish to obtain insight into product, order and customer profitability. For the model design no formal

specification was made. In an iterative development mode between Electronic Data Processing specialists of THOMAS ENGINEERING and the project group a model was set up. It used the activity analysis from Phase 1. and is also constructed according to the four cost categories mentioned above.

Although the PC model operates as a stand-alone, it can be fed by data from the mainframe computer. Among the data thus fed, the standard material and conversion costs and the customer order specifications are the most important ones. The model is maintained regularly; cost driver volumes are updated every 6 months and the BOMs, standard operating and changeover times are also brought up to date. Acceptance of the new PC cost model was eased by frequent feedback to management during the period of model development. The PC model supplies information on among other things:

- (1) the costs of an extra supplier/contractor;
- (2) the costs of a new product;
- (3) the costs of a quality test procedure and;
- (4) the costs of a purchasing order.

Subsequently, more insight into the build-up of product costs is provided, including development costs, sales and distribution costs and the customer order costs (see Figure 9).

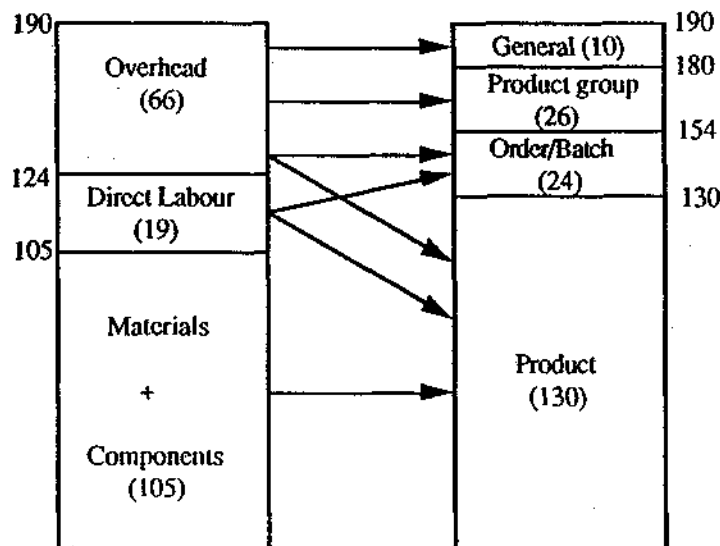


Figure 9: Changed product cost buildup categories THOMAS ENGINEERING.

#### Implementation and consequences WOODWARD GOVERNOR: data availability

The cost information used for the strategic cost structure analysis covered the period October 1989 to February 1990. These four months can be considered as being representative of WOODWARD

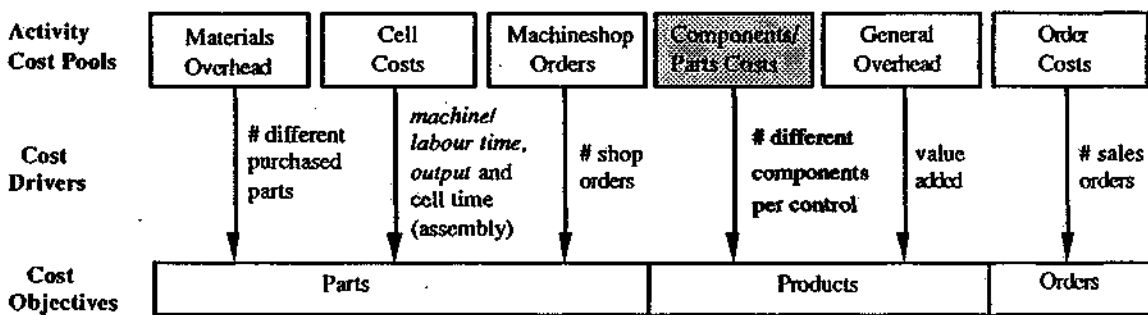
GOVERNOR. Evidently the product and process data, on which cost drivers selection was based, refer to the same period. For each department, salaries and wages (including social security) were assigned to the relevant activities based on the labour effort each individual activity consumes. It is assumed that there exists an average price for labour per department. Therefore, differences in salary and wage levels have no impact on the cost per activity. Such simplification is justified because employees at WOODWARD GOVERNOR frequently switch tasks, in which case the disadvantages of a more accurate cost assignment in terms of extra system costs outweigh the advantages of a more accurate cost assignment. The cost of management has been excluded if a more accurate assignment was desirable. This is the case where management performs one or more specific activities while its general management task takes up a relatively small amount of time. Where possible, other costs were assigned directly to activities, including for example depreciation on machines, tools, computers, etc. Whenever the use of machines or tools was directly related to labour input, labour was selected to allocate the costs concerned. Costs for which no accurate cost driver was found were not allocated at all, but gathered in the cost pool 'general overhead'.

