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**An examination of the use of profitability analysis in manufacturing industry**

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**An examination of the use of profitability analysis in manufacturing industry**

**Abstract:** Although profitability analysis has been identified as a useful technique, it is an under-researched area. This paper extends the limited research into profitability analysis by using research interviews to examine the circumstances when profitability analysis is or is not prepared, why various types of profitability analysis are prepared and the how it is used in decision making. Some notable results indicate that operating units prepare profitability analysis when there is an interest in preparing it and the resources exist to prepare it. Operating units prepare both product profitability analysis (PPA) and customer profitability analysis (CPA) to assist with increasing profits through managing low profit or loss making customers. The aim is to identify those products that contribute to the low profit or loss of a customer. In those operating units preparing only PPA, its function is to identify low profit or unprofitable products. This information is used to assist in determining what action should be taken to increase the profits of those products. In contrast, customer focused operating units produce only CPA.

**Keywords:** profitability analysis; product profitability analysis; customer profitability analysis; attention directing information; direct use of profitability analysis in decision-making.

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## 1 Introduction

Profitability analysis is regarded as "one of the most important management accounting practices" (Drury and Tayles, 2006, p.406). It consists of an internally produced management accounting report that identifies and matches the revenues and costs to show the profit for each item, like products and customers included within a particular cost object (Drury and Tayles, 2006). By preparing this information, profitability analysis can be used to identify profitable and unprofitable items included within cost objects (Drury and Tayles, 2006). In the case of low profit or loss making items, it is possible to use this information as an initial basis to identify possible cost reductions to try to increase profits or reduce losses. Further, in the case of product and service provision it could lead to decisions like the possible outsourcing or redesign of products and services (Drury and Tayles, 2006). Drury and Tayles (2006) note that in relation to product costing there has been limited research into management accounting decision support information, such as profitability analysis. Drury and Tayles (2006) show that research in this area is necessary because "companies are now placing huge emphasis on profitability analysis and consider it to be one of the most important management accounting practices" (p.406). They found that there has been virtually no research on the role of cost information in profitability analysis. Given this, there is a need to extend Drury and Tayles' (2006) seminal paper by conducting further exploratory research. Drury and Tayles' (2006) paper uses questionnaire-based research to obtain factual information about profitability analysis in practice. This paper extends this research by using interview-based research to understand why and how profitability analysis is conducted.

Prior research has identified the extent to which profitability analysis is used in practice. For example, Drury and Tayles (2006) found, from their sample of 187 questionnaire respondents working in UK operating units that 91 and 74 percent of respondents prepare profitability analysis for products and customers respectively. Similarly, in Australia, Chenhall and Langfield-Smith (1998) observed that 89 percent of operating units sampled used profitability analysis by product. Thus, although it is clear that profitability analysis is used extensively, researchers have not taken a step back to consider why profitability analysis is or is not prepared. Consequently, this paper addresses this deficiency by examining the reasons for and for not preparing profitability analysis. It is expected that organisations prepare profitability analysis to calculate the profits of various cost objects in order to assist them in decision making. In contrast, organisations are expected to not prepare profitability analysis if they do not find it useful or do not have the resources to prepare it.

Probably the two most obvious cost objects to which profitability analysis can be applied are products and customers. Product profitability analysis (PPA) shows the product revenues, product costs and product profits for each product produced and sold by an organisation. Although the calculation of product costs and product profits is the subject of many management accounting textbooks (e.g. Atkinson et al., 2007; Drury, 2012; Horngren et al., 2008) and prior research (e.g. Emore and Ness, 1991; Joye and Blayney, 1990; Brierley et al., 2001; Lamminmaki and Drury, 2001), there has been little research that addresses the use of PPA in practice. There is a need to conduct research to consider why companies prepare PPA. It is possible that this is prepared for the purpose of control to identify loss making and low profit products to determine either if their profit can be increased or if they should be discontinued.

Similarly, customer profitability analysis (CPA) shows the revenues, costs and profits of each customer of an organisation. Foster and Young (1997) identified the importance of customer profitability as a general management priority and as a cost/management accounting issue. It can be used to identify the characteristics of profitable and unprofitable customers and can assist sales and marketing staff to identify attractive customers (Bellis-Jones, 1989). By using CPA, organisations should be more aware of the costs of servicing their customers, especially in extreme cases where customers receive identical products, but the cost of servicing them varies (Smith, 1993). This may lead to some customers being removed and changes being made to the services provided to others (Smith, 1993, 2005). Even when unprofitable customers are identified, however, they may not necessarily be removed because it is possible to negotiate with them to influence their behaviour (Smith and Dikolli, 1995).

