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Activity-based management in a small company: a case study

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Keywords activity-based management, SMEs, case study

Abstract. This paper deals with the application of activity-based management (ABM) in a small company. The project took place in G. E. Mustill, a company that produces machines for the photo framing industry. This project aims to develop an ABM system for the company which leads to appropriate improvement actions based on a make or buy decision about different parts of the machine, 'four-head foiler'. Firstly, a theoretical framework for the design of an ABM system is developed. Then, secondly it is used to improve the business performance of four-head foiler manufacturing. The activities required to manufacture this machine are identified and then quantified by their consumption of resources. The factors causing or driving the cost (cost driver) of an activity in question have been identified and used to identify the value-adding and non-value-adding activities. Also, some suggestions are offered to improve the performance of the company using the ABM system.

1. Introduction

The analysis and cost of activities provide financial and non-financial information which is the basis for activity-based management (ABM). ABM makes this cost and operational information useful by providing a value

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analysis, cost drivers and performance measures to initiate, drive or support improvement efforts, and hence to improve the decision-making processes. Cost Accounting Management-International (CAM-I) defines ABM as 'a discipline that focuses on the management of activities as the route to improving the value received by the customer and the profit achieved by providing this value'. This discipline includes cost drivers analysis, activity analysis and performance measurements. ABM draws on activity-based costing (ABC) as its major source of information (Berliner and Brimson 1988).

The goals of ABC can be achieved by managing the activities. It is important to realize that managing activities is not a custodial task. Rather, it is a process of relentless and continuous improvement of all aspects of a business. This involves a continual search for opportunities to improve which in turn involves a careful and methodical study of activities (Kaplan 1984).

In this paper, a real life example of the photo framing industry, G. E. Mustill (GEM), has been considered to explain the application of ABM in a small company. In this project, an ABC system is used to accurately calculate the cost of the company's main product (four-head foiler) and cost of different subassemblies to a make or buy decision. ABC helps to analyse different activities in the company and to differentiate between value-added and non-value-added activities. The aim of ABM is to guide improvement efforts of management in the right direction by providing accurate information about activities.

The organization of the paper is as follows: section 2 deals with a conceptual model for ABM. A case study is presented in section 3 to illustrate the application of the model in a small company. The conclusions are presented in section 4.

2. Activity-based management

Each organization requires information to make decisions, set priorities, allocate resources and monitor the actions taken. ABC performs the arithmetic to provide accurate cost information, and ABM is focused on using this information to manage activities. Improving business based on the information obtained from ABC is called as ABM. ABM is a management analysis that brings the full benefits of ABC to an organization. A conceptual model developed as shown in figure 1 is used to describe ABM. Different stages of ABM in managing and improving activities are discussed in the following sections.

2.1. *Analysis of activities*

In this section, the details of the analysis of activities are discussed. The analyses of activities involve: (i) identification of value-added and non-value-added activities; (ii) analysis of critical activities; and (iii) comparison of the performance of those activities with that of benchmarked.

2.1.1. *Identify value-added and non-value-added activities*

Once activities are specified and the cost of each activity is calculated, the next step is to identify value-added

