Service performance measurement using simple techniques actually works

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Abstract *Asserts that there is good evidence that service quality may be achieved and sustained in the same way as is currently achieved and sustained in manufacturing industry by using simple measurement techniques. Moreover, there is evidence to suggest that the opportunity for continuous improvement that exists in manufacturing is also available in service applications. A simple experiment, using a small sample, indicated positive signs of predictive validity. The methodology chosen measured the service performance through a self-assessment technique. A fortuitous error in sampling enabled a de facto control group to be inferred that substantiated the existence of a continuous improvement component that was driven by the "measurement effect".*

Environment

Service performance measurement is the subject of eclectic interest. This has its expression in the public and private sector, being of relevance to commercial, legal, and academic interest.

- Commercial interest is expressed in continuous improvement programmes that are the subject of quality accreditation that addresses competitive strategic marketing issues.
- Legal interest is expressed by the Directives of the Local Government Act of 1992, the provisions for the disabled and other related legislation that followed the initiatives of the Citizen's Charter and the Patient's Charter.
- Academic interest in this area is evidenced variously, and with increasing rigour in the wake of Parasuraman *et al.* (1985), whose work defined and developed the parameters of service attributes and quality constructs.

Service myopia

Service performance measurement is also of increasing interest to a growing number of customers, whose attention and interest on service quality has far greater focus and acuity than can correspondingly be matched by a wide range of service providers. Where once it was common currency to deride product quality, it is now de rigueur to deride service quality. Manufacturing appears to have eroded its tarnished image, zeroing its defects and righting itself first time,

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whilst services appear to have inherited manufacturing's former image, consequently the perception of "service quality" is now often an oxymoron. Although much work has been done to address the customer clamour for satisfaction and symmetry, little work appears to have been done on how this can be sustained, and more importantly, whose job it is to sustain it.

Measurement approaches 1 – SERVQUAL

Much of the literature replicates and progresses work through the SERVQUAL model, and whilst much has been published that expands on, challenges or criticises this five-dimensional model, little discussion exists that brings new light on workable performance measurement systems. The SERVQUAL model is predicated on the notion of the performance gap as a basis for the measurement of service quality, though it has been suggested that there is little theoretical or empirical evidence to support this (Palmer, 1994; Carman, 1990). There are said to be three major areas of contention: the length of the SERVQUAL questionnaire; the validity of the five dimensions; and the model's inability to predict future performance (Hoffman and Bateson 1997; Cronin and Taylor, 1992). It has also been suggested that the model is too generic, and cannot be applied to specific industry measurement criteria (Kurtz and Clow *et al.,* 1991). The authors of the model themselves have suggested that there are intrinsic difficulties in the use of SERVQUAL that arise in attempting to measure perceptual components in service encounters.

For example, customers' perceptions of service quality are resolved by the reconciliation of prior expectations, the service process and the outcomes. The likelihood of manifold variability of expectations therefore will likely promote a high incidence of randomness, thus compromising opportunities for standardisation and ultimately conformance. Perceptual and attitudinal variability has thereby rendered a customer-based approach less feasible than a performance-based approach.

Measurement approaches 2 – SERVPERF

A comparison of gap 1 (customer expectations and outcomes) and gap 2 (service provider expectations) suggests that performance-based analysis is a more effective approach to measuring quality because of its ability to explain variation in customer satisfaction (Elliot, 1995). Many support the case for a simple supplier performance measurement (Bolton and Drew, 1991; Churchill and Suprenant, 1982). Indeed, much is currently in press on the relative effectiveness of the service performance measurement (SERVPERF) and the SERVQUAL approach (Angur, 1998; Cronin and Taylor, 1994).

Most approaches to service performance measurement lack demonstrable control systems that regulate quality through the measurement of standard performance. Jensen and Markland (1996) posit a statistical model based on SERVQUAL, and claim increased performance values when used longitudinally. Motwani *et al.* (1998) support the use of TOC (Theory of Constraints) and BPR (Business Process Reengineering) methodologies to gain

competitiveness. Headley and Choi (1992) postulate that key ideas from statistical control thinking can improve service quality approaches. This is supported also by Lapierre (1996) who suggests that the most promising avenue of future research has to do with predictive validity – standard performance in quality control is a prerequisite of predictive validity. Johnson *et al.* (1995) argue for a systems-based approach that emulates the general systems theory used in manufacturing industries.

Measurement approaches 3 – Deming demands

The methods used in the manufacture of products feature many opportunities to regulate and systemise operations through physical measurement, leading to continuous improvement to product quality. This reduction of randomness and error, conformity to specification, and effective quality control, has become the responsibility of those closest to the product's manufacture, this being an acknowledgement that such staff are the most able to achieve this by their position, knowledge and experience. This is a classic Deming management philosophy (Rienzo, 1993). In interpreting Deming's work as for service operations, he illustrates Deming's (1986) 14 points as moral principles rather than actions, suggesting that these require a radical shift in provider predispositions, attitudes and beliefs, and cites two case study examples in support of their appropriateness in service businesses.