Despite these alleged advantages of CPA, there is a lack of empirical research in the academic accounting literature about CPA. Smith (2005) notes that the focus of the CPA literature, and particularly within accounting, has been in practitioner journals (e.g. Bellis-Jones, 1989; Howell and Soucy, 1990; Smith, 1993; Connolly and Ashworth, 1994; Foster et al., 1996). Although Smith (2005) acknowledges the existence of Cooper and Kaplan's (1991) well known Kanthal case study, when, by

changing the basis for assigning customer-related selling costs to customers from sales revenue to the number of orders, Kanthal discovered that only 40 percent, rather than 100 percent, of its customers were profitable, to the author's knowledge, there have been only five academic research articles that have studied CPA.[1] These five articles are Anandarajan and Christopher (1987), Noone and Griffin (1999), Guilding and McManus (2002), van Raaij *et al*. (2003) and Lind and Strömsten (2006). Anandarajan and Christopher (1987) used interviews with marketing staff to derive a method for preparing CPA. Noone and Griffin (1999) and van Raaij *et* al. (2003) used a case study approach to examine the feasibility of implementing CPA. Guilding and McManus (2002) used multiple regression analysis to find that the perceived merit of CPA is related positively to the level of competition facing an organisation and the size of the organisation. However, there was no relationship between the use of CPA and these two independent constructs. Finally, Lind and Strömsten (2006) examined how different types of customer relationships were related to the preparation of CPA and other types of customer accounting. They found that CPA was prepared regularly for most types of customer relationships. Although prior research has accepted that CPA is used, this has been done without considering why companies prepare CPA. This may be prepared by organisations that make product sales to a few customers and may find it easier to control the profits of a few customers, rather than a large number of products. Alternatively, an organisation that sells a large number of customised products may want to prepare CPA to control the costs of servicing particular customers. When both PPA and CPA are prepared it is expected that they are both prepared to take advantage of the qualities of each type of profitability analysis.

Turning to the use of profitability analysis in decision making by companies selling many different products, Cooper (1997) suggests that companies should prepare profitability analysis (or, as he calls it, profitability maps) as attention directing information (or, as he calls it, attention focusing information) to identify those products to which special studies should be applied before a decision is made. Attention directing information can be in the form of various subtotals of contribution and profit that can be used to identify items in cost objects, such as products or customers, for further investigation. The special studies would be triggered by contribution/profit levels being lower than expected. The special studies go into more detail than attention directing information, like profitability analysis. They follow up on the exceptions identified in profitability analysis, such as low profit and loss making items by identifying the relevant cash inflows and outflows relating to a particular decision about those items. These could relate to decisions, such as, outsourcing, redesigning and/or reducing the cost of a cost object. Given the potentially large number of special studies that a company could undertake, profitability analysis has the role of limiting the number and, hence, the total administrative cost of conducting special studies (Drury and Tayles, 2006). To the author's knowledge, only Drury and Tayles (2006) have considered the extent to which profitability analysis is used as attention directing information or directly in decision-making. Drury and Tayles (2006) found that 81 percent of the respondents used it as attention directing information to identify problem areas for further investigation through special studies. The remaining 19 percent of respondents used the information directly in decision making, without any further studies. It is important to extend this research to examine not only the extent to which it is used, but also why and how PPA and CPA are used as attention directing information or directly in decision-making. In particular, it is necessary to consider if profitability analysis is used in decision making in the way envisaged by Cooper (1997) or if it is used differently.

Given the lack of research into profitability analysis, Drury and Tayles (2006, p.406) regard their paper as "a preliminary attempt to address this shortcoming". Hence, the objective of this paper is to take Drury and Tayles' (2006) exploratory research a stage further by using research interviews to explain why organisations prepare or do not prepare profitability analysis and, for those that do prepare it; why they prepare particular types of profitability analysis like, PPA and CPA; and how PPA and CPA are used in decision making. Although it may be argued that the probable answers to these questions are not worthy of being asked because the answers to these questions have already been speculated. This cannot be stated conclusively until it is tested empirically, which is the intention of this exploratory research.

The remainder of the paper is organised into three further sections. Given the limited prior research in this area, which has been noted above, this paper does not contain a literature review. Section 2 describes the research methods that will be used to test these research questions using a questionnaire survey and interviews. Section 3 provides details of and discusses the research results. Section 4 offers some conclusions to the research, identifies its limitations and provides information about the opportunities for further research.

## 2 Research method

### *2.1 Research questionnaire*

The interviewees used to answer these research questions were obtained from respondents to a questionnaire concerned with a variety of product costing issues. These questionnaire respondents were obtained from a list of 854 members of the Chartered Institute of Management Accountants in Great Britain who were working in British manufacturing industry and had the job title of cost, management or manufacturing accountant. An initial letter was posted to all potential respondents that specified the objectives of the research and informed them that they would receive a questionnaire in two weeks time. Accompanying each questionnaire was a covering letter, which assured respondents of the confidentiality of responses, and a stamped-addressed envelope. Non-respondents to the questionnaire were posted a follow-up letter two weeks later, and a further follow-up letter, questionnaire and stamped-addressed envelope were posted to any remaining non-respondents two weeks after that. After identifying operating units that had closed down, and potential respondents who had left their operating unit, or whose work did not involve manufacturing or product costing or when more than one subject worked in the same operating unit, the total potential respondents employed in independent operating units declined to 673. A total of 280 usable questionnaires were received (effective response rate = 41.6 percent).[2] Of these 280 respondents, 6 indicated that they did not use product costs in decision making and, hence, did not prepare profitability analysis, 11 indicated that they worked in cost centres and, hence, did not prepare it either, and 5 did not answer the questions in the questionnaire about profitability analysis. This left 258 questionnaire respondents that answered the questions about profitability analysis.

