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Quality Control Procedures in Small Businesses [and Discussion]

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Quality control procedures in small businesses

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This paper describes the results of a face-to-face interview survey with 40 owners of small businesses in northeast England: 20 were fast-growth firms and 20 were 'matched' firms. As part of that survey, respondents were asked about the extent to which they used statistical methods for quality control and new product testing. Their use was very limited indeed in either context, but was appreciably higher for the fast-growth firms than for the matched firms. Limited use in the testing of new products was explained by the fact that nearly 40% of firms have introduced no new products in the last two years. Slightly more use was made of statistical methods in quality control, but in these cases the initiative generally came from the customer, rather than the firm. Nevertheless, most firms did not feel they lacked advice on these matters, but rather that statistical methods were inappropriate for the needs of their business.

1. Introduction

This paper reports the results of a study of factors affecting the performance of small firms, one aspect of which is their attitudes towards, and procedures for, quality control.

The key distinction is made between fast-growth small firms and 'matched' firms, and so in the next section a brief description is provided of the characteristics of the firms themselves and how they were selected.

In §3 the responses of firms to a set of questions on quality control are examined. Here, not only are the statistical results reported, but we also report verbatim the responses of the firms concerned. It must, however, be emphasized that in total only 40 firms were interviewed, 20 of which were fast growers and 20 of which were matched, and so it cannot be assumed that the results are necessarily capable of wide generalization. Rather, the purpose is to provide some pointers towards quality control in small firms, an area in which there appears to have been very little work to date.

2. The characteristics of the firms

From a statistical viewpoint a collection of small firms differs from a collection of large firms in several important respects. First, small firms have a much higher failure rate than large firms, so that any random sample of small firms will contain on average approximately 40% of firms which will not be trading in three years. An examination of the performance of small firms shows that they exhibit a much greater year-to-year diversity, and within sample variance, than large firms. The most important statistic to recall when discussing a small firm's performance is that out of every 100 businesses started, 40 cease to trade in the first three years, and a further 20 cease over the next seven. At the end of a decade therefore, only 40 remain. However, the fastest-growing 4 will provide half the jobs and make perhaps more than half the contribution to the national economy (Storey *et al.* 1987).

These fast-growth firms are therefore the focus of attention by both public policy makers and the private sector financial institutions.

We have made a clear distinction between fast-growth small firms and other firms in the way in which we derived our sample. All firms in the survey are located and owned in the northeast of England, defined as the counties of Northumberland, Durham, Tyne and Wear, and Cleveland. They may, however, have factories or outlets outside this region. With one exception they are all firms with fewer than 500 employees.

A total of 20 fast-growth firms were identified from information available to the researchers, 15 of these firms being in the manufacturing sector and 5 being in the service sector. Each firm was then matched on an individual basis with another firm in the region, which was of a similar age and which operated in the same sector.

It has to be emphasized that the matched firms are not necessarily firms which are performing badly. Instead, they are selected purely on the grounds that they are comparable to a known fast-growth business in terms of age and sector. Indeed, for the firms where we were able to obtain financial data, it appears that in terms of rates of pre-tax profitability there was no significant difference between the two groups.

The fast-growth firms, however, have much higher levels of absolute profits and much higher levels of employment than the matched firms as is shown in table 1.

TABLE 1. EMPLOYMENT IN SAMPLED FIRMS

(Two firms not started by their current management are excluded.)

decade in which firm established	fast growth mean	fast growth median	fast growth n	matched mean	matched median	matched n
1960s	167.3	120	4	8	8	1
1970s	410.0	190	3	69.4	90	7
1980s	75.9	49	11	23.8	11	11

3. THE USE OF FORMAL METHODS OF QUALITY CONTROL AND NEW PRODUCT TESTING

Each firm was asked about its use of formal methods of quality control, and the responses are shown in table 2. From this it is clear that use of quality control charts and of sampling techniques is very low. Among the fast-growth firms, between 20–30 % use these techniques, but among the matched firms there is almost no usage at all. Further analysis shows that the firms which use quality control charts are broadly the same as those who undertake acceptance sampling, so that there is a considerable majority, even among those in the fast-growth group, who use neither of these techniques.