However, in seeking comparable service quality to that of manufacturing, the "manufacture" of the "service product" features fewer opportunities to regulate and systemise its operation. Moreover, those closest to the service "product", contact staff, although held to be accountable for service failure are often not given the responsibility or latitude to effect improvements, and consequently are unable to consistently or reliably control quality.

Comparative staff skills in manufacturing and service industries are brought into sharp contrast when considering the "hard" skills of a production worker and the "soft" skills of a service worker. The former may be confident that their work is satisfactory, the evidence for which is demonstrable by physical measurement of output and resultant products. The latter must rely on "feelings" at best since little reliable evidence remains after "production".

Service quality can equal product quality

This paper seeks generally to challenge the view that perpetuates the division between products and services in terms of performance, and asserts that there is good evidence to suggest that operational control of service performance can be approached by utilising a simplified manufacturing operations control model. This proposition specifically challenges the extant view that holds that because service performance is subject to variability, little can be achieved when compared to manufacturing performance, whose operation can be more physically regulated and thereby controlled. It is noted that this discrepancy is subsequently held out as a reason why it is impractical to attempt to control service performance, a view that appears to neuter the potential for the

generalisability of operations control. This assertion is supported by the discussion of a small-scale experiment undertaken to test the proposition that the "manufacture" of the service "product" could be measured consistently, and that such measuring may enable the basis for systemised quality control in service delivery.

The research hypothesis is therefore predicated on the question that if quality can be regulated in the manufacture of products by operational control, then could this also be the case for the delivery of service products? The subsequent set of findings not only confirmed that there is indeed evidence that service quality can be measured consistently, but also that the act of such measuring impels a continuous improvement effect on subsequent performance.

Theoretical antecedents

Many writers approach the measurement of service effectiveness by immediately differentiating it from manufacturing. This arises from the proposition that services are held to be demonstrably different to products (Grönroos, 1978; Lovelock, 1981; Shostack, 1977; Berry, 1980; Rathmell, 1974). Services are said to be "by nature" intangible, randomised, unstable and associated with "soft" data and other ephemeral features such that contrive to render the service product an impractical proposition to regulate, standardise, reduce errors consistently or quantify reliably. Even Galloway (1995) whose service quality model seeks to emulate that of a manufacturing operations model directly, makes the qualification that the part of the model that concerns operational quality is "less relevant in service operations". In fact, disproportionate efforts are put into achieving workable service recovery strategies in response to "inevitable" service failures.

Levitt (1972) earlier argued however that services should not be treated as a separate discipline, believing that "the product" was the "transaction between the seller and the buyer". Saren and Tzokas (1998) have recently revisited this proposition by their conceptualisation of the "pluri-signified product", "a continuous, tripartite signification process between buyers, suppliers and the object''. Each view the singularity of defining product, buyer or seller as too narrow, constricting the sensitivity with which such exchanges of meaning and value should more profitably flow. If the relationships involved are thus delimited – then imaginative, creative and responsive exchanges of value may occur and evolve.

Contact staff roles equate to production staff roles

Service failure need not occur, and neither should there be the misconception that it is inevitable. Operations control in manufacturing has been achieved, quite simply, by the delegation of the task of inspection and correction to those who have primary contact with the manufacturing operation. Prior to this, quality control was thought only achievable by inspectors, who would periodically sample the product and make adjustments or take corrective

action. Thus quality was "inspected in", and the role of those who were responsible for actual production, i.e. production staff, assumed relatively passive roles. What appeared to drive this thinking was the proposition that production output in terms of quantity would always be at odds with output in terms of quality, (one could only have quality at the expense of quantity), hence production workers should concentrate on output quantity, and not output quality. Self-measurement revolutionised the approach to quality assurance. It also empowered workers, often instilling a Hawthorne effect that expressed itself in raised morale, better teamwork, and higher production throughput.

The feasibility of self-measurement techniques has been evidenced in statistical process control in manufacturing applications (Levitt, 1972). Most "world class" manufacturing organisations have adopted this approach over the past two decades, achieving measurable effectiveness. The simple transition from "inspecting in" quality criteria to "building" it in has largely been achieved in the manufacturing sector. Deming (1982) particularly, in his 14 point approach to systemising quality control, set out to clearly change the methodology by which manufacturing has since followed:

> (Point) 3: Cease dependence on mass inspection. Require, instead, statistical evidence that quality is built in. (Prevent defects rather than detect defects) (Deming, 1982).

