



THROUGHPUT ACCOUNTING: TRANSFORMING PRACTICES?

DAVID DUGDALE

University of the West of England

T. COLWYN JONES

University of the West of England

We analyse the development of various forms of throughput accounting (TA) inspired by Goldratt's Theory of Constraints. We discuss the potential of TA to change accounting practices, and evidence of change in UK enterprises. We conclude that transformational (paradigmatic) change is most likely in companies in extreme circumstances: elsewhere TA is more likely to be adopted pragmatically in a portfolio of different accounting techniques.

© 1998 Academic Press

INTRODUCTION

In a previous paper published in *BAR* (Jones and Dugdale, 1998), we discussed the development of the 'Theory of Constraints' (TOC) in the work of Eli Goldratt. Beginning with the computer software 'Optimized Production Technology' (OPT), Goldratt's thinking on throughput developed from an early focus on production bottlenecks, to a broader concern with constraints in any aspect of business, to a generic underlying 'Thinking Process', which he claimed was the foundation of his construction of TOC. In the course of this intellectual journey, Goldratt identified TOC as 'Throughput-World' thinking which contrasts sharply with the conventional 'Cost-World' thinking of US and UK enterprises. These represent two different paradigms of management thought—with the third being 'JIT World' thinking. From the perspective of the Throughput World, cost accounting is 'enemy number one of productivity' (Goldratt and Cox, 1993,

We gratefully acknowledge the financial assistance of the CIMA Research Foundation and the general support of its staff. We also thank Oded Cohen (of the Goldratt Institute), John Darlington (of AlliedSignal) and David Waldron (of Galloway and Waldron Associates) for their co-operation in our research. We are grateful for the comments of a number of anonymous reviewers on this and other papers we have produced around the theme of throughput accounting.

Please address all correspondence to: D. Dugdale, Bristol Business School, University of the West of England, Frenchay Campus, Bristol BS16 1QY, UK.

Received 5 October 1996; revised 25 February 1997; accepted 10 July 1997.

introduction), since its local performance measures obscure the goal of the organization and hinder the realization of potential throughput. Goldratt therefore advocates stripping away much of the apparatus of conventional cost accounting and the construction of simpler accounting measures focused on maximizing throughput.

In this paper, we discuss the application of TOC ideas as 'Throughput Accounting', drawing on published works, conference and other public presentations, and research interviews with many of the leading figures in the development of these practices.

First, we discuss accounting applications developed by Goldratt and graduates of the Goldratt Institute, and a series of specific techniques devised by UK consultants Galloway and Waldron. Second, we evaluate the potential of Throughput Accounting to change accounting practices, and look at evidence of change in UK enterprises. We conclude that the realization of the potential for transformation claimed by advocates of Throughput Accounting depends on whether accounting change (and broader management change) is paradigmatic or pragmatic.

THROUGHPUT ACCOUNTING

The application of TOC to accounting is usually labelled 'Throughput Accounting' (TA). There are, however, some difficulties with this which we need to clarify. The first applies to the term itself. Referring to the USA and continental Europe, Noreen *et al.* (1995) use the term to refer to Goldratt's recommendations for accounting techniques, and to practices developed within companies by graduates of 'Jonah Programmes' run by the Goldratt Institute. In the UK, the situation is rather different. The earliest reference to the term we can find is in an article by David Waldron (1988), who claims to have coined it in conjunction with his management consultancy partner David Galloway. This has aroused the hostility of the UK branch of the Goldratt Institute with UK Partner, Oded Cohen, arguing that the term has been applied to a distorted version of early TOC thinking. Thus, in the UK, members of the Goldratt Institute avoid use of the term, and one of the Institute's Certified Associates, David Lewis (1993) warned a CIMA Branch Meeting that,

'There is no such thing as Throughput Accounting . . . Forget about Throughput Accounting'.

In the UK, the Institute prefers to use the term 'TOC in accounting'.

A second problem is the range of different techniques to which the term is applied. The theoretical propositions advanced by Galloway and Waldron have changed over time and many of the early techniques had been altered or abandoned by the time their management consultancy partnership was dissolved in 1995. Similarly, there are a number of different techniques

developed by graduates of the Goldratt Institute, and also more-or-less independent developments by others not associated with the Institute.

We will set these problems aside for the moment and return to them later. Taking TA as a generic title for a number of different techniques, we will explore forms of accounting for throughput, first through the work of Goldratt and graduates of the Institute, and then through the series of articles published by Galloway and Waldron.

