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Flexible management of logistics in response to turbulent oil prices: case of a European paint producer

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Abstract

How can flexible logistics improve performance in a turbulent world when volatile customer demand and rising oil prices require responsive operations? This paper seeks an answer for this question in the field of control management in J.W. Ostendorf, a European paint company. Until recently logistics had been largely farmed out and paid for as required. It had no or little role in business policy. The new business environment, however, requires that all organisational sectors flow in concert with the corporate objectives. A flexible logistics guided by an independent budgeting based on real costs expectations is offered as a solution. Major changes in information systems is assumed to contribute substantially to this effort.

1 Introduction

1.1 Problem identification

Significant changes in business environment, such as increasing oil prices, stagnating markets (Christopher and Gattorna, 2005), growing globalisation, and competition, have strengthened the importance of efficient flexible operations in particular logistics and supply chain as a whole. The paper looks at adjusting logistics management in J.W. Ostendorf (JWO), a medium-sized paints company. JWO is a well-positioned private brand manufacturer for the DIY sector, supplying wide regions of Europe with emulsions, glosses, aerosols, glazes and pastes. Due to its growing international presence and therefore the rising impact of delivery, JWO is continuously in the process of re-configuring its logistics.

1.2 Plan of the paper

The focus will be on general control approaches applied to logistics management. Sections 1 and 2 provide a theoretical background, which will be applied to JWO's

1

control system in Section 3, aiming to improve its logistics. This will be followed by conclusions in Section 5.

1.3 Logistics

Modern logistics is an inseparable part of supply chain management. Therefore, the study of logistics should cover the flow of material, information, and money all the way until a finished product reaches the consumer (Kuhn and Hellingrath (2002, p.10). While examining the organisational dimensions of supply chain and logistics, Croom (2005) too focuses on their planning and controlling aspects. According to Vonderembse and White (2004, p.93), logistics encompasses all components of a supply chain dealing with the movement of items, *e.g.*, trucking, railroading or shipping, and with the storage of them. Coordinating all activities concerning these components of the supply chain could be understood as logistics management. This work focuses on the above definition of logistics management. The following section examines the main functions of logistics, which should be supported by control approaches.

1.4 Functions

JWO's idea of logistics management fits in with the Ohio State University's description of the functional relevance of logistics (OSU, 2000, as cited by Donath *et al.*, 2002, p.191). Whilst the inbound, interplant, and outbound logistics, warehousing and handling are the responsibility of JWO's logistics managers, activities like sales forecast, product planning, order entry and purchasing, are in the hands of the other executives. The following section investigates the main objectives of JWO's logistics in order to find out whether they can be subjected to a control approach.

1.5 Flexibility as the core objective of logistics management in turbulent times

Flexibility, which particularly suits turbulent times, is responsiveness to customers' needs and ability to cope with the erratic environmental movements. Barad and Sapir (2003) believe that flexibility in a logistics system can act as a source of improved efficiency. Businesses are affected by shortened life cycles, resulting in less predictable demand. Logistics, therefore, needs to respond by being flexible to absorb the rigidity in production. In our case, JWO, as a manufacturer of 25 000 different paint products is faced with both turbulent input prices, and volatile demand which is tightly correlated to the frequently changing colour tastes of customers. Inevitably, the company is now forced to design a flexible and dependable logistics system. The following section briefly describes how to achieve this goal.

One of the most established logistics methods for reacting flexibly and reliably to changing demand is to hold inventories. Inventories are, however costly to hold, finance, and administer. JWO has several warehouses within Germany and abroad. These warehouses help reduce the distance to transport 'transhipment' which means flexible delivery. Postponement is another method for achieving flexibility: products are kept 'in their generic form' until further information is received from the customer (Barad and Sapir, 2003). JWO tries to follow this strategy by labelling many of its buckets just before distributing them. Through this operation, JWO is able to sell products, which are usually of irregular demand, to customers other than originally planned (language specific labels may attract unexpected customers). Nevertheless, it should be borne in mind that flexibility is not 'free' particularly in terms of picking and transport costs.

2 Strategic control

The Deyhle framework

Recent works locate control in the area of corporate management, strategy and profit (Schäffer, 2004). On a more practical note Albrecht Deyhle (cited in Ewert Online, 2005, p.9), the founder of the German 'Controller Association', provides a framework for control:

• leading by objectives (hence objective alignment and motivation)
• realising self-control (hence distributing competences *e.g.*, through budgets)
• avoiding losses (*e.g.*, supporting managers with costs and results calculations)
• noticing losses before they arise and initialising measures against them (hence, planning and controlling).

As will be shown, many functions and tools of JWO's logistics control are related to Deyhle's framework. The following section investigates which subfunctions of the *coordination/control function* of control management address the objectives of this paper. It should be reminded that in this paper control is synonymous with coordination.

Strategic alignment and motivation function

Based on Johnson and Scholes (1999, pp.263–264) we argue that all management activities should be aligned to fulfilling the organisation's corporate mission. Interlinked strategies on corporate, business and functional levels help each part of

the company contribute to that mission. The control department builds up an objective-hierarchy by deducing sub-objectives with an increasing level of differentiation and concretisation according to the sub-area's function. This strategic function of control is consistent with the first sub-objective of this paper, which is to investigate how corporate objectives can be deduced to subordinate levels.

Service and support function

The control department fulfils several management tasks of the other departments who are not able to fulfil their job adequately. For lack of decision-making power, the control department can only influence the others by advice. One of the most important functions in this context is its support for decision-making. Controllers are often numerate people with IT skills who can entertain an objective view of the organisation as a whole. Thus, they are the ideal people to estimate the logistics costs for decision-making.