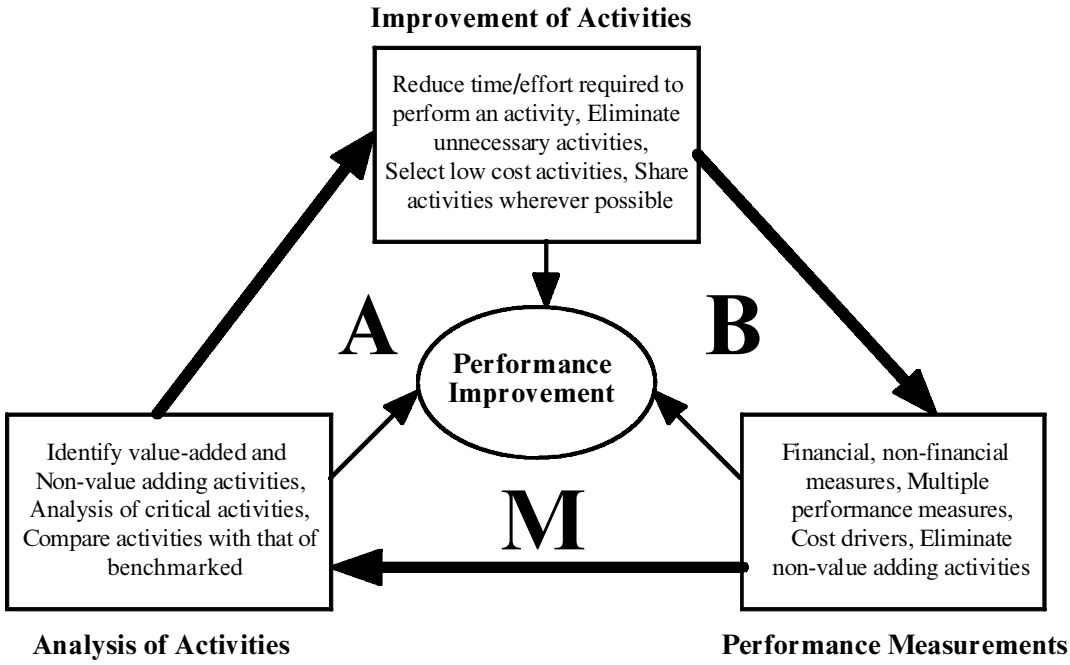

Figure 1. A conceptual framework for activity-based management.

and non-value-added activities. This judgement should be made within the context of company-wide and well-understood definitions for the terms. A non-value-added activity is often defined as 'an activity that can be eliminated with no deterioration of product attributes (e.g. performance, functionality, quality, perceived value)' (Miller 1992).

Making non-value-added cost visible is one of the major benefits of ABM, but also the most difficult to achieve (David and Robert 1995). Also, defining what is value added versus what is non-value added can be problematic. Definition of a value-added and non-value-added activity is often confused and misunderstood. Some think that non-value-added activity means waste, to others it might mean the cost of quality and to others it might mean everything other than the labour. The reporting of non-value-added activities and costs can quickly become a people's issue because no one wants to be labelled as performing non-value-added activities, e.g. labelling can easily be considered a threat to job security. Therefore, ABM should focus on the activities, not on the people who perform the activities.

Clarity and understanding between value-added and non-value-added activities are achieved when people understand and accept the reasons why an activity is classified as non-value added or value added (Miller 1996). Most people perform their value-added analysis by simply designating an activity value added or non-value added. This level of analysis is insufficient because every value-added activity includes non-value-added steps or tasks. A more thorough analysis should be undertaken to identify the potential for improvement in value-added activities. The following are a few examples of non-value-added activities in an organization.

- Machine setup is a non-value-added activity (as the machine is not producing anything while being setup).
- Logistics in the factory is another non-value-added activity (moving a product does not make it more valuable).
- Inspection is a non-value-added activity.
- Stock holding is a non-value-added activity (inventories do not add value to a product or customers).

Rework is one of the non-value-added activities that can be found in any industry. Nevertheless, this activity is a value-added activity for an operator who performs rework on a job because he/she increases the value of a product by rework. Therefore, all aspects of an organization should be considered while identifying value-added and non-value-added activities.

2.1.2. *Analysis of critical activities*

In a SME, generally the number of activities in a business may range from 10 to 200. It is not possible to analyse all of them at once due to limited time and resources. The key is then to focus on the most critical

activities that will add value to customers or help the effective operation of the business. Moreover, these are the activities that provide the significant opportunities for improvement. The Pareto analysis can be used to determine the critical activities. This analysis should be carried out separately for both the value-added and non-value-added activities. The activities can be ranked in descending order of cost and the cumulative percentage of the cost of all the activities can be calculated. Then, it can be found that 20% of the activities causes 80% of the total cost, and those activities are worth analysing.

2.1.3. *Compare activities with benchmarking*

All activities should be compared with similar activities in another company or within the organization which performs the best in class. Benchmarking should be carried out for both value-added and non-value-added activities. Comparing an activity with a benchmarked of good practice helps to determine the scope for further improvement. The activities should be measured based on factors, e.g. quality, lead-time, flexibility, cost and customer satisfaction. Then, each activity should be rated against an identified best practice (Coburn *et al.* 1995).