For the same period, sales were broken down into the number of orders and the number and type of products per order. This kind of breakdown is necessary in order to establish not only the number of orders, but also the number of purchased parts and the number of components used. By focusing on actual sales only the active purchased parts and components were taken into account. This prevents inactive parts and materials from blurring the analysis.

Estimating the standard throughput or cell time per part is complex. Each part has a "costed machine-shop routing" which contains information on set-up and processing time. This, does not add up, however, to total cell time, for the time spent on waiting, inspection and/or transportation between various process steps is not included. In order to get at cell time per part, every part to be manufactured needs to be labelled. This makes it possible to record the time and date at which a part was taken into production and the time and date of ending production. However, one single registration will not suffice. Cell time can be affected by several external factors. Therefore, it is necessary to base standard cell time on the average of several observations. At the same time we should consider the fact that a program of continuous process improvement will result in declining cell time. It is thus essential to evaluate the used standards periodically. The fact that a program of continuous process improvement affects cell time, makes cell time an pre-eminently suitable measure for cost-control. Cell time is one of the very few factors on which a more coordinated performance measurement of the overall manufacturing process is possible. That is why it is a substantially more effective 'efficiency measure' than traditional labour and efficiency variances which often motivate towards local or sub-optimization. At the same time this makes cell time an important variable to evaluate process improvement efforts.

**Implementation and consequences WOODWARD GOVERNOR: problems with data availability**

Apart from cell time in assembly it proved to be too short notice to obtain information on cell time per part (given the already mentioned 'cost accounting project' at WOODWARD GOVERNOR Company, it is expected that this information will become available in the near future). In addition to cell time per part, it was also impossible to come up with the number of components or parts a control is composed of. As a result, the ABC system as described above cannot be achieved for the moment. Figure 10 shows the alternative which is a somewhat simplified version of the one presented in Figure 3. This simplification was attained by skipping cell time as allocation basis for cell-costs, and including the cost pool 'components/parts per control' in the cost-pool 'machine-shop orders'.



Note: The shaded block indicates the reduction in cost pools, and the textual changes in *outline* and *italics* the reduction in cost drivers and the extension of the represented causal relationship respectively.

Figure 10: The simplified structure of the ABC system of WOODWARD GOVERNOR

**Implementation and consequences WOODWARD GOVERNOR: implementing the ABC system**

The reporting frequency, the consequences of a cost system designed according to a functional or a responsibility structure, the possibility of combining homogeneous activities into activity cost pools, and the use of different cost drivers for different purposes gives rise to the use of more than one cost system.

Integrating the ABC system in the general ledger is for the moment not advisable. This would not only change the present basic structure of the cost accounting system, but would also interfere with the purpose of responsibility accounting. Another motive is the fact that ABC information focuses on accuracy rather than exactness. This could be unacceptable for the annually published statements of WOODWARD GOVERNOR Company.

Given the arguments described here it is advisable to use the cost accounting system tied in the general ledger for responsibility accounting and annual reporting. The less frequently required cost information on for example product costs, product design and process improvement efforts, for which the ABC system is designed, can be generated external to the ledger system.

**Implementation and consequences THOMAS ENGINEERING: actions planned and taken**

In Phase 2 B. several possible profit improvement actions were formulated, all based on the insights provided by the new ABC model. Also, all actions formulated were directed at reducing short-term indirect costs. Three groups of actions can be distinguished:

- (1.) Redeploying the consumption of the time resource, i.e. abolishing NAVAs (e.g. meetings, 'red tape', double work, travel time) in order to gain more time for AVAs.
- (2.) Process improvement, i.e. reduction of NAVAs by better procedures and work methods. For example, improving creditor administration by reducing the flow of invoices.
- (3.) Product portfolio management, i.e. immediate improvement of product group and order profit margins. The first results of the ABC model have been used to outsource heavy loss-making, low volume product groups.