Information function

Information is a natural ground for control. Preisler (2004, p.16) asserts that, even if control did not solve any problems in a company, it would at least make problems transparent (see also Martin, 2001, p.448).

Planning and control function

Boyson et al. (2004, p.36) is worried about uncertainty and inventory costs. One way to minimise such insecurities is to plan the business more accurately. Some find it difficult to relate planning to business performance (Rogers and Bamford, 2002, p.205). Others find them correlated. Manufacturers using planning and collaboration estimate that this can cut supply chain costs down to 4%–5% of sales (Boyson et al., 2004, p.76). These authors count the following among the benefits of planning:

• better visibility and forecast accuracy – 10% to 40%
• lower inventory costs – 10% to 25%
• increased sales – 1% to 3%
• improved service levels – 0.5% to 2.0%
• improved shelf in-stock levels – 1% to 4%.

Ballou (2004, p. 726) presents a control process in which performance targets comprise the following triple elements:

Measuring	Assessing	Correcting
• Auditing • Performance measures Reporting	• Status analysis • Benchmarking Best-in-class	• Fine tuning • Major re-planning

Having outlined the basic elements of control, we can now turn to control instruments:

3 Established instruments of control

3.1 Budgeting

Some criticise budgeting for negative impact on learning and innovation (Marginson and Ogden, 2005, p.435) or for being costly and time consuming (Dyson, 2001, p.303). According to Horváth (1998, p.246) budgeting encourages short-termism, and may lead to wrong decisions if budget assumptions change. Despite these shortcomings, budgeting can lead to an improvement of managerial control. For instance, it makes managers forward-looking and able to assess their strengths and weaknesses most beneficially (performance improvement function). Marginson and Ogden (2005, p.435) argue that budgetary targets can result in managerial commitment to achieving goals and help senior management to monitor performance as budgets are relatively objective (Emsley, 2001, p.399). Finally, budgeting enables superiors to allocate resources sensibly.

3.2 Allocating relevant costs: activity based costing

Until recently, allocation of costs was only relevant to functional departments. With the rising importance of processes, projects, and modules, allocation to activities has gained prominence. It is in this context that Meyer (2004, p.91) says that costs should be assignable to the relevant decisions. A main problem that invites such arguments is that of allocating fixed costs. It is easy to assign variable costs. But when additional production leads to more warehouse depreciations or the fixed costs of R&D increases we are faced with a problem. To solve this some resort to Activity Based Costing (ABC). Cooper (1990, p.4) and Meyer (2004, p.89) believe that ABC, in which overheads are divided into different processes causing the costs is a good way to assign costs more fairly (see also Gunasekaran *et al.*, 1999, p.387). Accordingly, the major benefits of ABC are better cost system and higher customer profitability. Innes and Mitchell (1995, p.139) found out that ABC:

> "…gives visibility to costs by detailing the organization's activities and their respective costs. Instead of simply recording costs by the type of input which

they represent, it categorises them by the way in which they are consumed. This novel perspective lends itself to analysis which focus on cost reduction possibilities."

ABC, however, is costly to implement. Inadequate accounting system and lack of technical expertise have also been blamed. According to a survey only 18% of respondents used ABC (Donath *et al.*, 2002, p.113).

### 3.3 Strategic Profit Model

The basic objective of the Strategic Profit Model is to distinguish between the main factors of success. Vonderembse and White (2004, pp.108–109) argued that "…the major advantage of this tool is that it aggregates many other measures into the one common measure of return on assets, which can be understood and appreciated by all components of the supply chain". Other advantages of the system are the clarification of internal cause-and-effect chains and enhancement of profitability-objectives. This model is helpful in giving an overview of the company's performance on the very highest organisational level, but it does not aim to fulfil all information requirements at different hierarchical levels.

3.4 Balanced scorecard

Data systems are claimed to have a few weaknesses such as short-term perspective and disregard for the development of intangible success-factors (Kaplan and Norton, 1997, pp.2–33). In order to avoid these shortcomings, Kaplan and Norton developed a new strategic approach. It not only measures, controls and communicates past results, but also investigates strategic performance drivers. Kaplan and Norton have succeeded in transforming strategic planning from an academic exercise, into the nerve centre of an enterprise (Balanced Scorecard Online, 1998). Hundt *et al.* (2001, p.333) emphasise that visions and strategies, developed by the executive board, can be broken down into operative objectives according to the 'top-down-principle'. Among its benefits are: it improves the company's transparency and scrutinises its processes and activity-chains through the displaying of key-performance indicators (Christopher, 1999, p.101). Even its development process can be helpful and important for later use. The design process of the scorecard requires the derivation of strategic objectives, the checking of their plausibility and their transcription into concrete plans (Geonexus Online, 2005). Among the problems are that it is hard work especially for manually prepared statistics (Paul, 2002, p.51; Donath *et al.*,

2002, p.827). Furthermore,methodology changes are usually difficult to implement and bridge.