### *2.2 Construct measurement*

Questionnaire respondents were required to answer a variety of questions about costing from the perspective of the operating unit in which they worked. In relation to profitability analysis, a single question requested information about the extent to which profitability analysis was prepared and the various types of profitability analysis prepared. The various responses were:

- ranked by product profitability (e.g. from the most profitable to the least profitable),
- product profitability ranked by sales volume (e.g. from the highest sales volume to the lowest sales volume),
- product profitability shown in alphabetical order by product name,
- ranked by customer profitability,
- customer profitability ranked by sales volume,
- customer profitability shown in alphabetical order by customer name,
- do not use profitability analysis and
- other types of profitability analysis used.

Respondents from operating units that prepared some form of profitability analysis were required to answer a further question about how profitability analysis is used with responses of: 1 = as attention directing information, as a guide to whether further investigations should be conducted, 2 = used directly in decision-making and 3 = other.[3]

In addition, various pieces of background information were obtained about the respondents. Operating unit size was measured by asking respondents to state the approximate annual sales revenue of their operating unit in the last financial year and the approximate number of employees working in their operating unit. The level of competition and product customisation were each measured by two questions developed by the researcher.[4]

### *2.3 Interviewees*

Of the 274 questionnaire respondents using product costs in decision-making, 55 respondents ticked a box on the back cover of the questionnaire to indicate they were willing to engage in a face-to-face interview to discuss costing issues in more detail. Three of the interviewees were from cost centres, which meant that questions about profitability analysis were confined to the remaining 52 interviewees. The interviews covered a variety of costing issues and were not confined solely to profitability analysis. They were conducted at the interviewee's workplace, were semi-structured, tape-recorded, lasted for an average of 1 hour 26 minutes and the portion of the interviews relating to profitability analysis were transcribed. The interviews addressed the research questions described in section 1 and, where necessary, prompts and follow-up questions were used to obtain fuller answers to

questions.[5] The interviews were analysed individually and then together as a cross-case analysis. The phenomenon being coded was each of the questions asking about the use of profitability analysis. Open coding was used to identify concepts given in response to interview questions and these were grouped into various categories (Corbin and Strauss, 2008). Selective coding was then used to identify a central category from the open coding that could provide the answer to an interview question.

## 3 Results and discussion

### *3.1 Interviewee results*

Table 1 provides background information about the interviewees. This shows that the majority of operating units have annual sales revenue of less than £100m, employ less than 1,000 people, face a high level of competition, produce products ranging from highly standardised to highly customised and are from a variety of industries. The remainder of this section discusses the results of the interviews to examine the three research issues. A review of the relationship between the data shown in Tables 2 and 3 with operating units' sales revenue, number of employees, level of competition, level of product customisation and industry did not reveal any patterns in the data, and, hence, these constructs did not provide an explanation for the use of profitability analysis. The analysis continues in the next sub-section by addressing the first research question relating to the reasons for preparing and not preparing profitability analysis.

Insert Table 1 about here

### *3.2 Reasons for preparing and not preparing profitability analysis*

Forty-five of the interviewees (86.5 percent) prepare profitability analysis. When profitability analysis is used, it is regarded as very important because, as expected, it provides a means of controlling the activities of the operating unit by checking that profits are being made. As expected, these organisations consider that it is beneficial to invest in and use profitability analysis because it contributes to the control and management of the business. Seven of the interviewees (13.5 percent) gave two reasons as to why their operating units did not prepare profitability analysis. The first reason, given by three interviewees, for not preparing profitability analysis is because of a lack of resources to invest in the appropriate accounting software and/or accounting staff to produce the profitability analysis. Thus, there is a desire to prepare profitability analysis, but the infrastructure does not exist to prepare it. In order to prepare profitability analysis there is a need to invest in new software and/or staff. There is a need for profitability analysis, but the resources do not exist to purchase the necessary software.

The second reason, indicated by four interviewees, is because there is no interest in profitability analysis. This is because there is a concern with the overall profit of the operating unit, or because of the existence of a strong sales culture in the operating unit. In both cases, there is no concern with the breakdown of the profit of different cost objects. In the latter case, a sales culture exists in these operating units because sales and marketing staff are in charge of these organisations and they are concerned with maximising sales, rather than profits. Consequently, the sales and marketing staff regard profit-based information produced by accounting staff, including profitability analysis, as irrelevant. Hence, there is no demand for this information. Overall, the decision as to whether or not profitability analysis is used is context specific. As expected, it is dependent on whether there is a desire for profitability analysis, and if there is, whether the resources exist to invest in and operate it.