Actions (1.) and (2.) do not require any investment and can be realized within 1 or 2 months. In all cases, the question is whether the time which comes available is filled in with increasing effectivity (i.e. an improved coupling of resources to organizational goals) or reducing the number of personnel. Only in the last case can one speak of an actual cost reduction.

THOMAS ENGINEERING chose the increased effectivity option only for the Financial department, in all other cases (i.e. the Planning and Personnel department and secretarial support) the option of rationalisation of personnel was chosen. Regarding action (3.) Sales staff is now more able to explain to customers the price differentiations between products and order size. Also, various price modifications are now being negotiated with the largest customers as it became clear that 5% of the customers (among which the OEMs) provided the largest profit contribution. Customers with the worst profit contribution were those with many small orders of non-standard products.

One of the most important conclusions to be drawn from the PC model is the confirmation of the idea that complexity costs are the prime cause of the increase in indirect costs. For example, the costs of introducing a new product are much higher than expected. Not only the Design and marketing departments, but also the Quality Assurance, Purchasing, Production control, Planning and Shipping departments have to perform many activities regarding extension of the product assortment. Therefore THOMAS ENGINEERING decided to rationalize their existing assortment, price small product modifications differently and to evaluate new product decisions in view of the introduction costs now established. Furthermore, it is decided to adjust the materials administration to the changed production circumstances as a result of the newly acquired cost indications of the work order administration. Instead of booking WIP inventories between production departments, actual usage is recorded when exiting inventory. Standard usage and absorbed usage is now booked when entering Finished Goods inventory. Also under consideration is to do away with the registration of components issued at Parts inventory and to changeover to 'back-flushing', i.e. crediting Components

inventory once the full product enters Finished Goods inventory. Also, relating to a change in factory lay-out, the number of production cost pools will be reduced. Based on analyses made with the new PC-model, several other special projects are formulated, all leading to an increase in profitability in the medium term (see Figure 11).

SUMMARY PROFIT IMPROVEMENT PROJECTS	
PROJECTS	IMPROVEMENTS
1 Reduce changeover times in order to reduce throughput time	Increased service level / decreased WIP / decreased batch & order costs
2 Reduce the number of subcontractors	Increased delivery reliability / decreased components inventory / decreased purchasing costs
3 Improve procurement planning and management	idem
4 Improve production planning	Reduced delivery time / reduced WIP
5 Develop preventive maintenance	Reduced breakdowns / increased output / decreased maintenance costs
6 Development of quality inspection to in-process quality control	Decreased quality costs / increased customer satisfaction
7 Improve factory lay-out	Decreased internal transport costs / reduced throughput time
8 Couple pricing to order costs	Competitive prices for large volumes
9 Rationalize product assortment using outsourcing	Improved profit margins

Figure 11: Medium-term profit improvement proposals THOMAS ENGINEERING

Their contribution to operating income is expected to last another two years on average which is partly due to the funds required for the necessary investments. The management of THOMAS ENGINEERING, however, feels that problems have become a lot more workable and now have enough clues to improve decision-making.

## II. The cost pool method of cost allocation

The cost pool method of cost allocation is based on the view that indirect costs are not being made for products but for a performance necessary for the production process. As a consequence, one must first establish the costs of this performance and then determine to what extent the cost object has made use of this specific performance (Meij, 1960).

Cost allocation thus can be separated into two phases:

1. the allocation of costs to indirect cost pools;
2. the allocation of costs from each indirect cost pool to cost objects, usually products.

To define the concept of indirect cost pool first, it is necessary to distinguish it from a cost center. The latter refers to the field of responsibility accounting and implies the attachment of the performance of an organizational unit to someone who can be held accountable for this performance. It therefore focuses on management control and performance measurement. An indirect cost pool in the sense of an intermediate allocation level is more limited, i.e. a group of identical costs. For example, a cost center can comprise many cost pools, both direct and indirect.

An indirect cost pool performs a function in relation to the production process. The grouping of costs into cost pools do not have to coincide with the departmental organization of a firm. Sole criterium for grouping is that costs once grouped can be allocated using the same allocation basis. The search for an identical allocation basis has thus led to grouping of costs (Schmidt, 1930). Main problem in this respect was that it was difficult to refrain from the categorical division of costs as stemming from the cost categorisation in the general ledger accounts, e.g. labour costs, material costs, depreciation etc. Once it had become clear that costs of the same category relate to the product or cost object in totally different proportions, the need for grouping on the basis of an identical allocation basis was understood (Meij, 1960). Nevertheless, this identical allocation basis criterion has been generally abandoned in practice and replaced by a grouping according to the departmental or functional structure of the firm.