Figure 1 Balanced scorecard
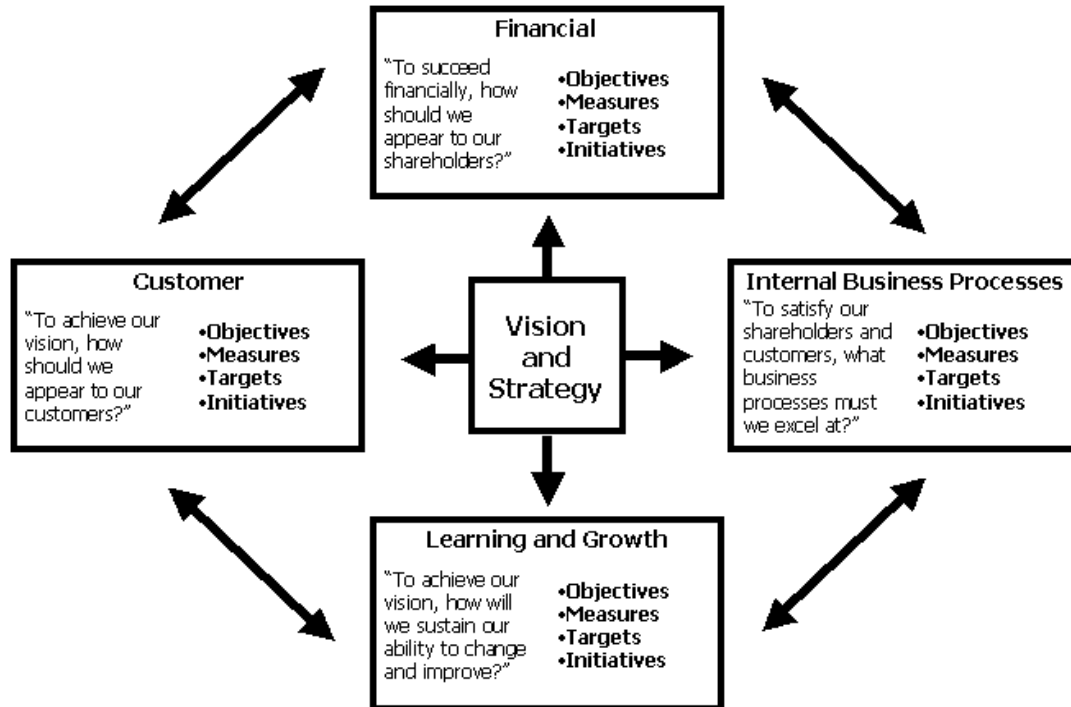
Source: Kaplan and Norton, cited by Geonexus Online (2005)

3.5 Supply-Chain Operations Reference (SCOR) Model

The SCOR model "… enables users to address, improve and communicate supply chain practices between and within all interested parties" (Supply Chain Council Online, 2005). It aims to increase the effectiveness of supply chains and to provide a process-based approach to SCM (Stewart, 1997, p.62).

Therefore, it provides a consistent language in the supply-chain for communicating among internal and external partners in the decision areas: plan, source, make, deliver and return. For each of these decision areas, SCOR features three levels of process detail and one level of implementation (Lockamy and McCormack, 2004, pp.1193–1194). Supply-Chain Council Online (2005) describes these levels more accurately. Stewart (1997, p.67) outlines some critical success factors for the implementation of SCOR. Firstly, the organisation's operations strategy needs to be consistent with business strategy.

Performance metrics and targets should motivate the employee's behaviour patterns. Additionally, the business must facilitate rapid decision-making. Finally, highly developed information technology is a practical requirement for the implementation of the SCOR model. To be more useful, SCOR should improve the communication between internal and external parties and it should compare its own performance with those of the other companies (benchmarking) while measuring ongoing process improvements. Furthermore, uniform key performance measures should be defined in order to compare activities between supply chain parties (Donath *et al.*, 2002, pp.887–889).

3.6 Variance analysis

Too much variance is often criticised by quality managers. The purpose is to find where it occurs and deal with it. Depending on the target, subdivisions and aggregations are common. Horváth (1998, pp.471–472) provides an example by dividing costs into three components:

Amount variance = Change in quantity × Planned price
Price variance = Change in price × Planned quantity
Secondary variance = Change in quantity × Change in price

This allows an allocation of variances to areas of responsibilities, so that we can find out the manager who causes changes in price or quantity. Often it is useful to subsume several similar and interlinked cost types within one variance analysis in order to evaluate the consequences of a shift of intensities between those different cost types (*e.g.*, freight to Spain and freight to The Netherlands).

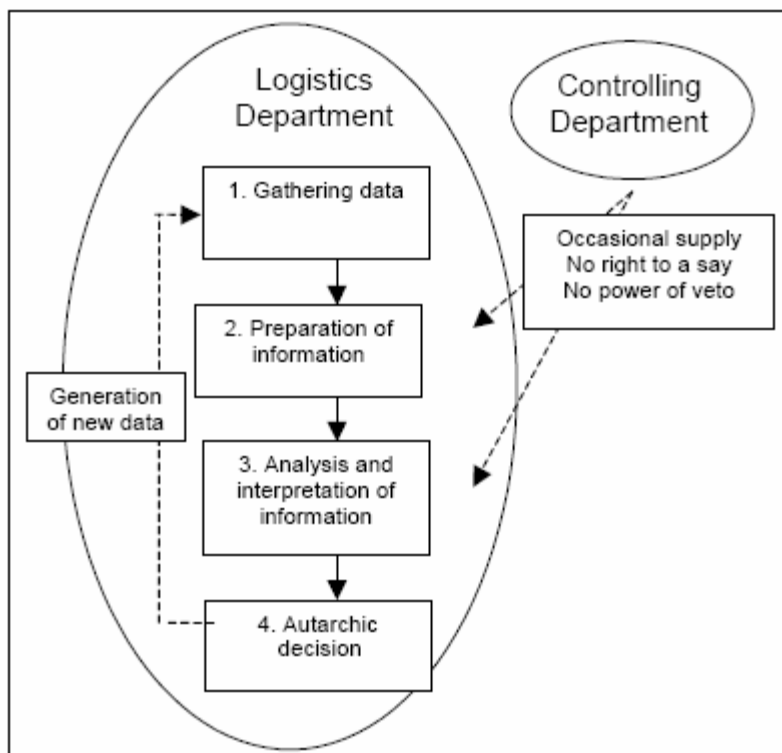## 4 Development of JWO's logistics control system

4.1 JWO's actual approach to logistics control

JWO's logistics department is not yet closely linked with the control department and it has likewise no particular approach to control management. Managers seeking information for a special decision, usually instruct their co-operators to gather related data for that specific issue. Then the co-operators prepare analyses, and the managers interpret the individual information and make their final decisions. This process only occurs sometimes with participation of the control department. There is no right of say or any power of veto for the impartial control. This process is replete with different weaknesses as shown in Table 1 and Figure 2.