### *3.3 Reasons for preparing particular types of profitability analysis*

Table 2 indicates various ways in which operating units prepare profitability analysis. The interviewees' responses indicate that, although operating units prepare a variety of different forms of profitability analysis, such as PPA/CPA ranked by profitability, PPA/CPA ranked by sales volume and PPA/CPA in alphabetical order, there are three distinct forms of profitability analysis, based upon the general form of the profitability analysis, namely both PPA and CPA, only PPA and only CPA. Other forms of profitability analyses, such as at the product group level, geographical area and sales person, are not prepared as often. The following analysis examines the reasons for preparing these three distinct forms of profitability analysis.[6]

Insert Table 2 about here

Unsurprisingly, operating units prepare just PPA to assist with maximizing product profits and, hence, operating unit profits. All eight interviewees said that it is used to either identify high profit, low profit and loss making products; or just low profit or loss making products. In the first case, the high profit products are identified as a benchmark to which low profit and loss making products should aspire. One interviewee from an industrial machinery manufacturer illustrated this by saying that PPA is used:

> "To find out which products are most profitable and to replicate that in others to find which products are least profitable and find out a solution to them. It's really an activity towards … making bad products better."

In these operating units, profitability analysis provides a tool for management to identify profitable products and their characteristics, and then attempt to incorporate their characteristics into unprofitable products.

In the second case, the focus is solely on low profit and loss making products and these are not benchmarked against high profit products. These products are then studied to assess if their manufacturing costs can be reduced, and hence their profits increased, or whether they should be discontinued. However, this product discontinuation decision is not made when a product(s) is/(are) sold as part of a product range. The low profit or loss making product(s) is/(are) sold providing the product range is sold at a profit. Hence, although PPA is prepared in order to identify loss-making products, it can only be used to its full potential when these products are not part of a profitable product range. Thus, the way PPA is used is consistent with expectations.

The interviewees in operating units that prepare only PPA gave a variety of reasons for not preparing CPA as well as PPA. These include the business being product driven, having only one major customer, the existence of too many customers that makes CPA too costly to prepare, being unable to prepare CPA due to software limitations, and CPA and PPA being the same because the company produces bespoke products and sells one product to each customer. Thus, the reasons for not preparing CPA are contingent on the particular circumstances of an operating unit, and CPA will not be prepared if it does not provide some contribution to the control and management of the operating unit.

Operating units that prepare only CPA are customer focused and CPA is prepared by the accounting department for the sales and marketing department. This is illustrated by two interviewees from the dairy and plastics industries, respectively, who said:

> "It's the only real piece of paper that the sales people see on a regular basis to use as a start point for their understanding of which customers are profitable and which aren't. … It would be their first point of contact to see how profitable is the customer."

> "The sales people etc., people that actually run the company, they like to see that information. They want to see which customers are more profitable than others."

The implication here is that sales and marketing staff who want CPA from the accounting department are perceived as using it and are finding it useful. In the operating unit of the latter interviewee, there are capacity constraints in the factory, which means that the CPA is used by sales staff to contribute to profit maximisation by ensuring that priority in sales is given to customers that are more profitable. The interviewee said:

> "Very recently, we've just done a whole list of how much profit/gross margin/contribution … that we make against each customer. This company is … getting more sales in than we have ever had before and we're finding we're getting ourselves clogged up in production because we are trying to satisfy every customer. Decisions are going to be taken on which customers do we keep, which customers do we have to let down. I don't mean that by saying bye-bye customer. It might take them a little bit longer to get their product, simply because we recognise that we don't get as much money out of these people and at the end of the day, we're here to make as much money as we can through everybody."

When there are more severe capacity constraints, CPA can lead to some customers' orders not being satisfied. For example, an interviewee from an industrial machinery manufacturer said:

> "The reason we do it [*profitability analysis*] by customer is because we can then see what profit we are making by customer and whether one customer is squeezing us on the price, whether we can get better prices elsewhere and it can be just a general pointer. Like now, if you're getting near to full capacity you will then go back and start being a bit choosy and saying well we get a good profit from that customer, that's the one we'll probably play more towards. The ones we are not making a profit, we'll try to shy away from if we can."

In operating units that have a large number of customers, the sales and marketing staff, use CPA to focus on a narrow number of customer accounts. This is important in operating units in the food industry, where the existence of powerful retailers means that their suppliers have to be customer focused and CPA provides customer focused information. This is illustrated in one food manufacturer, when the interviewee said:

> "It is very useful for the salesmen. Obviously, they use it for what are their key accounts. … We've got six or seven very key accounts that take 80 percent of volume and 80 percent of our contribution. The reason for doing this is technical people don't spend hours and hours working on an account that maybe we do 5 or 10 tonnes of business with."