A company with a number of different departments can improve the efficiency and effectiveness of each activity by comparing similar activities of different departments. Obtaining information from other companies is quite difficult. Therefore, benchmarking within the company or with the best practice is mostly used in real-life situations. For example, on-time delivery of customer orders is an essential activity and it can be performed manually. The best practice, however, uses electronic data interchange (EDI) that costs less per transaction, has a lower error rate and provides a faster service. This clearly shows that there is room for improvement over manual order taking (Turney 1992).

2.2. *Improvement of activities*

The following are some of the improvement strategies/methods that have been generally considered for improving the performance of any organization using the information obtained from an ABC system.

2.2.1. *Reduce the time or effort required to perform an activity*

A key element of improvement is to reduce the time and effort needed to perform an activity. This reduction can come from a process or a product improvement. For example, the time to set up a machine can be reduced by improved training, eliminating conflicts in employee assignments, placing tools and dies in convenient location, and changes in the product design. For example, a reduction of 90% in setup time is not unusual (Turney 1996). Reduction in time and effort may come not from the activity in question, but may be from the preceding activity. For example, the defect rate of parts received by a machining activity is a cost driver for that activity. Improving quality in the preceding activity reduces the quantity of this cost driver and hence the overall efforts required by the machining process.

2.2.2. *Eliminate unnecessary activities*

Some activities are candidates for elimination because they are not valued by customers or not essential to running the organization. It is possible, e.g. to eliminate material handling activities through changes to the process or products, e.g. reducing the number of components, using GT cells or even by outsourcing (Turney 1996).

There are a number of different options to eliminate any unnecessary activities. In any organization, steps should be taken to ensure that all incoming materials and parts are fit for use. The parts can then be delivered directly to the shop floor as needed. For instance, changes can be requested in the vendor's production process to improve quality, flexibility and increase the responsiveness. The parts that cause quality problems can be eliminated by instilling the responsibility of delivering quality products onto suppliers. Once these changes have been made, all the activities of a storeroom can be eliminated. Activities, e.g. material handling and inspection will be reduced automatically. Eliminating these activities will reduce the overall cost and the cost of products that no longer use these activities.

2.2.3. *Select low-cost activities*

Designers of products and processes often have choices among competing activities. This offers a means for reducing cost by picking the lowest cost activity (Miller 1996). A designer of a product may be able to specify the type of activity required for the assembly of a product. Depending on the design of components, several automatic assembly lines can be used for the assembly of a product instead of manual assembly of a product.

Each of these activities has a different set of resources associated with it. Manual assembly is a direct labour activity. An automatic assembly, however, requires equipment, software, skilled workers, and additional pro-

cess engineering and training. Because these activities have different costs, the selection of an activity has an important impact on the cost.

The process designer faces similar choices. For example, a part designed for machine insertion might also be inserted manually. A process designer may choose to have the part inserted manually because a reduction in the batch size makes it uneconomical to program and setup an insertion machine.

2.2.4. *Sharing of activities*

If a customer has unique needs, it is necessary to perform activities specific to that customer. However, if customers have common needs, it is wasteful not to serve those needs with the same activities. For example, product designers can use the common parts in new product designs. A common part is one which is used in several products to perform the same function (e.g. a gasket used in several car models). The only parts that need to be unique are those that add product-differentiating functions as valued by the customers (Turney 1996).

The activities associated with the common parts, e.g. part number maintenance, scheduling and vendor relations, are shared by all products that use them. This sharing increases the volume of parts produced each time when an activity is carried out, thus reducing the cost per part.

The process designer can also cut costs by grouping of products into work cells. This is possible when products have similar designs (members of a product family) and when the manufacturing process is sufficiently flexible to handle any differences in parts. The cost has decreased because the products in the cell share activities, e.g. supervision, testing, training, scheduling, material handling, storage and documentation.

2.3. *Performance measurements*

In an ABM system, performance measures include both financial and non-financial measures, and are designed to influence the behaviour of cost management. A fundamental issue is that a single performance measure will not reflect all the aspects of a company. Managers may require multiple performance measures even from individuals (Innes *et al.* 1994). Generally, activities involve groups of employees, and the performance measures therefore usually relate to the group rather than the individual and to the process as well as the output or result.