Table 1 Weaknesses of JWO's actual logistics decision-making

Weakness	Consequence
No standardised format for information Duplication of information Lack of impartial external control advice	High information preparation effort High information preparation effort Divisional decisions diverge from corporate goals

Figure 2 Typical decision-making process at JWO

4.2 Modelling of JWO's logistics control system

The following section aims to combine control functions as a coordinated system. This is only possible if the machines, operators and managers communicate to each other effectively (Wu, 2000, p.36).

Taking a clue from Wu (2000, p.36), JWO's control concept will need the following central information system at the core of the system, a process/functional structure, a data structure, a dynamic sequence, and a cross-checking facility for the data. Firstly, regarding JWO's logistics, the control concept should follow the SCOR model as explained above. This means that functions/processes that involve manufacturing,

freight, warehousing, picking and so on need to be addressed by the logistics control concept. Secondly, the data structure needs to encompass logistics data from various sources. They need to be stored in an analysable manner within a central database, which serves as the source of information for the system. The third requirement according to Wu (2000, p.36) is the consideration of the dynamics of this data. In this context, it is necessary to analyse which information is needed by managers and in what frequency in order to assure appropriate decision support.

5 Budgeting of JWO's logistics costs

Much of logistics costs depend on the company's output. Thus, JWO's logistics manager is not responsible for the cost variation caused by fluctuating sales volume or cost of oil. Variable costs are like freight forward volume or the price of oil. Fixed costs comprise stock costs or administrative costs and should accordingly get a fixed budget. JWO's logistics manager has a costed budget and therefore an area of responsibility. The logistics budget is divided into several functional budgets, so that the managers in charge can be controlled in terms of their different activities like freight, inventory, or personal management. They also get a separate project budget for irregular special tasks like the opening of a new warehouse or the integration of a transit hub. For designing the logistics budgets, JWO needs a more precisely defined budgeting process, which is depicted in Figures 3 and 4. It becomes clear that budgets are strictly dependent on sales quantity.
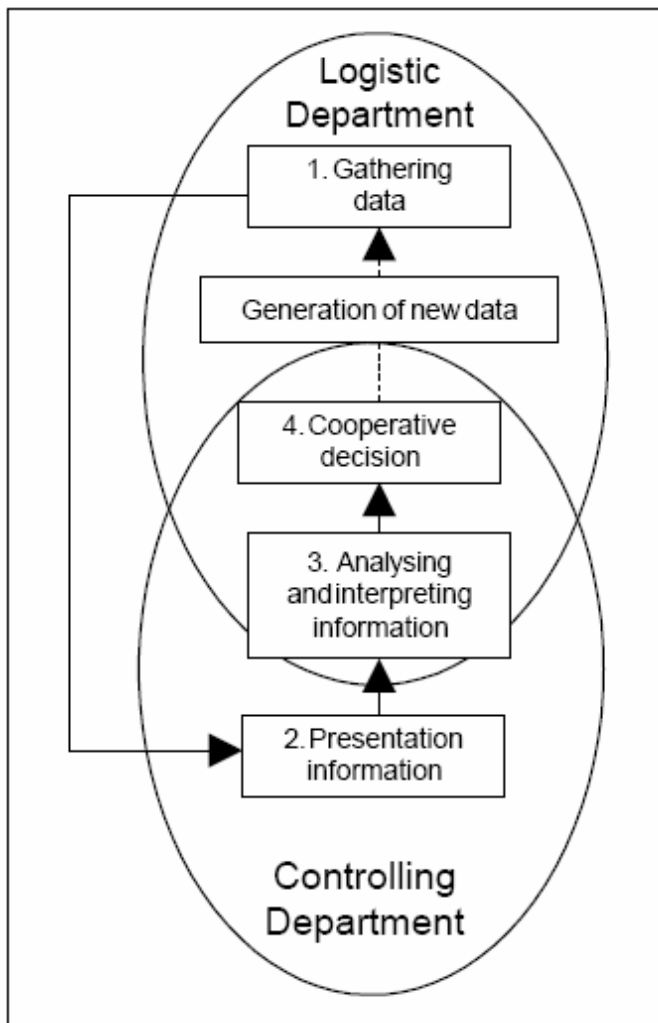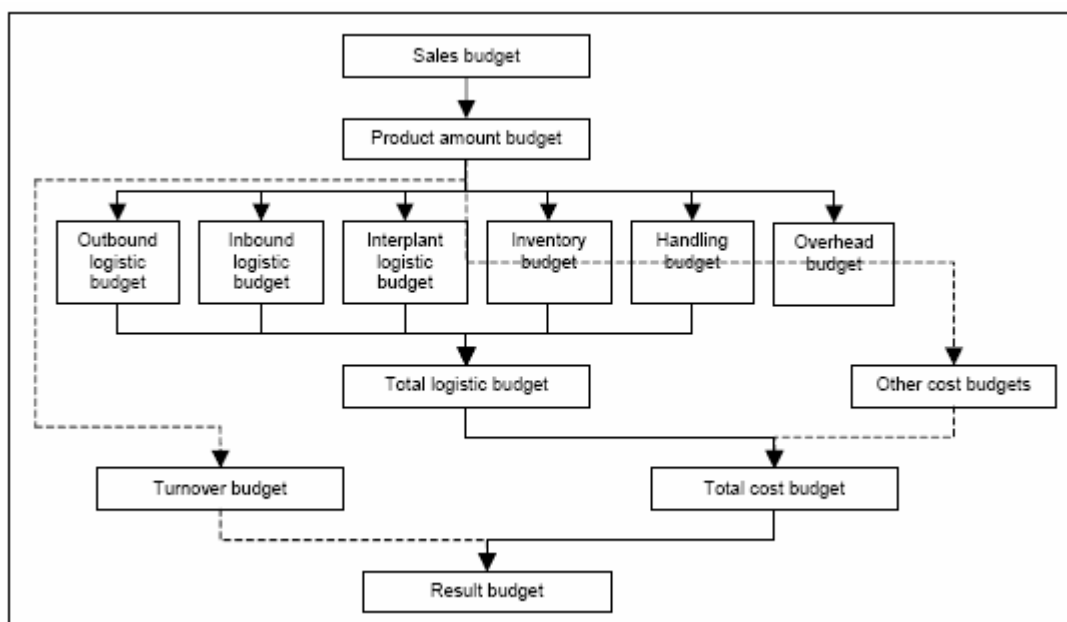
Figure 3 Suggested organisational interaction