TA and the Goldratt Institute

Goldratt offers a number of suggestions about the development of TA techniques. In *The Goal*¹, the first of these is the calculation of net profit on the basis of throughput less operational expense. 'Throughput' is defined as sales revenue less materials and services purchased outside the company which relate to products sold. 'Operational expense' covers the cost of conversion including all employee time. Return on investment is then calculated by dividing net profit by 'inventory', in which Goldratt includes not only stock, but also machines and buildings. Noreen *et al.* (1995, p. 13) note that 'these published definitions are too vague to be operational', and from conversations with Goldratt they present some change in definitions. The Institute now defines 'throughput' as revenue less totally variable costs, and Noreen *et al.* replace 'inventory' with 'assets'. These changes have the effect of bringing TA more in line with conventional accounting terminology and usage. Goldratt also suggests more detailed TA techniques (see Fig. 1), but much of his discussion of accounting is at a general rather than operational level. It is intended that accountants who are graduates of Jonah Programs will devise their own measures.

Noreen *et al.* (1995) studied such developments in 20 companies in the USA and continental Europe, and provide detailed discussion on seven of these. They found a variety of TA techniques in use (see Fig. 2). However,

Figure 1. TA techniques suggested by Goldratt.

- Investment appraisal
where improvement at bottleneck facilities increases total factory output:
improving non-bottlenecks provides no such benefit.
- Due-date performance
throughput value multiplied by the number of days overdue.
- Excess inventory
throughput value multiplied by excess-inventory-days.
- Local operating-expense measures
variances between planned and actual spending².

some of these did not appear to be influential in management decision making or control, and measures which multiplied throughput value (\$) by days were seen to lack credibility. In most cases, it would appear that the removal of traditional labour efficiency and machine utilization reports had more impact than the introduction of new TA measures. Noreen *et al.* were particularly interested in the impact of Throughput-World thinking (which they find important), and the application of the Thinking Process where 'we were disappointed to see that it was used infrequently . . . at most sites it got almost no use' (p. 138). Thus, this study offers little guidance in the development of a range of measures which would constitute a TA system.

Figure 2. TA techniques in use.

Monthly internal Throughput P & L reports

Inventory turns (throughput divided by inventory)

Productivity (throughput divided by operational expense)

Throughput per employee (throughput divided by headcount)

Throughput per dollar of working capital

Incremental throughput with incremental operational expense

Estimated excess inventory-dollar-days

Source: Noreen *et al.* (1995)

Galloway and Waldron's TA

The most extensive development of TA which has been published is that of Galloway and Waldron. Appearing in a series of articles in *Management Accounting*, this is likely to be the form in which TA is most familiar to UK accounting academics and practitioners, and provides material for exploring the issues involved in constructing TA techniques.

Introducing TA

Waldron (1988) contrasted fundamental concepts of conventional cost accounting with 'new principles of throughput accounting' (see Fig. 3). Guiding this thinking is the view that 'Products are not profitable or unprofitable, businesses are' (1988, p. 1). If one product can make a contribution of £20 per unit but only 10 can be made per day, then an alternative product which contributes only £10 per unit at a rate of 30 per

Figure 3. Throughput accounting.

Fundamental concepts of conventional cost accounting	New principles of throughput accounting
<i>There are direct and indirect costs: direct costs are variable and indirect costs are fixed.</i>	<i>Distinguishing between indirect and direct costs is no longer useful.</i>
<i>Summing component costs to derive a product cost and subtracting the result from the sales price is a good way to determine relative product profitability.</i>	<i>It is the rate at which the factory earns money that determines profitability, not the contribution of each product.</i>
<i>Inventory is an asset and working on material increases its value.</i>	<i>Inventory is not an asset. It is the product of unsynchronised manufacturing and stands between you and profit.</i>
<i>Reducing component costs directly increases profit.</i>	<i>Profit is a function of material cost, total factory cost and throughput.</i>

Adapted from: Waldron, 1988

day should be preferred. In the short term, all costs are fixed, and what is important is the rate at which resources are applied to materials to produce sales. To reflect this, TA is centrally concerned with calculating the rate at which businesses earn money and focuses attention on maximising the return per bottleneck hour.

Galloway and Waldron began their application of TA ideas with identification of the need for a new language for manufacturing replacing traditional concepts such as direct/indirect cost allocation, the economic batch size, and the idea of adding value through stock. Production methods had changed with the introduction of JIT, TQM and CIM and a new approach was needed to link manufacturing response time, inventory, quality and profit. Manufacturing units should be seen as an integrated whole with costs which are largely pre-determined:

‘It is more useful and infinitely simpler to consider the entire cost, excluding material, as fixed and to call the cost the “Total Factory Cost”’ (1988a, p. 34).

Here ‘Total Factory Cost’ (TFC) is defined in exactly the same way as Goldratt’s Operational Expense. Profit is identified as a function of manufacturing’s response time to the needs of the market and,

‘this in turn means that profitability is inversely proportional to the level of inventory in the system, since the response time is itself a function of all inventory, (1988a, p. 35).

The important feature for managers to recognize is that:

‘it is the rate at which a product contributes money that determines relative

product profitability. And it is the rate at which a product contributes money compared to the rate at which the factory spends it that determines absolute profitability' (1988a, p. 35).