The indirect cost pools can be divided into auxiliary and main cost pools, with the former usually coinciding with the service departments and the latter with the production department(s). Indirect costs are then routed from functional cost category to (auxiliary and then to main or directly to main) cost pools to, finally, products, orders, batches etc. (see Figure 12).



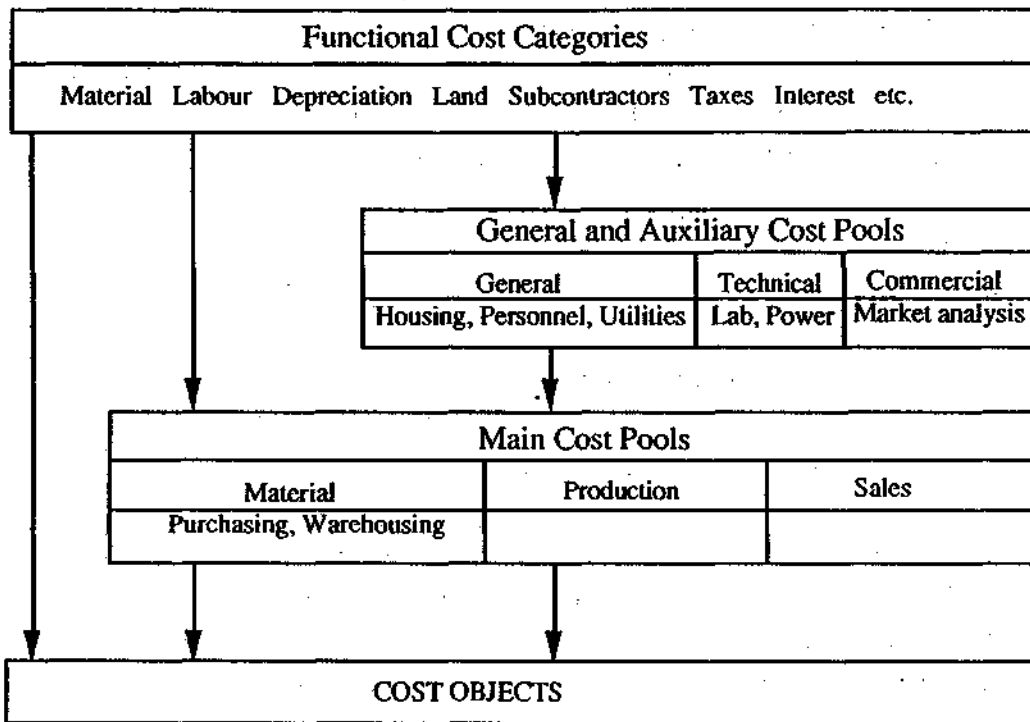


Figure 12: The phased design approach of the cost pool method of cost allocation.

When allocating costs to cost pools it is important to note that there are costs which are indirectly related to the product (cost object) but direct when related to the cost pool. Therefore, as costs are being allocated to predetermined cost pools, no indirect costs remain. The choice of cost pools is thus an exhaustive one, i.e. all costs can be directed to either a cost pool or a cost object.

Once accumulated in the cost pool, the costs are homogeneous on the basis of their further allocation basis. This allocation basis is, together with defining the cost pools, one of the most important elements. It represents the causal relationship with the process, using a relevant unit of performance to link up with it.

“Generally, the units of performance of each cost pool will have to be determined such as to distribute costs as correct to the proportional use the product makes of the cost pool.” (Meij, 1960, p. 204)

When allocating costs from auxiliary to main cost pools, a similar approach can be followed. The tariff used to bring costs over to main cost pools is based on a relevant measure of performance of that auxiliary cost pool. Surcharges or burden rates are theoretically undesirable since they are less representative as a relevant measure of the performance a cost pool supplies to the product. They can nevertheless be used, sometimes together with tariffs, if they relate to disproportionately small auxiliary cost pools.