Figure 4 Sales-to-logistic budgeting

5.1 JWO's logistics cost accounting

In order to cut logistics costs, it is necessary that the cost impact on the company's success becomes transparent and noticeable for all involved. This requires both detailed recording of the logistics costs and better communication of the costs to all managers. Table 2 contains a comparison between JWO's cost-type breakdown before its re-organisation and afterwards. A division of the cost types 'freight' and 'picking' into more differentiated cost types improves accuracy.

Table 2 Logistics cost types

Former types of costs	New types of costs
Freight	Freight inward
Freight	Freight for emptying output and interplant freight
Freight	Freight forward
Picking	Picking full pallets
Picking	Picking single items
Picking	Picking full pallets for stock transfer
Picking	Picking for extraordinary activities
Inventory	Inventory
Overhead	Overhead

Furthermore, sales managers allowing customers to get tailored logistics services need to become aware that these services require extra logistics processes and extra costs. These costs should be charged to the sales manager's account, *i.e.*, for the customer's and product's profitability. Profitability can be affected through implementation of logistics costs in the cost-unit accounting. This is flexible indeed.

JWO needs to consider whether the actual business should be charged with marginal costs or full costs. The choice depends on several factors. For instance, some sales activities like special sales campaigns require absolute low price offers. Furthermore, some countries have such a low-price level that there is no gap for prices covering full costs. In these cases, Ostendorf needs to choose marginal costing. Hence, only costs that relate directly to a special business will be matched to the cost unit. In cases where full costs should be absorbed, JWO needs an appropriate method for allocating the indirect costs. Innes and Mitchell (1995, p.140) argue for "…structuring costs in a hierarchy which reflects the levels at which they vary" costs allocated at these different levels can then be absorbed by those units who in fact benefit from the activities. According to Innes and Mitchell, we need four levels to absorb all occurring costs. Accordingly, marginal costing needs to implement at least all costs

11

of the 'unit-level' and the 'batch-level', because these costs occur with each additionally sold item. Prices not covering these costs (and of course other direct costs like material and manufacturing costs) result in a losing deal. 'Product- and facility-level' costs need to be covered as a whole by the business.

Hence, JWO's system of cost absorption follows ABC in the sense that Lee and Kao (2001, p.71) describe it: a costing system that traces costs primarily to activities and then to cost objects. It is obvious that the process suggested above requires much implementation and administration efforts for a company with 25 000 articles. It will be necessary to settle for an incremental implementation, starting with a lower detail of accuracy and improving the system gradually. This gives more flexibility to operations.

5.2 Planning the logistics costs and its control through variance analysis

Planning the business is already an inherent part of JWO's managing practice. Based on the plan of the sales quantity, generated by the sales department and facilitated by the SAP/R3 APO team, sector managers prepare their cost centre plans. Afterwards, these cost centre plans are revised by the managing board, according to corporate strategies. Because this process is already well established at JWO, it will not be of primary interest in this paper. However, JWO is less experienced with the analysis of variances between planned values and actual received performance.

The first step, according to Ballou (2004, p.726), is to measure and report the performance. This is the task of the logistics data sheet. In order to assess the success of performance, it needs to be related to targets or plans. In order to assess variances we need the variance analysis. Taking the handling activities of Ostendorf as an example, will suffice to illustrate the method. The total planned handling costs of 2.463.539 Euro were overshot by 257.508 Euro. This variance can be divided into the following sub-variances:

• The quantity variance appraises the cost change, arising through not keeping to the planned amount of handling processes. This variance is not negative, but it is a logical consequence of favourable sales developments.

Quantity variance = change in picking quantity x ø price per pick in comparison period

E.g., $199.891 = 642.411 \times 0,31$

- The price variance appraises the cost change, arising through prices that have become cheaper or more expensive.

Price variance = change in price x picking quantity in comparison period

E.g., $132.606 = 0,023 \times 5.738.491$

- Other handling costs like to-bin and from-bin transfer through stock transfers are subsumed under miscellaneous costs.

Miscellaneous cost = actual miscellaneous cost – planned miscellaneous costs

E.g., $11.000 = 23.000 – 12.000$

- The share of pallets that could be picked as full items, without manual commissioning efforts for each product, has an immense impact on picking costs. The structure variance appraises this effect. An increasing proportion of full pallets lead to favourably decreasing picking costs, even if both the total quantity of picked pallets and prices remain stable.