The ABM system uses cost drivers of a company's activities as a basis for changing the performance measurement system. In particular, some companies are concentrated on non-financial operational performance measures to monitor the improvements in their business processes. It is important to appreciate those performance measures which not only attempt to measure the performance, but also control and evaluate the performance, and motivate the people. The behavioural impact of performance measures is one of the most significant aspects of ABM.

Cost drivers, e.g. the number of purchase orders or the number of engineering changes, are used as a part of the performance measurement system. Some companies use physical measures, but others monitor the unit cost per driver, e.g. the cost of a purchase order. Performance measures should be selected carefully and tailored to the individual processes or organization. Each company must consider the activities which are critical to its business success. Greene and Flentov (1991) suggest certain general guidelines for selecting performance measures.

- The performance measures chosen should assist in monitoring the progress of controlling activity costs. These include throughput time, and the number of engineering changes and production schedule changes.
- The performance measures selected should be reviewed periodically. As the business and the internal and external environments of a business change, performance measures may have to also change accordingly.
- Everyone should be able to understand the performance measures. These not only must be clearly defined, but also the relationship to the company's strategic objectives must be explained.
- The performance indicators relevant for one individual or group should not be too many.
- Daily operations should be managed on the basis of these key measures.
- The evaluation of employees should be linked to the performance indicators selected.
- The selection of these performance indicators is a critical process and the success of this process depends upon a sound analysis of the critical activities for that particular business.
- Whilst activities-based approaches are not a panacea nor even an end in themselves, they do at least recognize the need to effectively manage the activities of a business. This should be reflected in the way the costs are reported and performance measures are employed (Marrow 1992). The analysis of activities as value added and non-value added is the basis of ABM. The main task of ABM is to direct improvement efforts in eliminating or reducing the

volume of non-value-added activities and improving value-added activities.

3. Activity-based management at G. E. Mustill—a case study

G. E. Mustill (GEM) is a small company with £ 0.5 million annual turnover. It employs about 20 people and is located in Essex, England. The main products of GEM are four types of machines (viz. sander, splitter, shaper and foiler) for the picture framing industry. The foiler and sander machines are produced in different numbers of heads varying from 1 to 6. They produce machines in standard specifications and according to customers' requirements. The company manufactures only 22% of parts of the machine in-house and purchases 78% of parts from subcontractors and suppliers. The assembly of all these parts is the main activity of the company. The company works in a traditional way and all activities are performed manually.

Information provided by an ABC system is used to find the opportunities of improvement in organization at the activity level. The analysis of activities involves classification of activities into value added and non-value added, and then compare these with that of the world class company or the best practices. Benchmarking with the best practice offers avenues for improvement in value-added activities. This also explains how management can use the cost drivers as the performance measures and control the volume of cost drivers. The ideal cost object is 'products' that are sold to customers. The cost of all activities is calculated in a similar way to that of parts. The total cost of a four-head foiler is shown in table 1.

- Marketing. The annual cost of marketing is £ 23 330 which is divided equally between four types of machines. Then, this amount is divided by eight because the annual sale of a four-head foiler is eight machines. Therefore, the marketing cost for this product is £ 729.06.
- Inventory carrying cost. The cost driver for inventory carrying is the stock value. The total stock value in GEM is £ 20 000. For a four-head foiler, the stock value is £ 1600. Hence, the inventory carrying cost for this machine is £ 491.20.
- Engineering support. The cost driver for this activity is the time spent by the engineering support staffs for a particular product. For this machine, a total of 80 h is spent by the engineering staff and hence the cost of engineering support activity is £ 1480.
- Assembly. The assembly of the machine is performed manually. The cost driver for assembly activity is the labour hours and the volume of the cost driver is 82 h. This leads to the total assembly cost as £ 886.42.

3.1. *Analysis of activities*

ABC provides detailed information about the company and its activities. This detailed information can be used by the management to initiate improvements and decision-making. The percentage cost of all activities is shown in figure 2. This shows that engineering support activities carry ~22.21% of the total cost of all activities. In the traditional costing system, there is no such information available on this.

Once the cost of each activity is calculated, the next step is to identify the value-added and non-value-added activities. According to the definition of a non-value-added activity (an activity that can be eliminated with no deterioration of product attributes), all activities are

Table 1. Cost of a four-head foiler.