In their second article (1988b) they indicated how products could be ranked according to their TA ratio.

$$(1) \text{ Where Return per Factory Hour} = \frac{\text{Sales Price} - \text{Material Cost}}{\text{Time on Key Resource}}$$

$$(2) \text{ And Cost per Factory Hour} = \frac{\text{Total Factory Cost}}{\text{Total Time Available on Key Resource}}$$

$$(3) \text{ Then the TA Ratio} = \frac{\text{Return per Factory Hour}}{\text{Cost per Factory Hour}}$$

In their third article (1989a) they constructed a key overall measure:

$$(4) \text{ Primary Ratio} = \frac{\text{THROUGHPUT}}{\text{TOTAL FACTORY COST}} \text{ or } \mathbf{T/TFC}$$

If this is greater than one, then the operation is profitable. Here, they define throughput as: 'the contribution remaining after material costs' and total factory cost as 'all the costs incurred other than direct material' (p. 33). Whilst this 'throughput' can be defined for the entire operation, they experienced some difficulty constructing departmental measures. One way to place a value on departmental output would be to use transfer pricing, but instead they preferred a time-based measure:

$$(5) \text{ Departmental throughput} = \frac{\text{Standard minutes of throughput}}{\text{of throughput}} \times \frac{\text{Budgeted departmental cost per minute}}{\text{cost per minute}}$$

Components produced are evaluated in standard minutes on the key departmental resource. Valuation of departmental output is then based on budgeted departmental cost per minute, which is itself calculated by dividing the department's operating cost by total available time available on the key resource. There are two departmental efficiency measures:

$$(6) \text{ Efficiency} = \frac{\text{Throughput}}{\text{Total Department Cost}}$$

$$(7) \text{ Labour efficiency} = \frac{\text{Throughput}}{\text{Direct Labour Cost}}$$

In their fourth article (1989b) they noted that, in a complex manufacturing environment, there may be several manufacturing facilities and, within each facility, the 'focal point' needs to be identified. Then:

$$(8) \text{ Cost per focal point minute} = \frac{\text{Total Facility Cost}}{\text{Focal Point Capacity (minutes)}}$$

They concluded by describing the way in which product costs can be compiled on TA principles:

$$(9) \text{ Product Cost} = \text{Time required on focal point} \times \text{cost per focal point minute} + \text{material cost}$$

For complex products, component costs would be calculated in this way and then summed. The criterion adopted by Galloway and Waldron in advancing these measures is that they should encourage managers to pursue activities which will increase throughput. Hence, the measurement of products travelling through bottlenecks or focal points is intended to maximize the use of these resources.

Developing TA

Following these early developments, Galloway and Waldron made changes which replaced, modified or extended the original TA ideas (Waldron, 1994). In relation to product costing, the TA approach was withdrawn, and Activity Based Costing (ABC) was seen as more appropriate:

‘some sectors of the accounting world would want to set TA against ABC . . . that’s a whole lot of junk because you need the added information and they’re both adding something . . . [ABC] doesn’t tell you anything about how the business can make money . . . It doesn’t tell you how many [products] I can make, or how fast . . . [but] TA will never tell you the right price to go to the market with for a product. So you need both . . . TA is *not* a product costing system (Waldron, 1994).

However, Waldron still insisted that departmental performance measures were required. The initial attempts at this were abandoned and a new system developed. Alongside the Primary Ratio (see formula 4) of ‘big T/TFC’, a new departmental measure was constructed:

$$(10) \text{ Departmental Ratio} = \frac{\text{throughput}}{\text{total facility cost}} \text{ or } \mathbf{t/tfc}$$

For the enterprise as a whole, a fairly uncontentious definition of ‘throughput’ can be created³. The identification of ‘departmental throughput’ is much more problematic. Abandoning standard minutes as a basis, schedule adherence was taken as the measure. This is daily delivery of products required on that day (not earlier or later). This represents at departmental level a surrogate for due date delivery or quantity of sales at enterprise level. This, however, did not produce the monetary measure which Waldron sought, and transfer pricing was still vigorously rejected. Two possibilities were proposed:

‘material value or some form of product cost value. It doesn’t matter as long as it is consistent’ (Waldron, 1994).

With this Departmental Ratio, Waldron predicted that supervisors would be encouraged to demonstrate improved performance by striving to meet the schedule (thus increasing ‘little t’), whilst simultaneously using less materials, people, and power (thus reducing ‘little t/c’). Because T/TFC is calculated in a different way from t/t/c, the departmental figures do not sum to the overall measure, but this was not seen as important. Instead, a new way of thinking about production was emphasized:

‘this has totally changed the supervisor’s job. I’ve made him responsible—*financially*—for his section’ (Waldron, 1994).