Structure variance = total variance – amount variance – price variance – miscellaneous

$-46.286 = 257.508 – 196.382 – 137.902 – (–30.490)$

Having assessed and analysed performance, corrective activities should now optimise processes. For instance, the high increases in prices should motivate a renewal of price negotiations with the service provider. Furthermore, the proportion of distributed pallets without high picking efforts should be increased continuously. Overall, the control process of measuring, assessing and correcting performance, suggested by Ballou (2004), in combination with the variance analysis, allows JWO to hone its performance control from a global statement, like the one 'costs of oil have increased' to a detailed cause analysis. There might still be a source of improvement, for instance, through upgrading the information system with details about environmental and organisational reasons for changes.

6 Distribution of information and reporting for JWO's logistics

6.1 Recipients of information

JWO expects the following advantages gained through collaboration, and hence aims to improve its interfaces with external partners. Transmitting information to suppliers, warehouse keepers and carriers will improve their planning accuracy, and hence their load factor, their productivity and, in turn, their ability to reduce prices. Customers might need logistics information as well. Detecting irregular ordering behaviour, expensive consignment structures, or high handling efforts and communicating these to the customers could help reduce distribution costs. As a result, the supply chain as a whole will become more productive and business will become more profitable for all parties concerned. The employees of the logistics department too will need information to be detailed according to their position. For example, an operator who is responsible for ordering the right amount of trucks each day, needs very detailed information about each destination and its orders, whereas the department leader needs information providing a total overview and the opportunity to detect problems and improvement potentials. Above all data should be relevant. As Drucker (1999) says, we must be selective with information. JWO strives to facilitate the interface between producers and consumers of data. This could for example be achieved by integrating the control department in the decision-making process. The employees in the control department can help with the optimising of the information process. All information provided should be presented in a structured manner.

6.2 The dynamics of information

According to Picot (1998, p.106), recipients of information only have an information requirement if they need the information within a particular period. According to this view, information, having relevance only within the indefinite future, does not belong in his category of information requirement and will not find favour in JWO's information system.

Additionally, it is necessary to distinguish between differently frequented, emerging periods of information reports. Since not all types of information are required in the same interval, therefore differentiation between weekly, monthly, quarterly, and yearly frequencies is advisable (Küpper, 1997, p.155). Reports with a broader reference period normally include information about more slowly changing issues and

about more strategic relevance. Reports that are more frequent usually present more operational problems. As a solution, regularly needed information should be generated in a standardised manner. Hence, JWO needs a regularly emerging data sheet containing information of significant importance. This data sheet needs to give an overview of the key performance indicators of those different logistics activities pointed out earlier. If standardised analyses do not satisfy information requirements, the control department needs to offer additional information that is more specific. *Ad hoc* analyses complete the offer of information in such cases of undersupply. Undersupply usually occurs, because standard reports are restricted through their inflexibility and their pre-selection of usually needed information. Thus, *ad hoc* analyses are required for individual and irregular issues, like for instance, profitability analyses of warehouses and transit hubs, or distribution channel calculations.

6.3 Critical evaluation of the reporting system

Logistics activities at JWO require continuous adaptation of information. The system's quality is heavily dependent on the quality of input data. For instance, much of the information featured in the reporting system is based on data generated through logistic partner's ERP, TMS or WMS software. This is good for collaboration and supply chain optimisation, but bears the risk of relying on others. This means that real-time information cannot be delivered by JWO's reporting tool. The company needs to implement control mechanisms to balance the risk.

JWO's information system is attempting to adopt some of the advantages of the balanced scorecard. Too much manual interference and countless individual modifications, however, is in the way. But JWO does not see any difficulty in adapting to new logistics structures. Through providing planned cost and performance targets and through monitoring them in the information system, the directing board is able to influence and direct the logistics sector into a position capable of fulfilling corporate requirements. JWO's logistics information system has not succeeded in becoming as detailed and informative as attributable to a mature balanced scorecard. JWO's system is still in the development phase.

7 The main components of logistics

7.1 Outbound and inbound logistics

Average transportation costs, amount to 3.24% of sales (Donath *et al.*, 2002, p.119). JWO holds outbound logistics dear, primarily because of the high cost impact, and,

secondly because it is the customer-facing side of business which affects customer satisfaction. The first step to control this cost is to achieve transparency in the total quantity of delivered goods in terms of pallets and kilos. The second dimension influencing transport costs are the prices.

In the transportation business, prices are normally dependent on the transportation distance, the bulk of delivery per destination and the type of transported goods (*e.g.*, chilled goods, animals or hazardous material). Increasing the number of pallets per dispatch, offers great cost saving potential, because prices per cargo decreases with increasing cargo quantity per dispatch. Hence, the figure 'pallets per delivery' is a key indicator for the productivity of transports. Knowing the exact structure of delivery in terms of the number of pallets per dispatch enables the logistics manager to analyse the customers ordering behaviour.

This information might be helpful for instance in developing supply chain cost saving measures. Full truck deliveries with one destination are the very cheapest way of transporting paints by road, because through avoiding several unloading points, running times can be reduced. Thus, the information about the quantity of full trucks is important in working out the cost saving possibilities. Productivity in terms of national outbound transportations can be calculated with the following formula:

Productivity of National
Outbound Logistics   =   Delivered pallets × 100 / Transportation costs

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This figure illustrates how many pallets JWO delivers to customers with a cost effort of 1.000 Euro. This performance measure of productivity will be determined for each process of the supply chain in order to have a uniform key indicator, which is comparable. For inbound logistics, JWO intends to strengthen relations with partners Incoterm who offer flexibility and knowledge.

7.2 Interplant logistics

JWO needs interplant transportation especially for storing the production in warehouses, or for relocating products from one store to another wherefrom it should be distributed. These processes generate a good deal of costs for unprofitable shuttle transportations between warehouses. Hence, logistics managers aim to minimise these processes, and to do so, they need transparency of commodity flow.