Cost Pools	Total	General Aux. cp.'s		General cp.'s		Material cp.'s		Production cost pools				Sales cp.'s					
		Housing	Personnel	Management	Administration	Purchasing	Warehousing	Planning	Assembly	Preproduction				Sales department			
										Cutting	Welding	Painting	Finishing	Sampling	Holland	Export	
Wages & Salaries																	
Material																	
Wear																	
Subcontractors																	
Taxes																	
Interest capital invested																	
<b>Total</b>																	
Housing		C															
Personnel			C														
Management				C													
Administration					C												
Purchasing						P											
Warehousing							P										
Planning								C									
Sampling																C	
<b>Total after transfer</b>																	

Standard Product Cost Buildup	
Material - - - - -	
Surcharge Purchasing costs - - - - -	
Surcharge Warehousing costs - - - - -	
<b>Total Material Costs - - - - -</b>	
Assembly - - - - -	
Preproduction - - - - -	
Cutting - - - - -	
Welding - - - - -	
Painting - - - - -	
Finishing - - - - -	
<b>Total Production Costs - - - - -</b>	
Sales costs (Holland) - - - - -	
<b>Full Product Cost (Holland) - - - - -</b>	

C = Credited, indicates actual services rendered versus the allowed costs  
P = Product costs directly assigned to the product

Figure 13: Cost Allocation table and its relationship with product cost build-up (adapted from Meij, 1960, p. 205).

The cost pool allocation method can be represented by a so-called cost allocation table. All costs are precalculative/standard costs and can be compared with actual performance of the various cost pools using the results of the same table. Furthermore, there is a relationship with the calculation of standard product cost (see Figure 13). All main cost pools are represented in the product cost build-up. From a reverse accounting perspective it is thus possible to indicate, given a target product cost, in which cost pools cost improvement efforts should be undertaken. The more numerous and detailed the main cost pools, the more specific this improvement guidance will be.

### **The cost pool method of cost allocation: ABC versus the cost pool method**

Both methods are relatively similar regarding their phased design approach. While the concept of cost pools is of significance for cost information in general, the concept of cost object is of primary importance for the performance(s) of the organization which are elements for price setting. The phases of cost categories, cost pools and cost objects bear great resemblance to Cooper's 'two-stage procedure' (1987a, 1987b).

"This procedure traces costs to the products in two distinct stages. The first stage takes such resources as direct labour and supervision and splits them up into sections, each related to a segment of the production process. These segments can be machines, collections of machines, or even entire departments (sic). The costs associated with each segment for each resource are then combined to form cost pools. These costs are then traced, in the second stage, from the cost pool to the product using a measure of the quantity of resources consumed by the product."  
(Cooper, 1987b, p. 48)

The theoretical difference with the ABC method is twofold. First, the way in which the production process is viewed, and second, related to the first, the selection of the cost drivers.

The cost pool method starts from the physical lay-out of the process. In fact, the lay-out determines the main cost pools to which all other cost categories and auxiliary cost pools are allocated. In contrast, the ABC method views the production process only as a relevant framework for the analysis of the activities performed within. The grouping of activities into homogeneous activity centers leads to establishing main cost pools other than material, production and sales cost pools alone. Furthermore, the internal allocation of auxiliary to the final main cost pools is not present within the ABC method, when a clear causal relationship is absent. These costs lacking clear causal relationships are 'orphanaged' in the ABC method, labelled 'facility' or 'process-sustaining' and allocated using a general surcharge.

The explicit recognition that many categorically different cost drivers are necessary, is only present in the ABC method. Especially, the differentiation between volume and non-volume related cost drivers is not explicitly made by the cost pool method. Only the trend towards a more detailed allocation of costs as a result of product diversification is mentioned by the cost pool method.

### **III. Discussion**

#### **Design conclusions**

When matching the ABC method with the outlined cost pool method, three main design areas can be distinguished:

1. strategy,
2. division of labour, and
3. organizational structure as represented by process and/or product complexity.

All areas result in design contingencies depending on what cost system view is used - Activity-Based Costing or the cost pool method.

First, both methods stress the importance of causally relating costs to the item on which management wants to be informed. In ABC, these are key activities within the production or service flow. As such they represent a strategic emphasis on the production/servicing process of the firm. Efficiency gains, process improvements and an increasingly effective production function in general, are essential elements in steering within this manufacturing strategy. More relevant cost information on production performance is therefore necessary (Schreuder, 1990).