In addition, operating units that produce and sell a variety of bespoke products to individual customers only prepare CPA because it is easier for these operating units to produce a limited number of profitability analyses for a limited number of customers, rather than for a larger number of bespoke products. In these instances, PPA is not produced because of the cost of preparing and the time spent analysing the PPA. Here, CPA provides a more cost-effective method of preparing information that can be used for decision-making and for control. Thus, as expected, operating units prepare CPA when there is a need to focus on a few customers or to find customer costs relating to the sale of customised products. One additional feature of CPA is that although the CPA is prepared by the accounting department, it is not used by them, in general. It is used by sales and marketing staff to assist them with customer related decisions.

When PPA and CPA are both prepared they are used for different purposes, but they can be used together to assist in achieving profits. For example, one interviewee from a tannery said:

> "Customer profitability is important more from the point of view of managing the relationship with the customer. Product profitability, we're looking at maybe alternative ways of producing the product. Sometimes just within our plant, sometimes in discussion with the customer. We'll look at alternative materials, alternative methods to give them the best value and maintain our profit."

In this case, if an operating unit makes an overall profit on sales to the customer, then PPA is not used. However, if customer profits are low or at a loss, then PPA is used to identify possible product cost reductions in the product(s) sold to the customer and/or possible product price increases, which are made in consultation with the customer. Ultimately, the way to increase customer profits is through increasing product profits. This is important in operating units that sell a range of bespoke products to any one customer because each customer receives a mix of unique products, which each have a unique manufacturing method, cost and price.

In the case of operating units producing standardised products, described above, a single PPA is produced for all products produced. However, the customer relationship can be managed in more detail by producing CPA and then producing a separate PPA for each customer that is sold a variety of customised products. One interviewee from a sheet metal manufacturer described this process in the following way:

> "We need to know which of our customers are producing the profit for us and within those customers, which products are the profitable products. The reason we do that is we are very much customer driven. We have a relatively small number of customers; we're talking 20 or 30 customers. They all tend to take fairly large volumes, so it's important to us to see who are the profitable customers and within that, which are the profitable products."

The customers purchase bespoke products, and unless the product is being sold as a loss leader, PPA is used to assist in managing the customer relationship by identifying areas for product (and, hence, customer) cost reduction.

Although PPA and CPA may be produced together, there may be circumstances when they are not used together because CPA is regarded as less important than PPA. This can arise for a variety of reasons, such as, when customer costs in the CPA are distorted because the operating unit has not paid sufficient attention to identifying separate customer costs, which reduces the accuracy and usefulness of CPA. In another case, an operating unit was structured so that it was product orientated. Hence, staff are responsible for products, not customers, and CPA is prepared only for large customers. In another example, an operating unit produced bespoke products, but CPA and PPA are the same for most customers because most customers purchase only one product. When they are the same, only PPA is reviewed. Thus, although, as expected, operating units take advantage of both PPA and CPA, they do not necessarily take advantage of them at the same time. It is possible that one of them takes priority and is used initially (which one is used initially depends on the particular context facing the organisation) and, if required, the other is used to provide further information.

### *3.5 The use of profitability analysis in decision-making*

The methods used to apply profitability analysis in decision-making are shown in Table 3. The use of profitability analysis as attention directing information and/or directly in decision making is dependent, as stated previously, on whether operating units prepare both PPA and CPA, only PPA or only CPA. Hence, the use of profitability analysis is described below for each of these three general types of profitability analysis.

Insert Table 3 about here

PPA is used as attention directing information in decision making for three reasons. The first reason is that operating units use it because they want to check the accuracy of the information prior to using it in decision-making. One interviewee from a pharmaceutical manufacturer, who was the only interviewee working in an operating unit using ABC, illustrated this by saying:

> "You've got to use it to check the validity of it. You don't jump straight to [*using the information directly*] you go through it. If you go straight to [*using it directly*] make sure that your facts are right."

Thus, there is need to ensure that decisions are made based on accurate information and that any errors in the data are identified. For example, if the PPA revealed a loss-making product, then a decision will not be made, for example, to discontinue that product until the information contained in the PPA has been checked. Thus, the PPA is checked for its authenticity prior to making a decision, rather than being used to undertake a special study before making a decision. If the PPA is checked and found to be correct, then a decision is made based upon this information. If the PPA is found to be incorrect, then it is corrected and a decision is made on the corrected information. Although the initial PPA is not used directly in decision-making, as recommended by Cooper (1997), it is used directly in subsequent decision making either in its original or amended form and it is not used as a basis for undertaking further special studies in the form described by Cooper (1997).