These efforts have led recently to an increase of delivery by 12 pallets per 1000 Euro.

7.3 Handling

At JWO, handling refers to all activities involved in the operating of warehouses. This means in particular putting pallets in and out of storage and the picking of customer orders. All these processes are outsourced to a logistics service provider, who charges Ostendorf with either a price for commissioning a full pallet as a whole or for picking only single items and consolidating all picks belonging to one order on a pallet. The figure sheet of course should provide absolute picking quantities and the fluctuation of service prices. Because picking full pallets of the same article is much cheaper than commissioning different items together to one pallet, the share of full pallets is a similarly interesting structural figure. The higher this ratio, the lower the average handling costs per item.

$$\text{Share of full pallets} = \frac{\text{Full pallets}}{\text{Total pallets}} \times 100\%$$

Monitoring the full-pallet ratios per customer would improve the information content, because this would be a figure for the interface between the logistics department and the sales department. Key account managers and customer advisors could address each customers ordering behaviour separately in order to cut supply chain costs.

7.4 Inventory

The logistics information system, aspired by JWO, does not aim to serve as a control instrument for the very lowest operational level and does not aim to give information about each item's stock. For these tasks, JWO, like 75% of the chemical industry, utilises an inventory management system. The control system thought to give more of an overall impression about the actual stock situation in order to advise logistics managers, as to whether or not they should go into more detail with the inventory analysis.

Relying solely on controlling the investment or the total amount of pallets in stock is insufficient for efficient inventory management. Of course, this number is important, but the figure on its own allows no assessment as to whether the stock level is too high or not. Vonderembse and White (2004, p.350) are apprehensive toward this figure because it is not comparable with other companies, and because it is always

dependent on the size of the company. More meaningful are the 'stock range of coverage' and the 'inventory days'. These figures express how long goods stay on stock before being sold to customers. Hence, a range of coverage of 0.5 means that products are in stock for an average of half a month. The 'inventory turnover ratio' expresses how often the total stock gets in and out of the warehouse within a period. They calculated the ratio as follows:

Inventory
Turnover Ratio = Annual cost of goods sold / Average inventory

The weighting between the different warehouses is especially important in terms of the utilisation of internal storages and foreign storages. The usage of interim storages usually means additional interplant transports, because these warehouses are often not suited to picking, so that transfers back to the distribution centre are unavoidable. Utilisation of foreign warehouses is important because it mirrors the regional coverage of JWO's target area.

In order to evaluate which parts of inventory should be accurately tracked, Vonderembse and White (2004, p.350) suggest an ABC classification. This analysis categorises materials into groups in accordance with their annual usage. SAP/R3 enables JWO to make such an analysis. Normally, the category of an article does not change frequently so that the ABC analysis is not a part of a monthly logistics report but of a less regular assortment analysis.

With the purpose of making JWO's warehouse management comparable with those of other companies, the data sheet provides the figure 'costs as % of sales'. According to Donath *et al.* (2002, p.119) warehousing costs cover on average about 1.84% of sales. In reference to this benchmark, JWO's exemplary numbers are very well positioned.

However, theory and practice have developed plenty of measures for assessing the inventory management of companies. Other suggested methods would be for example the Inventory-to-sales ratio (Donath *et al.*, 2002, p.30), or the period of goods storage (Teisman and Birker, 1999, p.412). Unfortunately, investigating all measures is beyond the scope of this paper.

8 Striving for efficiency in logistics

8.1 Efficiency criteria for information

The measurement of efficiency is quite difficult in terms of information because its effects on organisational objectives are often not directly noticeable. For instance, information does not cause direct receipts. Researchers like Budde (2000) deal extensively with the evaluation of information efficiency, but sometimes only qualitative terms like 'better or quicker information' are available (Horváth, 1998, p.856). Maybe, managers are able to give a qualitative conclusion as to whether or not decisions within the information supply were positively influenced by the information system. If so, one may suggest the following formula:

$$\text{Information Productivity} \quad = \quad \frac{\text{Output (decisions basis)}}{\text{Input (rated labour hours + investment for technology)}} \,.$$
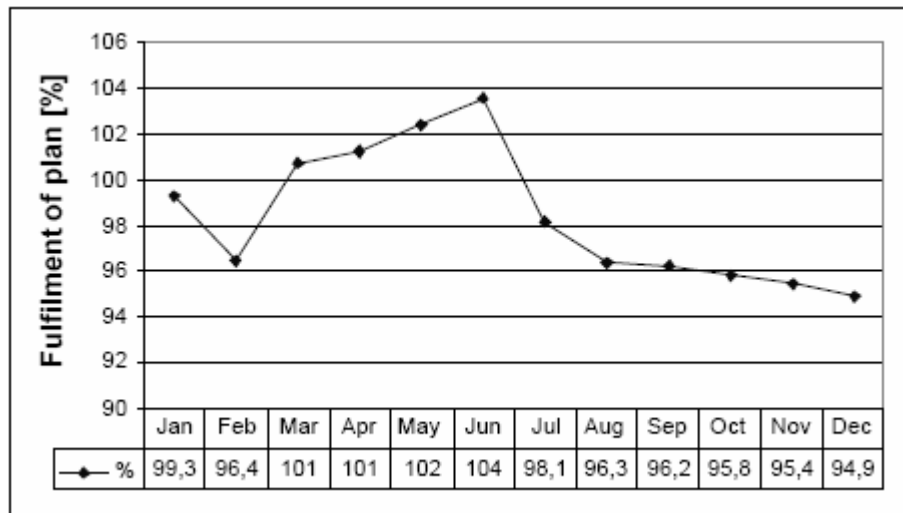
The following sections present measures for improving information efficiency.