The cost pool method, however, selects in practice the organizational and personal structure as item to which costs are to be causally related. Implicit in this choice is therefore the role of managerial control, i.e. one is informed on who and where in the organization activities are performed according to (budgeted or strategically set) standards. Matched with ABC, the cost pool method can be said to indicate an efficiency approach as opposed to a continuous improvement approach of ABC. Both approaches however, can be mutually supporting with the cost pool method for short-term decision-making and ABC for informing more long-term decision-making.

A strategic cost structure analysis employed by WOODWARD GOVERNOR has a strategic focus. This fits well in the strategic or long term perspective applied in ABC. Given the strategic nature of ABC, an annual analysis will be sufficient, only to be repeated after important intermediate changes in the internal or external environment of the firm.

It is not useful to perform product cost calculations frequently. Adding or eliminating products from the product portfolio is a long-term decision. It suffices to decide annually whether the present product mix or new products are desirable from a competitive point of view. Only radical changes in the internal and/or external environment might make a more frequent reevaluation of product costs necessary (e.g. the switch to cell production). The same reasoning applies to the evaluation of product design and process improvement efforts and, more in general, to strategic cost management efforts. Calculations are necessary once a year, only to be supplemented if the need is felt. This is in sharp contrast with recording controllable costs by responsibility centres, where a more frequent (monthly) reporting is desirable.

Consequently, the design contingency is one between strategy and cost structure.

Secondly, the two methods inherently pay much attention to the division of labour within the organization. Markedly, the ideal-type design of an ABC system starts with grouping so-called homogeneous actions into activities and then further aggregates them into activity centers or processes (Cooper, 1989; CAM-I, 1988). As the latter already state, actions is another label for the task structure built upon the production flow. ABC considers tasks to be homogeneous in respect to their tie with processing elements within the production flow. This as opposed to the cost pool

method which groups tasks in a more Tayloristic way, i.e. largely to identical functional contents. Both methods then start to aggregate, with ABC ending up in activity centers and the cost pool method with functional concentration in departments. The background of this difference growing from a similarity, is the role of technology. The increase in automation and computerization of production processes leads to tasks being taken over by hardware. Tasks are therefore less related to a functional splitup of the process (similarity of operational content) as to a process bounded part of the flow (similarity of flow interfaces). For example, cutting, drilling and machining of a product versus presetting, producing and packaging of a product.

This other division of labour results in another denominator of aggregating costs - activities instead of departments (flow instead of function) with the task structure as the main originator. It indicates a design contingency, this time on the technology-in-use and cost system design. Changing the firm's technology could require a change in cost information structure, including a change in cost allocation method and consequent product cost.

Both WOODWARD GOVERNOR's and THOMAS ENGINEERING's existing cost systems are structured by function. It so happens that the existing structure also corresponds with a grouping by responsibilities. Activity-based costing starts from a functional point of view. This allows for an analysis of activities performed within each functional unit or department. Subsequently, homogeneous activities are combined. The combined activities do not necessarily belong to the same functional unit or department. Therefore, rather than combining specialized tasks we now combine homogeneous activities and thus abandon the functional structure of a cost system. With the introduction of ABC not only the functional structure was left aside, but also the grouping by responsibilities. Homogeneous activities collected into an activity cost pool do not necessarily fall under the responsibility of a single manager. On the other hand, it is also possible that one manager is responsible for several, not homogeneous (and therefore not belonging to the same activity group) activities. In this respect, it is no coincidence that both WOODWARD GOVERNOR and THOMAS ENGINEERING are halfway introducing the Just-In-Time concept to their primary and secondary activities. The focus of JIT on flow and timeliness provides an extra incentive to abandon functional organization structures and processes, i.e. it also makes a return to original design considerations immanent.

The ABC system is a substitute for a cost system designed according to a functional structure. ABC is not, however, a substitute for a cost system designed according to a responsibility structure. In view of the fact that the need for responsibility accounting will not disappear with the introduction of ABC, this would indicate that two different cost systems indeed are required (Kaplan, 1988).