The emphasis on schedule adherence rather than more traditional measures was linked to other production changes which entail a rethinking of priorities. Supervisors’ inclinations to run large batches must be discouraged, because machining today might use up materials needed for other parts tomorrow. Thus, machine efficiency measurement should be avoided. In order to discourage the building up of WIP, it might be assigned zero value, because it is virgin material which has now been ‘spoiled’ and cannot even be sold to another manufacturer. This, however, is perhaps a rather drastic move which might prove unacceptable to managers, so Waldron thought it best to keep any form of product cost information off the shop floor. What was needed was information which would encourage useful activities and discourage irrelevant ones:

‘TA is about changing people’s working attitudes’ (Waldron, 1994).

Evaluating Galloway and Waldron’s TA

To a considerable extent, Galloway and Waldron’s version of TA represents a restatement of the contribution-per-unit-of-limiting-factor approach which has been discussed in management accounting for many years (see Drury, 1992, for a typical treatment of this). Thus, it might be incorporated into management accounting without requiring any major theoretical revisions. For example, the guide to official terminology for management accounting defines:

‘throughput accounting: a method of performance measurement which relates production and other costs to throughput. Throughput accounting product costs relate to usage of key resources by various products’ (CIMA, 1991, p. 15).

The first element is achieved at factory level by the ‘Primary Ratio’, which abolishes distinctions between direct and indirect costs and treats all costs (other than material) as fixed. This is a variant of the familiar marginalist approach. The second element, product costing, could provide a more marked contrast with conventional accounting practice. In the original

proposals, costs are attached to products proportionally to the demand they make on ‘the focal point’ and those which bypass this are costed as materials only. This would certainly be likely to change the cost information supplied to managers. However, this element of TA was withdrawn, and ABC advocated as an alternative to conventional costing. Similarly, the notion that WIP be valued at zero—as spoiled material—would be a significant change, but this was later seen as too extreme a step for managers and is not actively advocated.

For some, TA appears to be a short-term approach to decision making. This charge was roundly rejected by Coughlan and Darlington (1993) in relation to their version of TA, but Waldron (1994) was happy to accept it:

‘unashamedly TA has a short-term focus and thank god something does because standard accounting doesn’t, and I have to exist in the short-term. TA is very good in the short-term and is what it was designed for’.

This insistence on the importance of the short term stems from Waldron’s first close experience of accounting when managing a group of US companies in severe financial difficulty. This involved weekly meetings with bankers and he found that:

‘the accountants couldn’t tell me anything useful at that level’.

Despite the importance of the short term for corporate survival, he believed TA could also inform long-term decisions—but it needed to be used alongside other accounting information.

A key element in the development of TA is the attempt to create departmental performance measures. The original time-based measure (formula 5) and the two associated efficiency measures (formulae 6 and 7) do not meet the proposers’ own objective that:

‘standard hours and volume measures should be replaced by throughput achievement, lead-times and due-date performance measures’ (Galloway and Waldron, 1989a, p. 33)

since hours and volume are retained in the calculations. These measures were later withdrawn and replaced with the ‘Departmental Ratio’ of ‘little t/tfc’ (formula 10). There are further difficulties here.

The first difficulty is how ‘big TFC’ (Total Factory Cost) is to be divided between departments to produce ‘little t/tfc’ (total facility costs). This, of course, is the fundamental issue of overhead apportionment. Here,

‘One of the big steps was to say that the sum of all the “little t/tfc” didn’t have to equal “big TFC”—in other words I didn’t have to allocate things that are difficult to allocate’ (Waldron, 1994).

This side-steps the apportionment problem by concentrating on resources directly consumed at departmental level—in particular, labour hours and energy. The second difficulty is how the global value of ‘big T’ (factory Throughput) can be divided to produce ‘little t’ (departmental throughput).

If 'little t' is to relate to product price then some form of transfer pricing would be required. This, of course, has been a contentious issue in management accounting for many years, and is generally seen as an intractable problem. Rather than become embroiled in this matter, Waldron proposed an arbitrary, but consistent, allocation of monetary value to 'little t' based on material or product cost. Thus, whilst the physical measure of 'little t', based on schedule adherence, relates to global throughput, its financial expression is inconsistent with 'big T'. For accountants who have struggled with these issues for a number of years, the 'solutions' offered in Galloway and Waldron's approach may seem rather more appropriately termed 'evasions', and the self-consciously arbitrary positions adopted lacking in intellectual rigour.

Whether such theoretical issues have practical significance depends upon the managerial application of TA. Waldron (1994) argued that people's behaviour is determined by the measures used. The problem with conventional accounting systems is that they are essentially 'keep busy' measures without consideration of the purpose of activity. The intention of TA is to change people's thinking and hence their actions. For accountants, it may be important that a measure is technically sound and compatible with other measures. For managers, however, what is important is how measures affect behaviour. When presented with 'little t/tfc' departmental managers and supervisors should attempt to increase 'little t' and decrease 'little tfc' in order to score well. In the short term they are expected to strive to maximize schedule adherence; in the longer term, they are encouraged to reduce the quantity of materials, energy, and labour time consumed in doing so. Thus, the 'Departmental Ratio' provides managers with 'non-confusing information', which monitors their performance against the key objectives identified by senior management.