Empowerment of contact staff

Many writers have espoused the case for empowerment of operational personnel, and the ownership of quality control at source (Bell and Zemke, 1988; Schlesinger and Heskett, 1991; Lawler, 1992). In this regard, many hold that the performance measures of service quality should essentially differ little if any from that for products (Levitt, 1972; Gummesson and Grönroos, 1987), and in order to be effective require the same commitment to continuous monitoring (King, 1987). This "involvement approach" is not new (Argyris, 1964; McGregor, 1960; Likert, 1961), nor is it yet obsolescent (Zemke and Schaaf, 1989; Carlzon, 1987; Lawler *et al.,* 1992).

Significant discussion appears to exist in support of utilising some form of operational control model in service operations as currently employed by the manufacturing industry. There is evidence that such an approach enables cumulative productivity gains, both through continuous improvement and the reduction of waste. If further gains can be achieved by more effective empowerment of contact staff, then issues of employee motivation may also be examined. If this approach, and the model devised to test it, has the capacity to achieve demonstrable predictive validity, there may also be the opportunity of examining the generalisability of the model across many different service operations and products.

Service performance experiment design

The experimentation discussed here is as yet embryonic; work undertaken thus far suggests an overwhelming case for research that would more substantially

validate the performance model used. The model features two fundamental components – threshold and incremental values. Threshold values form the basic or core benefits that can be reasonably expected to be available as a generic or universally intrinsic assembly of service attributes from which a service provider cannot reasonably detract (Lehtinen and Lehtinen, 1983; Lewis and Booms, 1983; Sasser *et al.,* 1978).

Customers would likely perceive these as values that are manifested by fact or degree – threshold are those that should exist, and as a matter of fact, whether or not they do. Incremental values are those that could exist, and are expressed as a matter of degree to which they do. These are dynamic, open-ended opportunities for added value and continuous improvement to which a service provider can creatively add through the expression of mutually satisfying relationships with their customers. Service providers have much more freedom than their counterparts in manufacturing to do this. Since the service product can be modified through responding to situational sensitivity, improvements can be immediately effected on cue, relatively inexpensively and with far less "lead time" than in manufacturing. Manufacturing operations often require more time for assessment and testing, and may feature infrastructure changes such as retooling or raw material modification. Threshold values are expressive of the lowest common denominator of service provision, incremental the potential for the highest. This leads to the conclusion that service provision in the former is perfunctory at best, and "satisfying" customers only in the absence of any other provision or availability of service (Teas, 1993). Incremental service benefits offer a much richer competitive opportunity since genuine added value can be expressed as a differentiated service product. Additionally, since there is good evidence to show that customer wants and needs are effectively insatiate, the requirement for continuous improvement service delivery systems is found (Maslow, 1943). Far from being a negative effect on service providers, this customer faculty actually favours the process of creativity in the adding of value. Customers, therefore play a positive role in the effecting of continuous improvement.

Statistical process control model

It was envisaged that a service performance model that comprises closed and open-ended service attributes (threshold and incremental) should be capable of being devised for contact staff such that they will be able to operate simple measuring and monitoring techniques that will facilitate review and improvement (Flynn, 1993; Levitt, 1972; Chase, 1981; Chase and Garvin, 1989; Parasuraman, 1995). Following a standard statistical process control (SPC) methodology for services as for products, contact staff ought reasonably to be able to emulate their counterparts in manufacturing industries, by sampling and recording their work actions, (Bagozzi, 1983; Brown *et al.,* 1993).

A statistical process control formula was devised for the experiment thus:

$$\frac{\Sigma Pv\alpha + \Sigma Pv\mu}{\eta}$$

Where:
Pv = service performance value
α = threshold values
μ = incremental values
η = sample inputs

Supplier analysis systems feature this kind of sampling and recording. Many companies have used this approach with measurable success over the past two decades in supplier review assessments. What is needed is an objective method of monitoring cost and quality so that value can be seen in its proper context. Just as "feelings" are subject to variability and lack the evidence of facts, measuring and monitoring "hard" and "soft" values is necessary. Since this can only feasibly be done from a base of standardised operations, measurement techniques are required. Objectivity, also, can only reliably exist when hard and soft data are measured and compiled, from which observable conformance can be achieved. Additionally, since "things that can be measured can be improved" (Crosby, 1979), the basis for continual improvements can be facilitated.

Table I is an illustration of a simple model of service performance. The table describes a process control model that details how service attributes or benefits can be differentiated into those that should (α values) and could (μ values) be evidenced in the service encounter. It can be seen that the threshold values are binary values whilst the incremental values are relatively open-ended.