Activity	Cost driver	Cost driver rate £	Cost driver volume	Cost £
Assembly	labour hours	10.81	82 h	886.42
Material handling	no. of movements	0.2	1020 movements	204.00
Inspection	no. of inspection	0.41	450 inspection	184.50
Purchasing	no. of orders	20.65	16 orders	330.40
Marketing	no. of product	729.06	1	729.06
Inventory	stock value	0.307	£ 1600	491.20
Engineering support	staff hours	18.5	80 h	1480.00
Personnel	labour hours	0.64	470 h	300.80
Misc. overhead	labour hours	1.6	520 h	832.00
Manufactured parts				1306.88
Direct material				9773.0
			Total cost	**16 518.3**

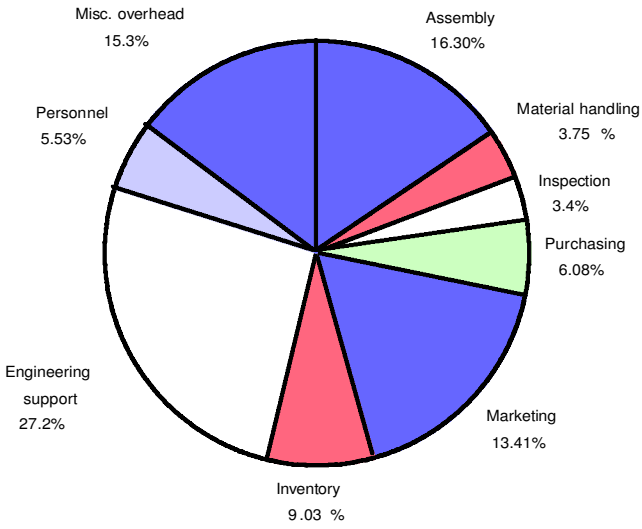

Figure 2. Percentage cost of activities.

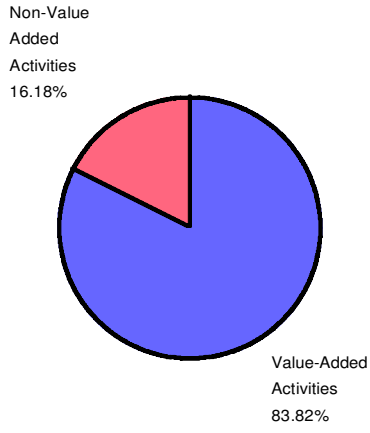

Figure 3. Percentage of value-added and non-value-added activities.

non-value added except activities, e.g. assembly, machining and engineering support. Activities, e.g. marketing, personnel and purchasing do not add value to the product, but these are necessary and cannot be eliminated. Therefore, there are three non-value-added activities, viz. inspection, material handling and inventory. Figure 3 shows the percentage of value-added and non-value-added activities. It indicates that non-value-added activities are ~16.18% of the total cost of activities. These activities can be eliminated without deterioration of product attributes, e.g. quality, performance and function. By using different quality assurance methods, e.g. TQM, ISO9000 and dynamic process control, quality can be maintained during production and hence there is no need for an inspection. Similarly, material handling and inventory-related activities can be eliminated using different methodologies and techniques, e.g. JIT, EDI, CIM and BPR.

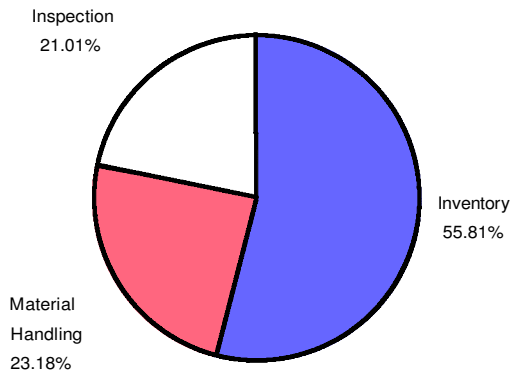

Figure 4. Cost of non-value-added activities.

It may not be possible to eliminate or reduce all non-value-adding activities at the same time. The key is then to focus on the critical activities which form a major portion of the total cost. Figure 4 shows that the inventory carrying cost is ~55.81% of the total cost of non-value-added activities. Therefore, activities related to carrying inventory should be eliminated first.