TABLE 2. USE OF FORMAL METHODS OF QUALITY CONTROL

methods	fast growth no.	fast growth (%)	matched no.	matched (%)
quality control charts	5	25	2	10
cumulative sum charts	3	15	0	0
acceptance sampling	6	30	0	0
acceptance sampling of final product	6	30	0	0
total number of firms	20		20	

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All firms were then asked whether, during the development phase of new products, they used systematic planned experimentation and testing in testing for reliability and quality. The responses of the firms are shown in table 3, but to appreciate its significance it has to be noted that while 17 of the fast-growth firms had introduced new products in the last two years, only 8 of the matched firms had done so. Even so, it is clear that the use of sophisticated procedures is almost absent from both groups. It also appears that matters are not expected to change much over the next two years; 18 of the fast growers expected to introduce new products compared with only 8 of the matched firms.

TABLE 3. THE DEVELOPMENT OF NEW PRODUCTS

development phase use of	fast growth no.	fast growth (%)	matched no.	matched (%)
systematic multifactor experimentation to find optimum conditions	3	15	0	0
systematic rather than haphazard experimentation to find trouble spots	2	10	0	0
systematic variation of factors to find conditions of maximum reliability	3	15	0	0

When firms were asked about access to advice on experimentation and testing a perhaps surprising number of firms considered that they currently had access to such advice. Indeed, as table 4 shows a higher proportion of the matched firms considered themselves to have access to this advice, than was the case for the fast-growth firms. It was not possible in all cases for respondents to identify the specific source of advice, but, as is normal for small firms, it was rarely either the government or the universities. The table shows that the 'other' category was the most frequent, with this including other small firms that they knew, the trade association, family members, but most frequently their customers. For example, several of the firms sold a high proportion of their output to one firm, who laid down in meticulous detail how the product was to be produced. In the lower half of the table, it is shown that those firms which stated that they did not have access to advice in this area were unconcerned because they had no need for such expertise. This conclusion is of course not surprising for the matched firms, which had not introduced new products and had no plans to do so in the next two years. It is, however, slightly more surprising for the quite substantial number of fast-growth firms that do have such plans.

TABLE 4. ACCESS TO ADVICE AND EXPERTISE

	fast growth no.	fast growth (%)	matched no.	matched (%)
with access to specialist advice	8	40	11	55
without access to specialist advice	10	50	9	45
advice from:				
consultant	1	5	3	15
government	1	5	1	5
academic	0	0	2	10
other	6	30	5	25
where no access to advice:				
no need for service	7	35	7	35
non-availability of people	1	5	1	5
other reasons	2	10	1	5

4. Quality control and new product testing: the corporate view

In addition to the specific questions discussed above, each firm was also asked to discuss, more generally, its corporate philosophy in matters of statistically based planning in the development phase of new products and also in the area of quality control. As would be expected, the responses were extremely diverse and so we shall not provide any detailed statistical tabulations in this section of the paper. Instead, we shall indicate the issues which the firms themselves stressed, with only a broad indication of frequency. As noted earlier, because all interviews were taped, it is possible to provide verbatim quotations from the respondents to amplify these frequencies.

The two most frequent matters raised by the firms in this context were 'The boss checks everything before it goes out' and 'It is the customer who sets the standards'.

(*a*) '*The boss checks everything before it goes out*'

It must be recalled that many of these firms are very small and the output from them can be quite modest. In some cases, the 'output' is in fact a service as in the case of the proprietor of a fast-food restaurant.

> Quality control is only appropriate if you have a large enough turnover to employ somebody to stand and look at the quality. We simply haven't got the turnover to pay somebody £6000 or £7000 to do that. So we do it ourselves. So I stand there for 14 hours a day and keep an eye on every product going out. If it doesn't look nice, then I get it replaced.

It is important to emphasize that *every* product is checked by the boss. As we have seen above, there is almost no use at all made by the matched firms of sampling procedures, and even among the fast-growth firms their use is relatively modest.

(*b*) '*It is the customer who sets the standards*'

A number of firms emphasized the role played by their customer. About one quarter of firms had either only a single customer or a very small number. Frequently, this customer was either a large firm or a public organization, which not only specified the design and specification of the product, but also the forms of quality control which were deemed to be appropriate. Where this occurred, it was almost always welcomed by the firm because it was felt that these good practices rubbed off to other parts of the business. One firm which undertook work for the Ministry of Defence (MOD) expressed it in the following way.

> To get approval from the MOD, they impose stringent procedures and tests, and we have to show that we can carry them out. They visit us, provide us with a quality assurance manual which details the specification of the semiconductor until it goes out of the door. We think these are all good procedures, and so we adopt them as a matter of course in other parts of our business.

The importance of a large customer, imposing quality controls having benefits for the small firm, is also apparent in the case of the following small food manufacturer.

> Marks and Spencer impose controls upon us. The nice thing is that you can't set up an operation for them and run two standards because you never know when you will be using the line for them. So you end up going for the high standard all the time.