Service performance model example

In this illustration, threshold values are given as static (existing or non-existing), and as such are binary in nature. Incremental values by nature are

Threshold values (should) (α)		Incremental values (could) (μ)		
Telecoms/switchboard	Not	Target	Over	Delighted
Call answered within three rings		3 rings	2 rings	1 ring
Caller connected within 30 seconds		30 secs	20 secs	10 secs
Caller not placed on hold more than 10 seconds without assurance		10 secs	5 secs	not held
Caller not on hold for more than one minute in total		1 minute	30 sec	not held
Courtesy observed		Target	Over	Delighted
Reassurance if necessary		Target	Over	Delighted
Communication style appropriate to caller, (child, older person)		Target	Over	Delighted
Communication style appropriate to perceived situation		Target	Over	Delighted
Possible score values	–8	0	+4	+8

Table I.
Example of a simple model of service performance

dynamic (existing and relativistic), and as such are not only capable of being perceived but also facilitating amplitude measurement. The possible score values are nominated as minus or plus values to enable computation of total performance score. Amplitude measurement facilitates optimisation, which is the basis for operations control and continuous improvement. In the example, target is the point of optimisation, whilst not and delighted are the respective end points of performance potential in the model.

Implementation of experiment

Over a period of one month at a major District General Hospital, experiments were undertaken using the service performance model outlined earlier. Three service operations were evaluated: switchboard, domestic services and main reception. The first two were rejected due to operational difficulties, and the reception was deemed ideal given the greater opportunities for direct customer interaction. Moreover, the staff involved were tangibly more enthused about the inherent opportunities to express the essential nature of their professional contact with customers, visitors and patients during the normal routine of their work. However, the most significant limitation to the implementation of the performance model was the very real need to "sell" the concept of measuring. This for most is a quite personal and relatively emotive area of the perceived product and value of what is embodied in service delivery, from the point of view of the provider. There is a very real and tangible psychological commitment evidenced in the relationship between contact staff and customer.

On many occasions there was a clear reticence to discuss this with anything but an inhibited style and terminology. It was judged useful at this stage to make the suggestion that contact staff should not rely on their "feelings" as to how they were doing, but of the actual measurements that they took. Similar work done by the author with contact staff in this regard proved useful, and the sensitivity with which such questions could be resolved, or at least addressed, was enough to persuade most to relinquish their inhibitions and participate with an open mind.

It is necessary to point this out since it became something of an issue, given the culture of the organisation, which although positive, nonetheless held residuals from an earlier and less fortunate climate. Depending on how far one's organisation has come, in terms of the relatively revolutionary change wrought in the Health Service, such issues cannot be tackled without a certain amount of sensitivity. There is much published on the emotive nature of service provision that deals with the psychological aspects of involvement. These tend to inhibit many from openly discussing what mechanisms operate, and how the question of improvement can be approached. No such restrictions and inhibitions appear to apply for those in manufacturing – quality control is more readily seen as a matter more remote from the "self" and so be perceived as having less involvement.

What became clear from these observations at the concept and planning stages was that early commitment needs to be sought, assurances need to be

made and accepted, and something of benefit for those who face the reality of coping with much uncertainty needs to be evidenced in an atmosphere of trust.

Service operations analysis

The phase of research that required that the work of the service providers be analysed needed much "hands-on" involvement by the writer. This was essential for two reasons – effective observation, at first hand, ought properly to be undertaken. Passive evaluation, or worse, preconceived ideas based on stereotypical behaviour assumptions would neither have elicited the essence of the nature of the work nor the essence of the relationship with the contact staff's customers. Secondly, becoming involved as a member of the group enabled trust to be established and improved on. There were many opportunities for good interaction and fortuitous insights, many of which could simply not have occurred if a detached, analytic stance had been adopted.

What became clear from observations made of the reception work team ethos was that there was evidenced a clear and valid agenda for those who work in these jobs to which those in legitimate authority are not privy. No team member had ever received any formal customer service training, other than registry procedure acquired from colleagues, and the people skills required were generally perceived as being a "natural" part of each person's innate character and makeup. Each team member sought to interpret, deliver and add value to their service encounters in a way that was quite "personal" (also termed "professional") and not a matter of open discussion. This again is a sharp contrast to the manufacturing worker – how impractical it now appears that a manufacturing worker should have a set of innate skills prior to employment.

Across the team there were quite clear differences between how each member would act in a given situation. This preferred "role repertoire" allowed for some division of labour in that certain team members were more predisposed (and perhaps as a result were good at) dealing with elderly patients, or expectant mothers, and so on. Equally clear was the general feeling that each member of the service team had a positive attitude, driven by the belief that they were doing their best for their customers, whether they arose from within the organisation or without, whether patient or visitor. When probed further, each would admit to uncertainty about precisely how well or how effective this "best" actually was, but most agreed that there was little more that they could do to improve things. The prospect of continuous improvement appeared to many as daunting, demotivating and unreasonable, if not downright insulting, since after all they were doing their best. Those that did join in with enthusiasm were keen to find out if "doing better still" actually could be achieved. They were motivated initially by the prospect of actually knowing, and to what extent, how much they actually could achieve, and whether this could be sustained continually. This appeared far superior to simply "feeling" they were doing well.