8.2 Improving efficiency through comparisons with plan and target values

A meaningful statement of the information system would be whether the actual measure has become better since the last period or the last year. It is stated that by relating different periods to each other, realised results are easier to assess and developments can be detected more quickly (Küpper, 1997, p.321). Furthermore, comparisons with previous values are helpful for presenting a periodic change or trend and for allowing forecasts for the future (Ziegenbein, 2002, p.590).

The second relevant measure is the quote by which the operator of responsibility has achieved the planned and targeted values, respectively. Orientation towards the future is the major advantage of plan and target values. Information systems illustrating deviations between those values, improve the control of achieving objectives. The degree of fulfilment of plans can be depicted graphically in a time chart:

Figure 5 Plan-fulfilment chart

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
%	99,3	96,4	101	101	102	104	98,1	96,3	96,2	95,8	95,4	94,9

Source: Own development

Limiting illustration of actual and plan measures solely to this display format would limit the explanatory power of the values, because addressees would miss information about extent and consequence of this development. For instance, in order to evaluate whether 100% sales-plan fulfilment indicates good performance, the reader needs to know whether 100% corresponds to 100 Euro or to 100.000 Euro. Hence, we need absolute values.

8.3 Improving efficiency through flexibility

JWO has sales contracts with very strict agreements about the quote of deliveries in time. Normally, DIY store chains demand a quote of 98% or higher. This calls for a flexible and dependable productions and logistics. In the past, JWO's manufacturing facilities were, similar to those of the whole industry, very rigid. Paints were produced in big batches and with long lead times. High stocks and high fluctuations in stock were needed to absorb these differences between quantities ordered and quantities produced. Today, JWO has invested in very flexible manufacturing facilities, capable of producing even small batches with minimal lead times. It does not necessarily mean that the quote of delivery in time is 100% if the quantity produced is higher than the quantity ordered. In fact logistics are able to absorb the absence of flexibility in production. Nevertheless, there is still risk in logistics. This is especially the case when production is larger than the quantity ordered, or if there are losses in transport, or if the logistic department is not able to pick and deliver all goods on time.

8.4 Improving efficiency through comparisons with benchmarks

Benchmarking means that a company seeks to identify best companies in the industry in order to match up with their processes and performances (Drucker, 1999, p.117). This type of performance control often reveals new ways of improving productivity (Boyson *et al.*, 2004; Horváth, 1998, p.400; Martin, 2001, p.768), for example by focusing efforts on 'real' problems (Donath *et al.*, 2002, p.888). Through finding the gaps between own practice and best practice, companies get indications as to where they could improve, for instance quality (Dibb *et al.*, 2001, p.734), or shorter processes (Horváth, 1998, p.400). The most important advantages according to firms operating with benchmarks are listed in the Table 3.

Table 3 Benefits of benchmarking

	Percentage reported
Improved standard warehouse operating procedures	45.9
Better management controls	45.7
Reduced warehousing costs	41.1
Reduced inefficiencies in material handling	39.7
Improved customer service	34.6
Improved utilisation of facilities	33.9

Source: Donath *et al.* (2002, p.21)

In chemical industry, only 26.3% of companies utilise benchmarking in logistics (Donath *et al.*, 2002, p.22). To some extent, JWO belongs to the majority of chemical companies who do not practice benchmarking rigourously. It is argued that firstly, benchmarking only implements past values. Secondly, benchmarking might cause a stagnation of innovation because managers concentrate on copying the items already available. Furthermore, despite massive use of resources, necessary for gaining access to meaningful data to benchmark against (Van Landeghem and Persoons, 2001, p.259), results might be misleading for decision-making. Copying the performance of another company is not necessarily the best way to conduct a business. JWO normally aims to exceed the competitors' operational behaviour. As a result, JWO normally tries to follow its own way by developing best processes matching its individual requirements. The company is already a field leader regarding R&D, production technique, and environmental protection and therefore does not feel the need to imitate others. Hence, JWO's standard reports do not actually compare JWO's performance with benchmarks.

9 Conclusion and recommendation

This paper has discussed the relevance of control functions and selected instruments to JWO's objective of improving logistics management. By using the control instrument of budgeting, we tried to align logistics performance to corporate strategies. While accounting for the likely benefits we pointed at the weaknesses of the budgeting instrument such as for instance high administration costs. Hopefully, the study has meanwhile highlighted the definition and the right types of budgets and the budgeting process. The second objective of implementing logistics costs in more strategic decisions was addressed by working out JWO's logistic costs, which is capable of responding flexibly to various problems and which is able to break down logistics costs to cost units. Furthermore, this paper attempted to analyse the kind of information needed by JWO's management, and how it can be presented in a logistics reporting system. It was argued that the company needed a clear information structure to evaluate the causes that lead to changes in costs. Hence, JWO's logistics data sheet displays figures about the quantity, price, structure and quality of logistics performance, while for each logistics activity a more detailed analysis is made available. In addition, the benefits of planning were analysed and it was illustrated how management can learn to reveal improvement potentials through interpretation of variances. Overall, it was shown that through cross-departmental cooperation, in our case between the logistics and the control department, performance could be impressively improved. Logistics competence has been combined with the control department's methodical expertise, and the result is a combination of management tools that provide the operating department with more funded, flexible, and targeted decision-making approach.

JWO had outsourced most of its logistics in response to the wave of outsourcing which seemed to bring palpable benefits to the company. Now that the volatile, but generally rising prices of oil and other raw material are putting pressure on the company, JWO has justifiably decided to respond by creating a new flexible logistics system in which some sections of the activity will be carried out in-house while other sections will remain outsource. Whether it is going to be the more oil-bearing parts to be farmed out remains to be seen. Hopefully, this work will contribute to the strategic decision.

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