Indeed, it is clear that the customer is a key driving force for several of the firms which claim to use sophisticated quality control methods. Furthermore, it is also clear that the absence of

a key customer for the matched firms is a major reason why none of them have such controls.

In the slightly larger businesses, where it is not possible for the boss to check every item, the area of quality control is devolved to the workforce. In some cases, a specific individual has the sole duty of ensuring quality control, whereas in other cases, the task is given to a manager who may have other responsibilities. In any event, many firms stressed, and even prided themselves, on the fact that everything continued to be checked at every stage. In many respects, the following textile firm is typical.

> We do a 100% check. In fact we do a 200% check. We inspect on the end of every line, then we inspect finally before the garment goes out of the door.

Even so, the same firm was to admit later on that

> This business basically revolves round people. Quality control methods are just an area in which we haven't invested at the moment. It comes down to the individual and the customer. If he says the quality is O.K., then the system is working.

This again illustrates the importance of the customer in determining the nature of quality control procedures employed. Even so, in these slightly larger small firms, the devolving of quality control to the workforce can be handled in perhaps three main ways, inducing the following types of response.

(i) An individual is given sole or prime responsibility for quality control.
(ii) Quality control is the responsibility of the workforce.
(iii) Production is so systematized that it eliminates the need for quality control.

(*c*) *An individual is given sole or prime responsibility for quality control*

Even where an individual is given responsibility for quality control, the organizational profile of the task varies markedly from firm to firm. One owner-manager noted that

> Our quality control girl is responsible to me and to nobody else. She walks into any department and can take any of the products apart to make sure it is correct.

Even so, this firm recognized that it had major problems in all aspects of its production management. Its overall level of operating efficiency was low and, despite the above statement, there were a number of other indications that the firm would have been prepared to sacrifice quality to increase output.

(*d*) *Quality control is the responsibility of the workforce*

While a number of firms did indicate that an individual had a specific responsibility for quality control, as many indicated that the responsibility for quality was a collective one. One respondent, asked to describe policies towards quality control, said

> The staff know the kind of standards which I demand and they ensure that they are maintained.

Another firm echoed this view that quality control did not require procedures, but was merely a question of good working discipline.

> As components are being produced we take them from the line. The guys in the factory are made aware that they are responsible for good quality. It is a normal factory operation.

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(*e*) *Production is so systematized that it eliminates the need for quality control*

Several firms referred to recent changes in technology and in work practices, which they felt had reduced the need for quality control. One printer stated

> With electronic printing, maintaining high standards of quality is relatively easy anyway. The machine does it all; there is nothing like the high element of skill which was required with the old lithographic printing.

Another firm emphasized improvements in work practice.

> The way we have got the consistency in the product has been by systematizing the whole procedure from start to finish. This eliminates the individual's discretion and has meant that the consistency and quality has come through.

The above firm was in the specialist business of reconditioning engines for motor vehicles, but much the same philosophy is apparent from the proprietor of a fast-food restaurant.

> The sort of person we employ is 17–18 years old, female and it has to be said, of below average intelligence. The system is simplified wherever possible. It is a repetitive job, but machinery takes the difficulty out of cooking the chips. There is no thought process which has to go on.

If, however, we are to identify the elements which are distinctive to small firms, there are probably three. The first has already been discussed and is that the operation is often sufficiently small for the boss to be able to check everything himself. The second is that many small firms produce either a unique product for which there is no absolute standard of quality or produce a product or service on a bespoke basis.

(*f*) *No absolute standards*

Some firms, which did not have a major customer laying down standards of quality for them, were concerned that there were no clear standards which the final product should meet. The following firm begins by articulating the view that the workforce is expected to have a concern for quality, but that this concept can be difficult to identify in practice.

> We employ and train people to a very high standard. All the skilled people on the shop floor feel and exercise a responsibility for quality ..., but the problem is that there are no absolutes in terms of quality in our business. It is possible to argue that something less than 100% is acceptable either because of the nature of the customer, or the pressure under which we are put to produce it quickly.

(*g*) *Bespoke products*

An associated issue is that a number of firms produce one-off or bespoke items either from a specification provided by the customer, or where the firm itself designs the product to meet specific needs. For example, for a firm which produces artificial limbs on a bespoke basis, it is difficult to envisage the same concept of quality control as would occur on a conventional production line. Nevertheless, it is possible to ensure that the mouldings and the sewing are of an appropriate quality. The real merit of the product, however, lies in the extent to which it is effectively designed to overcome the patient's disability.