Whilst it was expected and hypothesised that the act of measuring would initiate and enable the psychological effect of inducing both optimisation and later continuous improvement, this could not of itself be acceptable unless it could be

reliably tested. Fortuitous misunderstanding facilitated the precise conditions for this test. Of the two major participant team members, one had chosen to tally her scores after each sample – the other chose to leave the calculations to the writer.

Once this irregularity was evidenced it was decided to retain the format – one sample measured but not calculated until the end of the sample run series, the other sample measured and calculated in the interim and at the series end. This formed the basis for a control sample and reliably returned the data set, which has fortuitously added value to the original research design.

Table II details the service process plan that was compiled jointly by the two participants and the researcher based on observations of service operations. It features the two dimensions, (α) and (μ) values, and is sufficiently flexible to

Reception	
Threshold (α) values	Incremental (μ) values
1. Desk is manned and secure	1. There is a welcome
2. Patients/vistors responded to quickly	2. There is an appropriate greeting
3. Pvs processed efficiently	3. There is a smile
4. Pvs processed courteously	4. Telephone is answered quckly
5. Information given sufficiently explicit	5. Elicitation to assist (can I help?)
6. Information given correct	6. Empathetic assitance given
7. Telephone is answered	7. Reassurance clear and explicit
8. Administration is processed	8. Admin processed quickly
9.	9. Admin processed accurately
10.	10. Pvs' needs prioritised over staff's
11.	11. Service levels equal over Pvs and staff
12.	12. Return offered with name
	13. Supportive statement made
	14. Communication appropriate
	15. Waiting monitored
	16. Waiting controlled
	17. Waiting Pvs assured regularly
	18. Handicapped facilities made clear
	19. Toilets indicated for waiting Pvs
	20. Pvs directed to coffee lounge if delayed
	21. Pvs security screened if warranted
	22. Assistance given/called to guide Pvs
	23. Allowances made for non-UK Pvs
	24.
	25.
	26.
	27.
	28.
	29.

Notes:
Incremental items 13-23 are each "situation specific" i.e. – need to be judged by circumstances and the appropriate level of communication.

Numbered spaces not nominated are for service providers who may add incremental service benefits as they progress.

Table II.
Example of service process plan

allow for future extensions to the basic plan. To accommodate the binary nature of (α) values, it was decided to use minus values (–1) to register a null observation. Recording (α) values thus comprises –1/+1, which best represents yes/no conditions in the model. Tables III and IV incorporate the service plan inputs into a scoring or performance measurement frame. These were used by the participants as "score sheets" to measure service input values.

Implementation of performance model

Two separate participants operated the service performance model over a period of three weeks and one month respectively. The first participant (Pv_1) sampled 146 service inputs over 20 working days under varying operational conditions. The second, (Pv_2) sampled 106 inputs over 12 working days under similarly varied conditions. Pv_1 data is detailed in Table V; Pv_2 data in Table VI. Service performance data returns were then expressed as regression analyses (Figures 1, 2, 3, and 4) and polynomial trend lines added to indicate best fit.

Scoring: Tables III and IV are examples of completed performance measurement frames.

- Threshold (α) values – 1-8 = 1 point each (minus point for each item missed).
- Incremental (μ) values – 1-12 = 1 point each; 13-17 = 2 points; 18-23 = 3 points.
- Add points from threshold (or take away) to (from) incremental total (see Tables III and IV).

Service performance (Pv) score = $(\sum^{1-\eta}\alpha) + (\sum^{1-\eta}\mu) = 40 + 108 = 148$

Discussion of findings

Figure 1 relates to Pv_1 data sampled in Table V. Service performance is here analysed in aggregate form, that is, by combining both α and μ performance values. It can be seen that the trend line for cumulative performance of Pv_1 adopts a regressive curve, suggesting declining performance over time. Further

Table III.
Examples of completed performance measurement frames with threshold (α) values

α values	1	2	3	4	5	6	7	8	9	
1. Desk	1	–1	1	1	–1	1	1	1	1	
2. Respond	1	1	1	1	1	1	1	1	1	
3. Efficient	–1	1	1	–1	–1	1	1	–1	1	
4. Courteous	1	1	1	1	1	1	–1	1	1	
5. Specific	1	1	–1	–1	1	1	1	–1	1	
6. Correct	–1	1	1	1	–1	1	–1	1	1	
7. Phone OK	1	1	–1	–1	1	1	1	1	1	
8. Admin OK	1	–1	1	1	1	1	1	1	1	
$\Sigma\alpha^{\eta}$	4	4	4	2	2	8	4	4	8	$\sum^{1-\eta}\alpha = 40$