These key objectives begin with the maximizing of throughput, but this does not carry the overriding importance it has in TOC. Managers can improve their scores on the 'Departmental Ratio' by concentrating on operational expense rather than throughput. Once the schedule has been met the ratio becomes an index of cost reduction, and its measurement in monetary terms would seem to reinforce this drive. Inventory is also strongly emphasized, and Galloway and Waldron claimed that:

'above all else, we must remember the one truth—any decision which increases inventory is a bad decision' (1989a, p. 33).

This applies even to the buffers which TOC uses to protect bottlenecks, and which is a key element in Goldratt's approach to production (Jones and Dugdale, 1998). Waldron (1994) argued that such buffers incline managers to be relaxed about production constraints rather than strive to break them. Instead, following JIT principles, it would be best to set a target of zero stocks, which could be reinforced by assigning a zero value to WIP. Overall, the impact of adding TA to the schedule adherence measure would

appear to be to increase the emphasis on operational expense and inventory and thus dilute the attention given to throughput.

Like Goldratt, Waldron's central concern moved away from bottlenecks. This, however, did not lead to the identification of broader constraints, but to a very different concept—the 'focal point'.

'A focal point is that resource and/or skill which best reflects the businesses' relationship with its market' (Waldron, 1994).

At the corporate level, it refers to those activities which represent the distinctive feature of what the company offers the market—it represents the quintessential core of the business. At the local level, the focal point can be identified as the distinctive feature which each department offers the company. It was this thinking which led to the measure of cost per focal point minute (formula 8). Since the focal point should have more capacity than everything else, bottlenecks are likely to be elsewhere and TA could be used to identify 'bottleneck costs', which are the costs of the unused focal point time. Waldron argued that the management of focal points was the core issue in manufacturing and the way in which TA assists this is the criterion by which it should be assessed. However, the focal point is a difficult entity to define and identify (let alone measure) and although TA formula 8

'... worked, it just didn't add anything and people found that confusing' (Waldron, 1994).

Thus, although the concept of focal point was still used by Waldron in his analysis of companies, it was no longer central to his TA measures. TA was not seen as the leading edge in initiating change: its importance lay in ensuring that conventional accounting is prevented from hindering improvement, and new forms of accounting are compatible with changes initiated elsewhere in the organization.

From all these revisions and retractions, it is not clear whether the later formulation of Galloway and Waldron's version of TA can be described as a new system of accounting for throughput. There are certainly a number of contrasts between their approach and that of Goldratt. Behind the rhetoric of going 'back to basics' and redesigning management information systems, there appear to be many familiar accounting problems and solutions. Whilst 'big T/TFC' may be a distinctive throughput measure, attempts to apply this at departmental level immediately encounter conventional problems of overhead allocation and transfer pricing, and the various proposals for dealing with these have involved standard labour times and budgeted costs. The addition of TA to the schedule adherence measures actually seems to decrease the emphasis on throughput by adding new weight to operational expense and inventory. Although Waldron (1994) suggested,

'neither of us are accountants . . . and I claim it's a prime reason we can think clearly about the subject',

the path they have followed over the last few years may well have been trodden by many accountants before them.

TRANSFORMING PRACTICES?

TOC makes strong claims that conventional cost accounting is the key source of problems in UK and US manufacturing enterprises. Goldratt provides a general discussion of forms of accounting for throughput, and Galloway and Waldron propose a range of detailed techniques. The main emphasis of the Goldratt Institute, however, is that accountants should take up TOC and develop their own forms of TA applicable to their particular circumstances. The promise is that this will transform the fortunes of manufacturing enterprises. What are the prospects for this, and what evidence is there that such moves are taking place?

Potential for change

In many respects, TA represents a restatement of the existing accounting technique of 'contribution-per-unit-of-limiting-factor'. However, Noreen *et al.* note:

'The companies involved in TOC are different from most companies in that they actually put into practice much of the advice found in textbooks.'

What TOC appears to offer then, is not a new form of accounting as such, but an effective means of persuading practitioners to abandon long-established 'conventional' techniques and to replace them with those informed by TOC principles. There may, however, be some important barriers to this.

Goldratt's critique of conventional accounting may provoke an immediate hostile response which must be overcome before the potential contribution of TOC is recognized.

'Eli Goldratt has achieved some notoriety in accounting circles by declaring, on numerous occasions and places, the "cost accounting is the enemy number 1 of productivity"' (Kaplan and Atkinson, 1989, p. 419).