The second reason for using PPA as attention directing information arises when it is used initially in decision making in conjunction with other non-financial information, such as marketing information. Thus, a product-related decision is not based solely on the PPA. PPA can identify problem areas for further investigation, with decisions being made using the PPA and other non-financial information. In this case, special studies are undertaken, but these do not involve the use of financial information, such as calculating discounted cash flows. The special studies are confined to non-financial information and are not necessarily in the form described by Cooper (1997).

Unlike the two cases described above, some operating units would like to use PPA directly in decision-making, but are unable to do so because of perceived problems with the accuracy of the PPA due to limitations in the accounting software. This can take the form of using simple methods to assign overhead costs to product costs. This means that PPA can be used only to highlight exceptions for further investigation, rather than for direct use in decision-making. As one interviewee from an electronic components' manufacturer said:

> "It's not amazingly accurate. … If we are selling a product at a loss, and a noticeable loss, we'll flag it up. … It's used to pull up exceptions, rather than being used all the time."

The usefulness of PPA, however, is limited when it is regarded as being inaccurate. Hence, it is necessary to ensure that PPA is accurate enough to make a significant contribution to decision making. Thus, in this case the special studies are undertaken in a way that is similar to that described by Cooper (1997). Unlike Cooper (1997), however, if PPA was more accurate then management would have more confidence in this information and decisions would be based solely on that information, and special studies would not be undertaken. Thus, PPA is not used in the way envisaged by Cooper (1997). It is only when PPA is regarded as being accurate that operating units consider the need to undertake special studies for the purpose of decision making. If the PPA is considered to be accurate, then operating units have sufficient confidence is the information to use it in decision making.

Similar to those using PPA and CPA, but unlike the interviewees in operating units using only PPA in decision-making, interviewees in operating units preparing only CPA said it is used either as attention directing information, directly in decision-making or in both of these ways. When CPA is used as attention directing information, the accounting department is a preparer of this information, not a user. Sales and marketing staff use CPA as a control tool to review customer profitability. It is used by sales and marketing staff to ensure that customer profits are in line with their expectations. If as a consequence of its use as attention directing information, then there is a need for special studies. However, these special studies are undertaken by sales and marketing staff, and accountants are not involved in this.

Interviewees from operating units using CPA directly in decision making said that sales and marketing staff use it, but they did not know how they use it. In this case, it is difficult to interpret this result because it is possible that it could be used in decision making by sales and marketing staff as attention directing information, directly or in both of these ways. Although the accounting staff know that CPA is used, their role is limited to being a preparer of this information, and once the information is supplied to the sales and marketing staff, the accounting staff have no further involvement with the CPA.

When CPA is used both as attention directing information and directly in decision making by sales and marketing staff, the interviewees had a better understanding of how it is used. As described above, it is used as attention directing information to review customer profitability by identifying relatively low profit customers that need to be investigated to see how profits can be improved. It is used directly in decision making as part of pricing decisions to provide information about previous pricing decisions that can assist in determining future prices. One interviewee from an industrial machinery manufacturer, said:

> "It [*CPA*] can give the sales history to give how well the profit has gone on the product. So, when they [*sales staff*] come to quote again they can look back on how they've done in the past and see whether they've quoted, what they've quoted in the past they hit it on the nail or they've underquoted and have lost out. And then … it's used as a management tool each month that if you do have a bad month you can then go back and really find out what has caused you to make the bad profit."

Thus, the CPA information does not determine the actual selling price, but provides a guide for determining the price.

Interviewees from operating units that produce PPA and CPA use it as either attention directing information, directly or in both of these ways in decision making. Operating units that use PPA and CPA as attention directing information and/or directly in decision making use it as attention directing information for control purposes, such as, to identify loss making products, and it is used directly in decisions, like make-or-buy and pricing decisions.

## 4 Conclusion

This paper has used research interviews to expand on the limited research into profitability analysis. It has made an incremental contribution to this research area by examining the circumstances when profitability analysis is and when it is not prepared, why various types of profitability analysis are prepared, and the how it is used in decision making. Operating units prepare profitability analysis to assist with control. Those that are not cost centres do not prepare profitability analysis when there is no interest in preparing it because the objective of the business is sales maximisation, rather than profit

maximisation or, even though there is a need for profitability analysis, the resources do not exist to prepare it. Operating units prepare both PPA and CPA to assist with managing and increasing profits through managing low profit or loss making customers. Initially, CPA is used to identify low profit or loss making customers. Then PPA is prepared either for all products or for the products sold to a specific customer. This information can be used either as attention directing information, directly or in both of these ways in decision making to try to increase product profits on sales to the customer. If only PPA is prepared, it is used as attention directing information to assist in determining what action should be taken to increase the profits of these products. Customer focused operating units produce only CPA. These operating units have a strong sales and marketing culture, which means that the accounting department prepares the CPA, but it is not involved in using the CPA in decision-making. The CPA can be used as attention directing information, directly or in both of these ways in decision-making.