μ values	1	2	3	4	5	6	7	8	9	
1. Welcome	1	1	1	1	1	1		1		
2. Greeting	1	1	1			1	1	1	1	
3. Smile		1	1		1	1	1	1	1	
4. Phone quick	1					1		1		
5. Can I help?	1	1	1		1	1	1	1	1	
6. Empathy		1			1			1		
7. Reassurance				1			1			
8. Admin quick		1			1					
9. Admin OK	1			1			1			
10. Pvs over staff		1			1				1	
11. Service equal	1	1			1				1	
12. Return + name	1	1		1		1	1		1	
13. Supportive say	2				2			2		
14. Comms OK	2	2			2	2		2		
15. Waiting o/seen			2				2			
16. Waiting cont'd			2				2			
17. Reg assurance			2							
18. HCp facs clear					3					
19. WC waitg Pvs			3				3			
20. Delyd Pvs coff			3							
21. Security coded									3	
22. Pvs guided if nd	3			3			3			
23. Non UK Pvs								3		
$\Sigma\mu^{\eta}$	14	11	16	7	14	8	16	13	9	$\Sigma^{1-\eta}\alpha = 108$

Table IV.
Examples of completed performance measurement frames with incremental (μ) values

analysis in Figure 2 shows α and μ performance values separated. Each are declining, however, for the α values ($\Sigma Pv\,\alpha_1$) this is more suggestive of decay. Since Pv_1 is the measured but non-calculated sample, it may be reasonable to assume that one interpretation of the pattern is suggestive of "good intentions" which, while initially dramatic in intensity, will inevitably fade with time.

Figure 3 relates to Pv_2 data sampled in Table VI. Here, the curve ΣPv_2 adopts a sustained upward trend and is indicative of continuous improvement in performance over time. When disaggregated in Figure 4, $\Sigma Pv\,\mu_2$ sustains the pattern of aggregated performance whilst $\Sigma Pv\,\alpha_2$ shows slight decay. Since Pv_2 is the sample that was measured and calculated by the participant, it may be reasonable to assume that the effect of both these tasks induced a component of continuous improvement or "measuring effect". This service provider measured, recorded and calculated each input, and so was at all times fully aware of all input results together with cumulative progress.

It would be tempting to perceive that such an effect could be simulated by the more typical but very limited quality drives through which many organisations have pursued a strategy of spirited employee exhortations to effect inevitably temporary performance improvements. Almost all organisations have attempted a quick-fix solution, each has failed to sustain effectiveness in the long run, and few have recovered without cynicism. That such strategies are not

s	*Pv*	obs	date	1	2	3	4	5	6	7	8	9	$\Sigma\eta$	*Pv* α	*Pv* μ	Σ*Pv*
1	α	5	Jun-12	7	6	6	7	6					32	6.4		
2	μ	5	Jun-12	14	15	11	19	14					73		14.6	21
3	α	6	Jun-13	7	7	7	7	7	7				42	7		
4	μ	6	Jun-13	21	17	20	26	17	22				123		20.5	27.5
5	α	9	Jun-13	8	8	8	8	8	7	7	7	8	69	7.67		
6	μ	9	Jun-13	26	26	21	18	15	22	24	14	23	189		21	28.7
7	α	9	Jun-19	6	6	6	6	6	6	6	6	7	55	6.11		
8	μ	9	Jun-19	23	14	20	18	17	19	16	14	18	159		17.7	23.8
9	α	4	Jun-19	6	6	6	6						24	6		
10	μ	4	Jun-19	16	13	15	21						65		16.3	22.3
11	α	6	Jun-20	6	6	6	6	6	6				36	6		
12	μ	6	Jun-20	14	15	17	21	14	11				92		15.3	21.3
13	α	9	Jun-26	7	7	7	7	7	7	7	7	7	63	7		
14	μ	9	Jun-26	18	16	14	15	11	18	20	21	17	150		16.7	23.7
15	α	8	Jun-26	7	6	6	6	6	6	6	6		49	6.13		
16	μ	8	Jun-26	20	17	21	20	16	12	15	17		138		17.3	23.4
17	α	9	Jun-27	6	7	6	6	6	6	6	6	6	55	6.11		
18	μ	9	Jun-27	22	12	16	14	14	15	17	13	12	135		15	21.1
19	α	8	Jun-29	6	6	6	6	6	6	6	6		48	6		
20	μ	8	Jun-29	15	17	14	15	17	14	10	20		122		15.3	21.3
	$\Sigma\eta$	146														