The form of new accounting which he proposes is also likely to face resistance. Many accounting academics have advocated variable or marginal costing systems for years, and yet these have not been widely favoured by practitioners. In part, this is because accountants are concerned about the long-term effects of allowing marketing managers—'the accountant's nemesis' (Macintosh, 1994)—scope to build up business through slashing prices. At present, absorption costing enjoys resounding support in US and UK business (Johnson and Kaplan, 1987; Drury *et al.*, 1993), and could prove difficult to remove. Even if accountants are persuaded that marginal

costing is preferable for management information purposes, it seems likely that absorption costing will remain central to financial reporting for the foreseeable future. Johnson and Kaplan's (1987) argument that US costing systems have been dominated by financial reporting requirements is also applicable in the UK, where they are enshrined in SSAP9.

One possible solution might be the operation of parallel but different management and financial accounting systems. If the only problem with this was the cost of information, which is Johnson and Kaplan's prime point, then cheaper, more powerful, information technology could alleviate this. However, the co-existence of conflicting information in companies can also increase the potential for misunderstanding, mistakes, and 'gaming' behaviour amongst managers. What should also be considered is the huge investment in human and technological resources which has gone into the creation of existing cost systems, and which continues to be needed in order to maintain them. Unless change is perceived as an overridingly urgent necessity, then the sheer inertia built into systems is likely to be a hindrance.

If all of this suggests a gloomy prognosis for the development of accounting for throughput, there are also more positive indicators to the potential for change in accounting practice. For example, although Waldron (1994) discovered from his consulting work that some accountants do resist change:

'there are two kinds of accountants ... [and some have] a very healthy scepticism for what they do. And they're easy to talk to.'

On this point, and perhaps only on this, Cohen (1993) agreed:

'many managers know that the accounting system is a constraint. They want to break out of this constraint.'

Thus, it would be wrong to stereotype the accountant as an arch-conservative force in management always opposing change, or to suppose that there are not already criticisms of conventional accounting amongst managers. Thus there is space for the introduction of new thinking.

Many accountants have been exposed to this thinking. TA has begun to appear in textbooks (e.g. Drury, 1992; Yoshikawa *et al.*, 1993; Bromwich and Bhimani, 1994) and has been incorporated into CIMA syllabuses. CIMA Mastercourses on 'TOC in Accounting' (CIMA, 1993a) have attracted over 100 practitioners from scores of companies, and there have also been CIMA Branch presentations by members of the Goldratt Institute and others. *Management Accounting* has published a number of articles in the area. A substantial time-slot in the CIMA (1993b) promotional video is devoted to TOC/TA ideas, alongside discussion of standard costing, ABC, and non-financial performance measures.

These forms of presentation are directed at accountants (or those interested in accounting) but other, less direct, routes may be more potent. Goldratt's ideas have had their greatest impact in production management.

TOC is now routinely taught on production control and operations management courses, and is familiar (through *The Goal*) to a generation of manufacturing managers. Within production, OPT systems have been implemented by a large number of companies, including many industry leaders (Wheatley, 1986). OPT may be seen as a Trojan Horse, since it smuggles TOC ideas into the company. Managers following OPT schedules will discover that buffers are built-up at bottlenecks, inventory is stripped elsewhere, and batch sizes are reduced. All of this has a knock-on effect on accounting information which, together with the new schedule adherence information, can alert accountants to changes taking place within production. Those accountants whose curiosity is aroused may then be prompted to explore further and follow the theoretical steps from OPT to TOC to accounting for throughput which we have laid out in this paper. Thus, software, rather than the written word, may be a strong influence changing accounting practice.

Evidence of change

Cohen (1993) found that many aspects of Goldratt's work are greeted with the remark 'but this is just commonsense' to which he would reply 'yes, but it isn't common practice'. Evidence of the take-up of TOC and TA in the accounting practices of UK enterprises is limited. There are few large-scale surveys which have included specific references to accounting for throughput, and those that are available need to be treated with considerable caution. For example, Bright *et al.* (1992) present the finding that 40% of companies were using, or planning to use, TA (compared with 60% for ABC). However, their discussion of these findings raises considerable doubt about the meaning of such claims because the figure reported:

'did not conform to our own observations . . . [and] many managers were willing to debate the advantages and disadvantages of different "advanced" techniques and practices with only a very tentative understanding of what the terms embraced and involved' (p. 204).

Managers appeared eager, or perhaps pressured, into reporting interest in new techniques even if this interest was tentative or notional. Questionnaire survey evidence is unlikely to provide a reliable guide to what is actually happening in UK manufacturing (Dugdale and Jones, 1998).

In our field research, we discovered nine companies⁴ where there had been some development of accounting for throughput. Of these, three may be seen as having an uncommitted interest in TA. In a *pragmatic mode* of change (Jones and Dugdale, 1998), they used TA techniques alongside other developments, such as ABC or target costing. Implementation might be described as hesitant, patchy, or experimental, and there was no indication of abandoning conventional accounting or of a paradigm shift in thinking.