Thirdly, in both methods the possibilities for cost management are present. As pointed out before, ABC starts with aggregating tasks into actions into activities into activity centers. It does so without questioning the present methods of producing/servicing, i.e. its design starts from the

assumption that the status quo is perfect and contains no inefficiencies or structural flaws. If there are any, they are consequently built into the ABC system. However, this presupposes an independent design of the cost system and possible (necessary) changes in the organizational design. As was the case with WOODWARD GOVERNOR and THOMAS ENGINEERING, the use of an activity analysis based on the value chain concept can partially alleviate this suboptimal design process. Similarly, the cost pool method is in practice a standard cost system with cost categories and tariffs obtained from the installed bookkeeping system registering functional input categories and (industrial) engineering studies focusing on present methods of operating. Its design therefore has an identical inclination towards disciplinary separated design trajectories.

Cost management in an ABC system is a result of interpreting cost driver consumption by various products or activity cost pools against a background of some sort of strategically set or ideal consumption. Only if a significant unfavoured figure or behavior (as is the case with WOODWARD GOVERNOR 's goal of continuous improvement) shows up, further study is initiated. The same goes for the cost pool method where the variance analysis character of cost management is even more present. Under- or overabsorption of costs by departments indicate the need for alternative action with an emphasis on correcting possibly inadequate departmental management.

Revision of the original, cost system underlying processes is therefore piecemeal, i.e. when a strongly unfavourable deviation occurs, and only insofar as it is (financially) represented in the cost system. This form of cost management 'by the numbers' can thus inhibit truly needed management action (Ezzamel et al, 1990). Such management 'by the numbers' however implicitly presupposes a form of organizational blindness in order to lean on 'number reality'. Both WOODWARD GOVERNOR and THOMAS ENGINEERING have shaken off this 'reality numbness' by introducing ABC and using it for what-if analyses, activity monitoring and other forms of proactive behavior. Also, it presupposes an inherent cost system inflexibility (in its design or in its use) as to stay untouched by all forms of organizational change.

For example, a complex production/servicing process can either be (financially) managed by using a large number of cost centers and variance analyses (cost pool method) or by representing the complexities into the cost system by using cost drivers and activity centers, in neither of the two situations the effect of a pure process simplification/rationalization is recognized (Kunst and Roberts, 1990). In other words, first redesigning the operational processes and structure towards greater efficiency and effectiveness can lead to more results than working from the cost system 'down to the process'. Therefore, the design contingency here is one towards the relationship cost system versus organizational design as represented by its main proponents of process and/or product complexity.

#### **Discussion: suggestions for future research**

Even a casual glimpse of the recent developments in the field of Management Accounting reveals an image of a well-known biblical scene: sheep without a shepherd. Future research should therefore be directed at finding a generally accepted framework for Management Accounting systems design in which sound conceptual foundations and new paradigms are combined.

The emphasis placed on continuous improvement, external focus and a long-term view brings elements of the field of strategic management to the scene. Subsequently, a promising point of view can be found in strategic cost management. This line of reasoning stresses the continuous cycle of four stages in the process of strategic management:

1. Formulating strategies;
2. Communicating those strategies throughout the organization;
3. Developing and carrying out tactics to implement the strategies;
4. Developing and implementing controls to monitor the success of the implementation steps and, hence, the success in meeting the strategic objectives.

According to Shank (1989) strategic cost management is a blending of three themes from the strategic management literature: value chain analysis, strategic positioning and cost driver analysis.

The case of THOMAS ENGINEERING clearly showed the role which the value chain concept can play in designing and implementing a new cost system. Its typology of Value Adding and Non-Value Adding sets the mind for selecting key activities from the organizational processes; key activities which are in themselves the result of a strategic positioning of the firm. In other words, the value-adding concept takes strategic accents to the cost system where, finally, the information for strategic evaluation has to come from.

Also, both cases presented above show the various use of the cost driver concept, be it in make-or-buy decision-making, simplifying complex processes in terms of cost information or for directing long-term improvement efforts. Cost drivers can also provide an opportunity to link up with the cost pool method which many European firms have installed or have a working knowledge about. The cost pool method of cost allocation already supplies a range of causal factors linking various departments to each other and to the flow. A reassessment of the used definition of cost pools in both methods can be the only thing needed to evaluate if an ABC system is workable for a specific firm. As with the value adding concept, cost driver analysis can be another vehicle for bringing strategic perspectives into the accounting system; it creates awareness for designated areas by the users of the accounting system.

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