Notes:
α = threshold values
μ = incremental values

Table V.
Service performance
(*Pv*$_1$)

s	*Pv*	obs	date	1	2	3	4	5	6	7	8	9	$\Sigma\eta$	*Pv* α	*Pv* μ	Σ*Pv*
1	α	9	Jun-17	6	6	6	7	6	2	4	6	5	48	5.33		
2	μ	9	Jun-17	4	9	5	3	3	7	9	13	12	65		7.22	12.6
3	α	8	Jun-24	6	4	6	6	6	6	6	6	6	52	6.5		
4	μ	8	Jun-24	15	8	6	10	10	12	10	10	11	92		11.5	18
5	α	9	Jul-01	6	6	6	7	7	6	6	6	6	56	6.22		
6	μ	9	Jul-01	16	12	10	10	11	13	14	16	13	115		12.8	19
7	α	9	Jul-07	6	6	7	7	5	7	7	6	6	57	6.33		
8	μ	9	Jul-07	15	14	10	12	14	17	15	15	16	128		14.2	20.6
9	α	9	Jul-14	6	6	6	6	7	7	7	7	7	59	6.56		
10	μ	9	Jul-14	16	15	14	17	19	20	18	14	16	149		16.6	23.1
11	α	9	Jul-21	7	7	7	7	5	6	7	7	7	60	6.67		
12	μ	9	Jul-21	15	17	20	22	20	14	19	19	20	166		18.4	25.1
	$\Sigma\eta$	52														

Notes:
α = threshold values
μ = incremental values

$$\Sigma Pv_{\eta} = \frac{(\Sigma Pv\alpha_{\eta} + \Sigma Pv\mu_{\eta})}{\eta}$$

Table VI.
Service performance
(*Pv*$_2$)

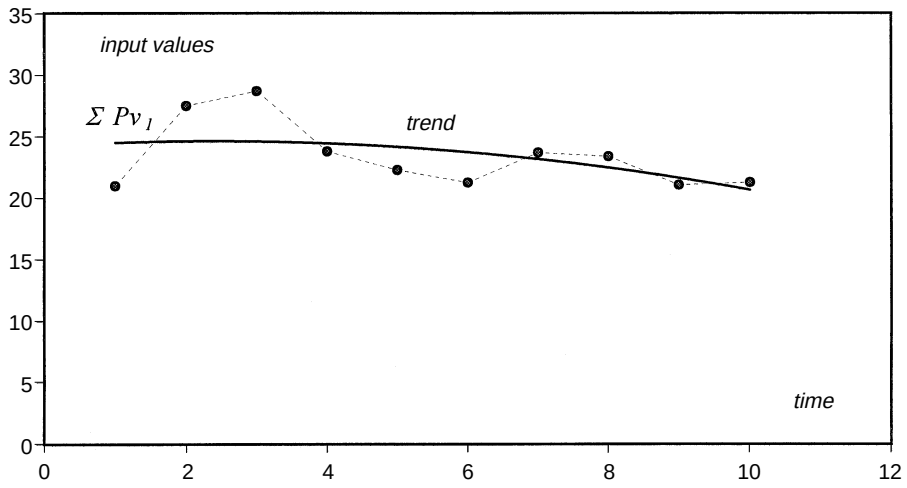

Figure 1.
Service performance (ΣPv_1)