The other six companies showed a committed interest in accounting for

throughput. In a *paradigmatic mode*, accountants had not only changed their systems but had taken-on the thinking which lies behind the throughput-oriented changes. Since we had particularly targeted companies which had made a strong commitment to change, the relative proportions in our sample should not be taken as representative of those companies who claim an interest in TA in questionnaire surveys. Our finding that, of the nine companies expressing an interest in TA, six were actually implementing significant change, is (almost certainly) an exaggeration of the general level of commitment.

Within these six companies, there were a number of similarities. The strongest was that the change to both production and accounting was prompted by an urgent necessity to change. In five cases, this was because the company either had low and falling profitability, or was already unprofitable, in conventional financial accounting terms. In all these cases, the Financial Directors/Controllers were convinced that the threat of plant closure was real and imminent unless dramatic change in performance could be achieved quickly. This was cited in each case as a key factor in instigating change. In the sixth case, the company was profitable, but Group management regarded it as insufficiently so, and the Financial Controller of another company within the Group was promoted to take over as General Manager. He had been involved in TOC-inspired changes in his previous post (in one of the other companies discussed here), and effectively put himself under short-term pressure by predicting a swift and steep rise in profitability following the introduction of TOC into his new plant. In five cases, interest in accounting for throughput followed the introduction of OPT⁵ software. In some cases, the reconsideration of accounting which this prompted was informed by Galloway and Waldron's discussion of TA, but in no case was this pursued by accountants. However, the ideas of Goldratt—usually through reading *The Goal*—had an important impact on accountants' thinking.

These findings need to be treated with caution. Clearly, the companies are exceptional: but that in itself may be an important factor in change. They are 'under the hammer', both in terms of the battering that managers receive from senior levels over their poor profitability, and in the prospect of their companies being closed or auctioned-off. These circumstances are reminiscent of Alex's predicament in *The Goal*, and also of Waldron's first close encounter with accounting. It is likely that these circumstances are conducive to the paradigm shift entailed in accountants becoming committed to TOC. Of course, it is usually the survivors who tell the story of what follows. We do not know of any companies that adopted TOC and then failed, but since this evidence is not easy to obtain, we cannot be confident that they do not exist. However, the survivors are united in their view that the new vision offered them by TOC was crucial to the success of their companies, and that now they cannot go back to seeing the world in conventional accounting terms.

CONCLUSION

The terms TOC and TA are often used interchangeably, but in the UK, the latter has become widely associated with the particular version (or versions) proposed by Galloway and Waldron. Here, although there are a number of similarities, we also find important differences. Whereas Goldratt stresses the harmful effects of using measures of local optima, Galloway and Waldron attempt to create new ones to provide 'non-confusing information' to steer managers and supervisors in the prescribed direction. The devising of these new measures has proved difficult and some of the early proposals have been amended or withdrawn, and ABC is now preferred as a costing methodology. In struggling to create TA measures, Galloway and Waldron encountered familiar accounting problems, and their solutions are not indicative of a fundamental shift in accounting theory. In contrast, TOC is not centrally concerned with devising new accounting measures. What it offers, instead, is a new vision of the nature of manufacturing enterprises which requires a paradigm shift among accountants. In disseminating ideas, the Goldratt Institute sees its role as introducing accountants to TOC and encouraging them to develop their own information systems. For this and other reasons, the Institute is hostile to Galloway and Waldron's development of ready-made TA methods. The drive is to remove much accounting (mis)information, to simplify what remains, and ensure it is directed at maximizing throughput.

In a previous paper in *BAR* (Jones and Dugdale, 1998), we argued that, for those who believe that there is a need for a fundamental transformation in manufacturing, TOC offers a coherent, comprehensive, and persuasively articulated alternative to conventional management approaches. We suggested that this involved a 'paradigm shift', changing both perceptions and values in relation to manufacturing. In companies changing in a *paradigmatic mode*, this could lead to a transformation in which old theories and practices are abandoned and replaced with new ones. In other companies, there is a *pragmatic mode*, where TOC ideas are adopted as one element in a 'portfolio' composed of 'traditional' and other 'new' management approaches.

Tentatively, we suggest that companies adopting TOC in paradigmatic mode are likely to be those which face the real and imminent prospect of extinction if dramatic change is not achieved. In such companies, transformation may be led by production or marketing managers, rather than accountants. If accountants respond to these initiatives, the removal of traditional accounting information (following its identification as a key constraint on improving throughput) is likely to be influential in the short term. In the longer term, the paradigm shift may lead accountants to develop a range of techniques directed at encouraging or reinforcing managers' attention to throughput. Rather than a distinctive technique of TA, we may see various forms of accounting for throughput emerging in different companies.

There are a number of factors which can militate against a fundamental change in accounting practice. These include inertia in the existing infrastructure of costing systems and financial reporting requirements, the switch to marginal costing (which practitioners have resisted for a number of years), and the demotion of accountancy as a central managerial function. For those accountants in companies not facing crises, the response to TOC and TA is more likely to be the *ad hoc* use of particular measures or techniques to supplement, rather than replace, existing systems. Here accounting for throughput may be seen as adding another instrument to the accounting toolbox and giving managers an extra perspective on traditional issues. From the viewpoint of TOC, this would, in effect, be to capture accounting for throughput for the 'Cost World'. Far from creating or facilitating a paradigm shift, this would reinforce conventional thinking, and thus be part of the problem rather than the solution.