(*h*) *The extreme cases*

As can be seen, most small firms in this survey regard quality control as important, but few employ sophisticated techniques as part of their production processes. There were, however, a

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small number of firms in the survey which contradict that general statement. One fast-growth firm prided itself on its use of mathematical and statistical techniques in all aspects of the business. It employed a qualified quality assurance officer and used sampling techniques at all stages. Unlike most of the other firms this was not required by the customer, although recently a major order from the MOD had specified the use of these techniques. The company itself, however, believed that it only got the order because it was able to demonstrate a familiarity which its rivals were unable to show.

If this firm is at one end of the spectrum, then there were also a number of others who professed either a lack of interest in the matter or who indicated that quality control was not relevant to them. For example, a software house stated

> Quality control is not desperately important because we are selling books and bits of plastic duplicated by a professional company. The only thing that can go wrong from there is that the wrong thing gets put in the wrong box, and we do control for that by making spot checks on the shelves.

Alternatively, among some firms there was a realization that present procedures were not adequate. One firm said

> I know that our quality control procedures are not very good. Of course I try and keep an eye on what is going out, but I am often disappointed to see faulty goods slipping through. Really, I suppose there is no formal quality control, and I know there should be.

5. Conclusions

From the above survey results it can be seen that very few small firms extensively use sophisticated statistically based procedures for quality control and new product testing. It is, however, true that fast-growth firms are more likely to employ these methods than the matched firms, although this is often because these requirements are imposed upon the firm by a major customer.

The reasons given by the firms for lack of use vary. It must be remembered that about one third of the sample had not introduced any new products in the last two years and had no plans to introduce any in the next two years. Clearly, new product testing is irrelevant for this group. For those which have introduced new products, the vast majority used informal, *ad hoc* methods because these were thought to be more appropriate to their business.

Statistical methods were also used only infrequently by small firms in quality control. Those firms using such methods tended to have them imposed by a major customer, although once they were in operation the firms themselves saw the benefits in applying them to all orders, not simply those for the major customer.

For those not using such methods, the majority considered that such techniques were not relevant to their business. In some cases output was very small and could be checked by the boss, with possible checks at intermediate stages. In other instances, the products produced were of a bespoke or one-off type where statistical methods of quality control were less relevant.

Even so, there were a sizeable proportion of firms which would be likely to benefit from improved quality control. A number of these firms recognized that they were likely to be

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affected by the introduction of British Standards in their industry. Almost without exception they were both hostile and fearful of the consequences. For example, one firm said

> We have quality assurance from all the big companies. We do not have BS5750 or anything like that. I will not be bothered with things like that because it is a paper-chasing exercise. Because you have a piece of paper saying something is right doesn't mean to say that it is. You don't need a piece of paper to tell you whether or not a part works. You just put it on the machine and try it.

A somewhat more positive response came from another firm.

> We know that BS5750 is coming, but currently we cannot afford the personnel. In time we realize that it will be essential to install these procedures.

A further interesting conclusion from this small survey is that, although most small firms do not use sophisticated forms of quality control, few firms attribute this to the absence of advice on these matters. Where advice is needed, it is obtained from customers, trade associations or private sector consultants. Rather less frequent use is made of government or academic sources. Where advice is thought to be unavailable, this is no cause for concern because such advice is not required by most firms. It is possible that the gradual introduction of more uniform standards of product quality may lead to changes in this finding.

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Discussion

S. J. Morrison (*University of Hull, U.K.*). The resistance to statistical quality control among some small firms experienced by Dr Storey is similar to that found in a survey of the British machine tool industry in 1981–1984. The dogmatic view of one chief executive that there was absolutely no place for statistical quality control in the machine tool industry seemed to be reflected in the attitude of many of his opposite numbers.

It was apparent that in many machine tool firms the failure to use statistical methods was due to the absence of any formal quality-management structure. A quality-management model for the machine tool industry was developed and was later published in a more general form suitable for any industry (Morrison 1985). In that publication, the myth that small firms cannot afford quality management was demolished by pointing out that the whole range of management functions all have to be performed even in the smallest firm. These are accommodated quite simply by individuals having to wear more than one 'hat'.

No firm of any size can afford to be without quality management. What is necessary is that the quality-management 'hat' should be suitably fashioned and correctly worn. When that is done, the use of statistical methods will follow as a matter of course.

D. J. Storey. I strongly agree with the comments of Mr Morrison. The results of our survey clearly show that it was the faster-growing firms which were most likely to be using statistical methods for quality control. It is also the same firms that are most likely to be professionally managed. Mr Morrison's point that use of statistical methods and quality management are strongly correlated is entirely valid.

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