Although this research shows that marketing staff use CPA, a limitation of the research is that by obtaining information about CPA only from management accountants there is relatively little information available as to how this information is used by marketing staff. Further research needs to be undertaken by conducting interviews with marketing staff to assess whether they understand CPA, how they use profitability analysis, how appropriate is the information supplied to them by management accountants and how important is this information in decision-making relative to information produced by the marketing department. Limited research in this area has indicated that marketing managers have expressed dissatisfaction with CPA produced by accounting systems that are not set up for customer costing (Anandarajan and Christopher, 1987), but this needs to be investigated further. In addition, future research should investigate the extent to which the format of profitability analysis affects the extent to which non-accountants, including marketing staff, use it. For example, in an experiment using business students, Cardinaels (2008) found that, after controlling for the effects of work experience and ability, those with a low level of cost accounting knowledge perform better (achieve a higher profit) when CPA is in a graphical format; while those with a high level of cost accounting knowledge perform better when using a tabular CPA format. There is a need to extend this research to non-accounting managers to consider the extent to which the format of profitability analysis affects the extent to which it is used and is used appropriately.

Given that CPA can be regarded as a distinct type of profitability analysis because it includes the identification of costs that are not found ordinarily in a product-based form, future research needs to examine the extent to which operating units identify customer related costs (Smith and Dikolli, 1995). Although the majority of operating units included in this and other research do not use ABC,[7] and, hence, do not prepare profitability analysis using ABC (see e.g. Kaplan and Narayanan, 2001; Kuchta and Troska, 2007; Drury, 2012). Companies can still prepare profitability analyses by distinguishing between costs that can and cannot be matched directly with items in cost objects (e.g. individual products and customers). In its crudest form, this can be prepared by taking the revenues generated from each item and deducting the variable costs for each individual item to give a contribution for each item and then deducting total fixed costs from all items within a costs object. Research needs to consider the extent to which non-ABC-based profitability analysis distinguishes between relevant and non-relevant costs for the purpose of providing appropriate information for decision-making. In particular, there is a need to consider the appropriateness of non-ABC methods to assign distribution, marketing and customer service costs to customers in CPA in comparison to ABC (see e.g. Drury (2012)). Furthermore, researchers need to investigate whether and why profitability analyses that are used in decision-making are based on a profit figure that is derived after deducting the arbitrarily allocated fixed costs.

This research has taken prior research into profitability analysis a stage further by using interviews to identify why profitability analysis is prepared and how it is used. Given the relatively small amount of research in this area, it is hoped that the results of this research will stimulate others to continue research in this relatively new area.

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**Table 1** Background information about the interviewees

| | | *Score* |
|---|---|---|
| Annual sales revenue | | |
| Minimum | | £3.00m |
| Lower quartile | | £17.25m |
| Median | | £34.00m |
| Upper quartile | | £76.75m |
| Maximum | | £1,327.00m |
| Useable n | | 52 |
| Number of employees | | |
| Minimum | | 65.0 |
| Lower quartile | | 182.5 |
| Median | | 280.0 |
| Upper quartile | | 705.0 |
| Maximum | | 3,300.0 |
| Useable n | | 49 |
| Competition[a] | | |
| Minimum | | 2.5 |
| Lower quartile | | 4.0 |
| Median | | 4.5 |
| Upper quartile | | 5.0 |
| Maximum | | 5.0 |
| Useable n | | 52 |
| Product customisation[a] | | |
| Minimum | | 1.0 |
| Lower quartile | | 2.0 |
| Median | | 3.0 |
| Upper quartile | | 4.5 |
| Maximum | | 5.0 |
| Useable n | | 51 |
| Manufacturing industry sector | *N* | *(%)* |
| Chemicals, rubber and plastics | 7 | (13.5) |
| Electronic equipment | 4 | (7.7) |
| Food and drink | 9 | (17.3) |
| Iron, steel, bricks, glass and pottery | 4 | (7.7) |
| Metal products, tools and scientific instruments | 5 | (9.6) |
| Machinery | 6 | (11.6) |
| Motor vehicle parts and accessories | 1 | (1.9) |
| Paper, packaging and printing | 4 | (7.7) |
| Ships and aerospace | 2 | (3.8) |
| Textiles, tanning, soft furnishings and woodwork | 8 | (15.4) |
| Other | 2 | (3.8) |
| | 52 | (100.0) |

Notes: [a]Scored on a 5-point scale from a low score of 1.0 to a high score of 5.0.