Whether change follows a paradigmatic or pragmatic mode may well be the decisive factor determining whether the accounting practices discussed in this paper actually deliver the transformation of manufacturing which their advocates promise.

NOTES

1. A novel about production which popularized throughput ideas (Goldratt and Cox, 1984, 1993).
2. As Noreen *et al.* (1995, p. 20) point out 'there are no specific guidelines in TOC literature about how this local-operating-expense control actually would work'.
3. This is if we are prepared to treat some objections as mere quibbles—for example, whether the 'material cost' of throughput should be treated as the cost of material purchases or the material cost of sales.
4. The term 'companies' refers in all but one case to divisions within larger enterprises. One of these, our first site, is the subject of a detailed case study (see Dugdale and Jones, 1996). In this company, we found a committed approach to TOC which began in production and then had a significant impact on accounting. In turn, changes in accounting influenced production, purchasing and marketing.
5. Or variants of this such as OPTICS or ST-Point.

REFERENCES

- Bright, J., Davies, R.E., Downes, C.A. & Sweeting, R.C. (1992). 'The deployment of costing techniques and practices: a UK study', *Management Accounting Research*, Vol. 3, pp. 201–211.
- Bromwich, M. & Bhimani, A. (1994). *Management Accounting: Pathways to Progress*, London, CIMA.
- Cohen, O. (1993). *Research Interview*, November.
- Coughlan, P. & Darlington, J. (1993). 'As fast as the slowest operation: the theory of constraints', *Management Accounting*, June, pp. 14–17.
- CIMA (1991). *Management Accounting: Official Terminology of the CIMA*, London, CIMA/Unwin.

- CIMA (1993a). *TOC in Accounting: Throughput and Beyond* (Mastercourse Brochure), London, CIMA.
- CIMA (1993b). *Essential Issues in Management Accounting: A CIMA Accountancy TV Video*, London CIMA.
- Drury, C. (1992). *Management and Cost Accounting: 3rd Edition*, London, Chapman & Hall.
- Drury, C., Braund, S., Osborne, P. & Tayles, M. (1993). *A Survey of Management Accounting Practices in UK Manufacturing Companies*, London, ACCA.
- Dugdale, D. & Jones, T.C. (1996). *Accounting for Throughput*, London, CIMA.
- Dugdale, D. & Jones, T.C. (1997). 'How many companies use ABC for stock valuation? A comment on Innes and Mitchell's questionnaire findings', *Management Accounting Research*, Vol. 8, pp. 233–240.
- Galloway, D. & Waldron, D. (1988a). 'Throughput Accounting—1: The need for a new language for manufacturing', *Management Accounting*, November, pp. 34–35.
- Galloway, D. & Waldron, D. (1988b). 'Throughput Accounting—2: Ranking products profitably', *Management Accounting*, December, pp. 34–35.
- Galloway, D. & Waldron, D. (1989a). 'Throughput Accounting—3: A better way to control labour costs', *Management Accounting*, January, pp. 32–33.
- Galloway, D. & Waldron, D. (1989b). 'Throughput Accounting—4: Moving on to complex products', *Management Accounting*, February, pp. 40–41.
- Goldratt, E. M. & Cox, J. (1984, 1993). *The Goal*, London, Gower.
- Johnson, H.T. & Kaplan, R.S. (1987). *Relevance Lost: The Rise and Fall of Management Accounting*, Cambridge, Mass.; Harvard Business School Press.
- Jones, T.C. & Dugdale, D. (1998). 'Theory of Constraints: transforming ideas?', *British Accounting Review*, March, pp. 73–91.
- Kaplan, R.S. & Atkinson, A.A. (1989). *Advanced Management Accounting (2nd ed)*, Prentice-Hall International.
- Lewis, D. (1993). 'The Theory of Constraints in accounting', *CIMA Branch Meeting*, November, Swindon.
- Macintosh, N.B. (1994). 'Management accounting's dark side', *CA Magazine (Canadian Institute of Chartered Accountants)*, September, pp. 40–44.
- Noreen, E., Smith, D. & Mackey, J.T. (1995). *The Theory of Constraints and its Application to Management Accounting*, New York, North River Press.
- Waldron, D. (1988). 'Accounting for CIM: the new yardsticks', *EMAP Business and Computing Supplement*, February, pp. 1–2.
- Waldron, D. (1994). *Research Interview*, February.
- Wheatley, M. (1986). 'How to beat the bottlenecks', *Management Today*, October, pp. 84–86.
- Yoshikawa, T., Innes, J., Mitchell, F. & Tanaka, M. (1993). *Contemporary Cost Management*, London, Chapman & Hall.