The cost driver for inventory carrying activity is the value of stock. The company should not maintain any stock in order to eliminate related activities. This could be possible by the introduction of just-in-time purchasing. At the same time, the cost of purchasing should be closely monitored. The purchasing department will place more purchasing orders to maintain the minimum stock level. If the company eliminates inventory-related activities and increases the cost of purchasing activity, then there are no benefits in eliminating non-value-added activities.

Similarly, the cost of maintaining quality in processes should be considered in eliminating the inspection activity. Material handling activities cannot be eliminated at the cost that is difficult to justify. Sometime, non-value-added activities can be clearly identified, but difficult to eliminate completely. However, it is always possible to reduce the cost of these activities.

3.2. *Compare activities with benchmarking*

All activities related to the manufacturing of a four-head foiler should be compared to similar activities in other companies or within the organization. Benchmarking should be carried out for both value-added and non-value-added activities because value-added-activities include non-value-added tasks. The comparison of some of the activities of the company with the best in class company's activities is presented below.

- Purchasing. World-class companies have a direct link with suppliers and subcontractors by the electronic data exchange (EDI) system, and it places orders automatically whenever materials are required. This leads to a reduction in ordering cost, lead time and overall purchasing cost as compared with that of manual order processing. Hence, there is room for improvement in the purchasing activity of GEM.
- Assembly. The assembly activity is performed manually in GEM. Compared to an automatic assembly activity, there are many chances of improvements. The cost of automation should be justified based on the labour cost and response time including tangible and intangible costs and benefits.
- Material handling. There are a number of machining stations in GEM, e.g. drilling, milling and turning. The movement of materials between these stations is the cost driver. It is possible to reduce this movement by using multipurpose machines (AS/RS, robots, AGVs) to perform various operations. The movement of materials can also be reduced by changing the layout of machines.
- Machining operations (drilling, milling, turning, etc.). GEM uses very old machines to perform these activities and these are labour intensive. Therefore, these machining operations can be compared with that of the CNC machine tools. Similarly, all the activities can be compared with the best practices. Benchmarking at each activity level helps to determine the scope of improvements.

3.3. *Performance measurements*

In ABM, performance of GEM should be measured at an activity level, and performance measures include both financial and non-financial measures. The cost drivers are performance measures for all activities. The volume of the cost driver indicates the performance level of each activity.

For example, the cost driver for an assembly activity is labour hours. If labour hours required to perform the assembly activity increases, then this indicates that the performance of the assembly activity is poor. If labour hours decrease, then the performance of the assembly activity improves which in turn leads to a reduction in the cost of the product and hence an increase in the profit level. Similarly, appropriate cost drivers are performance measures for all identified activities in the company.

From the analysis of activities, the value-added and non-value-added activities are clearly identified. In GEM, the inventory carrying activity is the major non-value-added activity which should be eliminated. However, it is difficult because the purchasing cost of the present system will increase as the company places more purchased orders with the objective to reduce inventories. Therefore, it indicates that the purchasing activity should also improve. The comparison of this purchasing activity with the best practice (purchasing using EDI) indicates the scope for improvements. ABM uses ABC information to motivate the people in improving and monitoring the performance of their activities.

4. Conclusions

Management practices and methods have been changed over the last decade, and organizations are moving from managing vertically to managing horizontally. Activity-based costing and activity-based management provide cost and operating information that mirror the horizontal view. ABC provides accurate cost information and ABM uses this information to initiate improvements. ABC systems produce a large amount of information that is used by the ABM. The costing at part level or subassembly level helps the management in a make or buy decision. The analysis of activities to identify value-added and non-value-added activities and benchmarking at the activity level direct improvement efforts in the right direction.

In this paper, an attempt has been made to study the application of ABM in a small company. Firstly, a conceptual model is developed to describe the major components of ABM. Secondly, a case study is presented to discuss the application of the model in a real-life small company. The benefits of ABC and ABM can only be achieved if it is applied for the whole organization. Therefore, GEM should use activity-based analysis to identify non-value-added activities (e.g. inventory carrying, material handling and inspection), and then try to eliminate these activities by using the number of available management methods and techniques. Also, there are possibilities to improve value-added activities. The cost driver of activities should be used to measure the performance of activities.

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