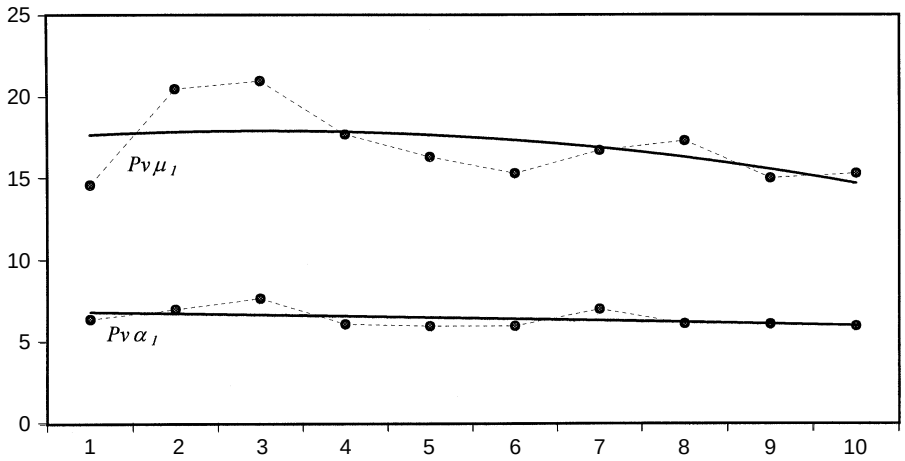

Figure 2.
Threshold ($Pv\alpha_1$) and incremental ($Pv\mu_1$) performance

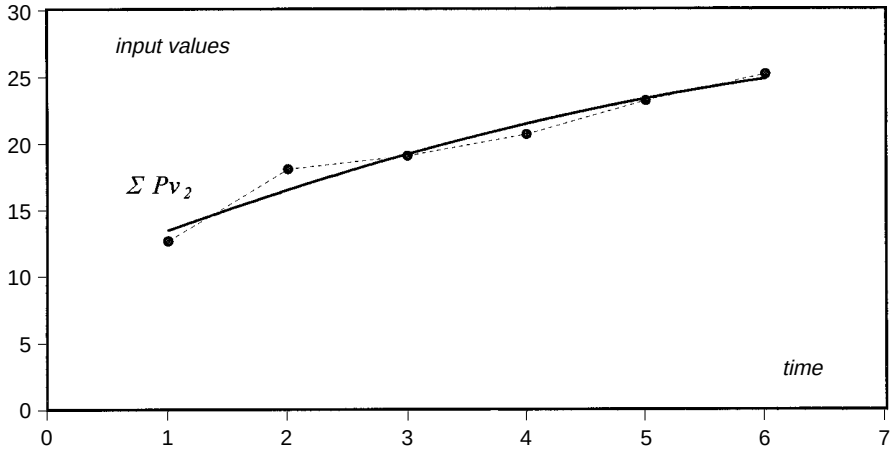

Figure 3.
Service performance (ΣPv_2)

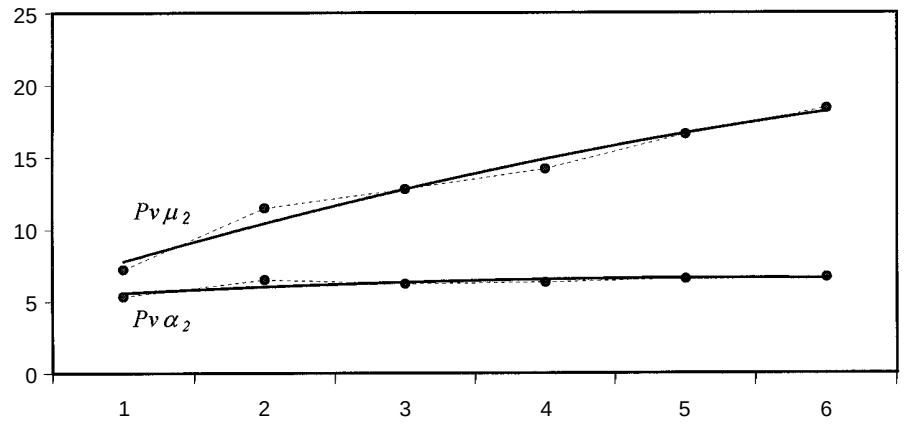

Figure 4.
Threshold (*Pv* α_2) and incremental (*Pv* μ_2) performance

only limited to the very short term is disappointing, that they also engender the likelihood of future negative prejudice is a compelling reason why they should not be undertaken impulsively or without careful and clear planning.

Conclusions

The research discussed in this paper has proposed and evaluated the case for emulating a manufacturing model of operations control in service operations. The reason why this case should be evaluated is to see whether similar quality control and continuous improvement gains may be available. The research then detailed a proposed design of a suitable service performance measurement model that was capable of emulating the statistical process control models used in manufacturing. Finally, the implementation of the model was described and the experimentation thus conducted was analysed. The data resulting from this research evidenced two samples – one in which the sample data was subjected to a measurement effect, and one that was not. The findings of the experiments supported the hypothesis that quality control in service operations could be undertaken in an identical manner to that of manufacturing operations and that quality may not only be measured and controlled in this way, but also that continuous improvement to service performance may be sustainable.

Summary of conclusions arising from Pv_1 *sample:*

(1) Even when participant service providers record and measure their actions, early performance gains in will more likely occur in response to participant enthusiasm than to the mechanism of measurement itself.

(2) Without the positive reinforcement of evidence of progress, which tallying successive inputs of measurement would show, there will remain a reliance on pre-measurement criteria, that is “feelings”.

(3) Service providers, falsely bolstered by the spurious belief that the act of measuring but not tallying will evidence progress, will the more strongly hold less reliable "feelings" about performance.

Summary of conclusions arising from Pv_2 sample:

(1) When participant service providers record, measure and total their input performance data, standardisation of threshold performance can be affected.

(2) The positive reinforcement of evidence of progress, which the act of totalling successive inputs of measurement would affect, would induce and sustain action to affect continuous improvement in incremental service performance.

(3) Service providers, bolstered by the belief that the act of measuring and totalling, together with the resultant evidence of progress, will the more strongly hold more reliable and supportable knowledge about their actual and continuing performance.

The implications of the above findings are strongly supportive that a suitable service performance model can have a relatively dramatic and sustained effect on operational effectiveness. The concept of standardisation to threshold values and the potential for continuous improvements to incremental values can thus be accommodated by the use of this or a similar model.

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