**Table 2**
I: Types of detailed profitability analysis prepared[a]

| | | *N* | *(%)* |
|---|---|---|---|
| A: | Ranked by product profitability | 24 | (53.3) |
| B: | Product profitability ranked by sales volume | 17 | (37.8) |
| C: | Product profitability shown in alphabetical order by product name | 9 | (20.0) |
| D: | Ranked by customer profitability | 25 | (55.6) |
| E: | Customer profitability ranked by sales volume | 12 | (26.6) |
| F: | Customer profitability shown in alphabetical order by customer name | 10 | (22.2) |
| G: | Other types of profitability analysis | 14[b] | (31.1) |

Notes: [a]These operating units have the potential to prepare more than one of the various types of profitability analysis. The percentages reported are of the total number of interviewees using profitability analysis (n = 45).
[b]The other types of profitability analysis reported include by: product group = 5, geographical area = 5, any way required = 2, product profitability by market = 1, salesperson profitability = 1, customer profitability by product group = 1, own internal classification = 1. The total of these various types of profitability analysis exceeds 14 because some operating units use more than one of the various other types of profitability analysis.

II: The extent and type of general profitability analysis prepared

| | | *N* | *(%)* |
|---|---|---|---|
| General types of profitability analysis prepared: | | | |
| A: | Product and customer profitability analysis | 16 | (30.8) |
| B: | Product, customer and other types of profitability analysis | 9 | (17.3) |
| C: | Only product profitability analysis | 8 | (15.4) |
| D: | Product and other types of profitability analysis | 4 | (7.7) |
| E: | Only customer profitability analysis | 6 | (11.5) |
| F: | Customer and other types of profitability analysis | 2 | (3.8) |
| G: | Other types of profitability analysis | – | (–) |
| Operating units preparing profitability analysis | | 45 | (86.5) |
| Operating units not preparing profitability analysis | | 7 | (13.5) |
| | | 52[a] | (100.0) |

Notes: [a]These are all operating units that have the potential to prepare profitability analysis, that is, they are not cost centres.

**Table 3** The use of profitability analysis in decision-making

| | *N* | *(%)* |
|---|---|---|
| As attention directing information | 27 | (60.0) |
| Directly in decision making | 13 | (28.9) |
| As attention directing information and directly in decision making | 5 | (11.1) |
| Useable N | 45 | (100.0) |

## Notes

[1] This excludes Drury and Tayles (2006) who consider the use of profitability analysis, in general, and make only passing reference to the use of CPA in practice.

[2] A copy of the questionnaire is available on request.

[3] Decision-making was defined as including selling price, make-or-buy, product mix, output level, cost reduction, product design and product discontinuation decisions.

[4] In relation to the measurement of competition, the first question concerned the current level of general competition for the major products produced by the operating unit with responses on a five-point Likert scale of 1 = Very intense to 5 = Very slack. The second question covered information about the expected level of general competition over the next two years for the major products produced by the operating unit, with responses of 1 = Very high and 5 = Very low. For data analysis, the scores on these questions were reverse scored, summed and divided by 2 to give a measure of the general level of competition on a nine-point scale with a low score of 1 and a high score of 5. Similarly, product customisation was measured by two questions. For the first question respondents had to identify the range of products produced on a five-point Likert scale with responses ranging from 1 = Virtually all customised products, to 5 = Virtually all standardised products. For the second question, responses ranged from 1 = At least 95% of products produced are unique and produced to satisfy individual customers' orders, to 5 = At least 95% of products are identical products produced in large quantities. The responses to both questions were initially reverse scored for data analysis, summed and divided by 2 to give a measure of the general level of product customisation on a nine-point scale with a low score of 1 and a high score of 5. A principal components factor analysis with a varimax rotation confirmed that the four items making up the two psychometric constructs load on to two separate factors with eigenvalues greater than one and explaining 84.72 percent of the explained variance. The two factors were based on the two-items measuring the levels of competition and product customisation. The factor loadings for the competition construct were both 0.927 and for product customisation were 0.913 and 0.914. The reliability of the constructs was confirmed by Cronbach's (1951) alpha, with the alphas for the measures of competition and product customisation being 0.796 and 0.833 respectively, which is almost as high as the recommended level of 0.80 (Carmines and Zeller, 1979) and higher than the minimum acceptable level of 0.60 (Price and Mueller, 1986).

[5] The interviewees were also asked what sub-totals for contribution and/or profit were included in their profitability analysis. Given the variety of responses provided by the interviewees, this was difficult to code for the purpose of trying to compare responses between interviewees. This shows that this type of information should only be obtained by a combination of interviews and observing operating units' internal documents (Dugdale et al., 2006). Consequently, the title of this paper refers only to the 'use' of profitability analysis and not its calculation.

[6] For the purpose of the subsequent data analysis, the three distinct forms of profitability analysis are derived from the following types of profitability analysis listed in Table 2. PPA and CPA are made up of operating units that produce product and customer profitability analysis, or product, customer and other types of profitability analysis. PPA is made up of operating units that produce only product profitability analysis, or product profitability analysis and other types of profitability analysis. CPA is made up of operating units that produce only customer profitability analysis, or customer profitability analysis and other types of profitability analysis.

[7] This is also true of research that has examined the adoption rates of ABC (e.g. Innes and Mitchell, 1995; Innes et al., 2000).