

QUANTITATIVE MANAGEMENT, QUALITY OUTCOMES: The Pursuit of Quality in the 1990's

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The chill winds of change have been sweeping through educational systems across the nation and there is little doubt that the way in which schools are managed and the way in which teachers work will continue to change throughout the nineties. This will impose a level of challenge to school administrators and teachers that will demand both a flexibility of approach and openness of thinking that has the potential to reap great benefits to students right across the nation. Dare it be said, but the cuts to education which have decimated systems in all states may unintentionally (I say unintentionally because I doubt the foresight and motivation of many of those who imposed such cuts) ... unintentionally provide a rare opportunity to achieve significant improvements in our educational systems.

Why could this be so? In reacting to the pain and shock of reduction of resources which has often taken place in an absence of any understanding of how educational systems work, innovative educational administrators will be free to experiment with new strategies and techniques, evaluate new ideas and shake off the shackles of traditional methods of operation which may have actually hampered educational management in the past.

Conversations and debate about the merits and value of various educational theories and practices will be forced to take place in staff rooms and system offices across the nation. Those which stand the ultimate test of producing identifiable outcomes will survive while those based on trendy philosophies or the shaky foundations of ill-defined practice will become increasingly hard to maintain. Perhaps we are reaping the consequence of poor educational management during the last decade which allowed educational systems to grow to the stage where they were financially unsustainable and the benefits, products and outcomes were not clearly apparent.

This environment can be a time of great stress, frustration and exhaustion for teachers and administrators working in education, but there may also be the opportunity to create something new, fresh and invigorating from the chaos we are told surrounds us. However, to achieve this will involve new ways of thinking, managing and teaching that will challenge everyone involved in education, particularly principals, who have a critical role to play in turning systemic intentions into practical reality within schools.

In order to work most effectively under these new conditions it will be essential for school administrators to adopt the very best of educational theory and practice that is available to them. There is great value in recognizing the view of Gillis (1969) who said that:

"Management is still an art. It is not an art without a discipline. While there are areas of decision making where professional judgements must be made on the basis of an ephemeral sense of 'what is right', there are other decisions which can be quantified and reduced to a more clerical manipulation of known facts and shrewd estimates."

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There does exist a body of principle which can, if understood and followed within the context of professional sensitivity and judgement characteristic of educational management, make a significant contribution to the consistent implementation of intuition.

This is important to rural schools because they must face the challenge of improving their processes and outcomes with less support than their urban counterparts, which no amount of networking or technological support can fully replace. While they will generally experience strong support from their local communities, they will not have the same level of interaction, infra-structure and cross fertilization of ideas and experience available to schools in urban areas. It is therefore essential that rural schools tap into current thinking and practice in management and select those strategies and techniques which will best suit their needs and deliver the best possible outcomes with a minimum of external support.

A variety of management models are available to schools to assist them in this task, but those with the most potential are perhaps those related to the quality movement, which has influenced industry for many years. The quality movement is concerned with promoting greater customer satisfaction, lower costs, increased productivity and the best use of resources. Little work has been done in adapting proven principles of management practice from the quality movement to the area of education and it is not the purpose of the present discussion to do so in great depth. It is intended however, to draw the attention of schools and administrators to some concepts which will help them in the task of striving for quality educational outcomes during the 1990's.

First it is useful to appreciate how the concept of the school needs to change. Detailed below are three different stages in the development of the school as a concept as outlined by Webb (1993):

Stage 1

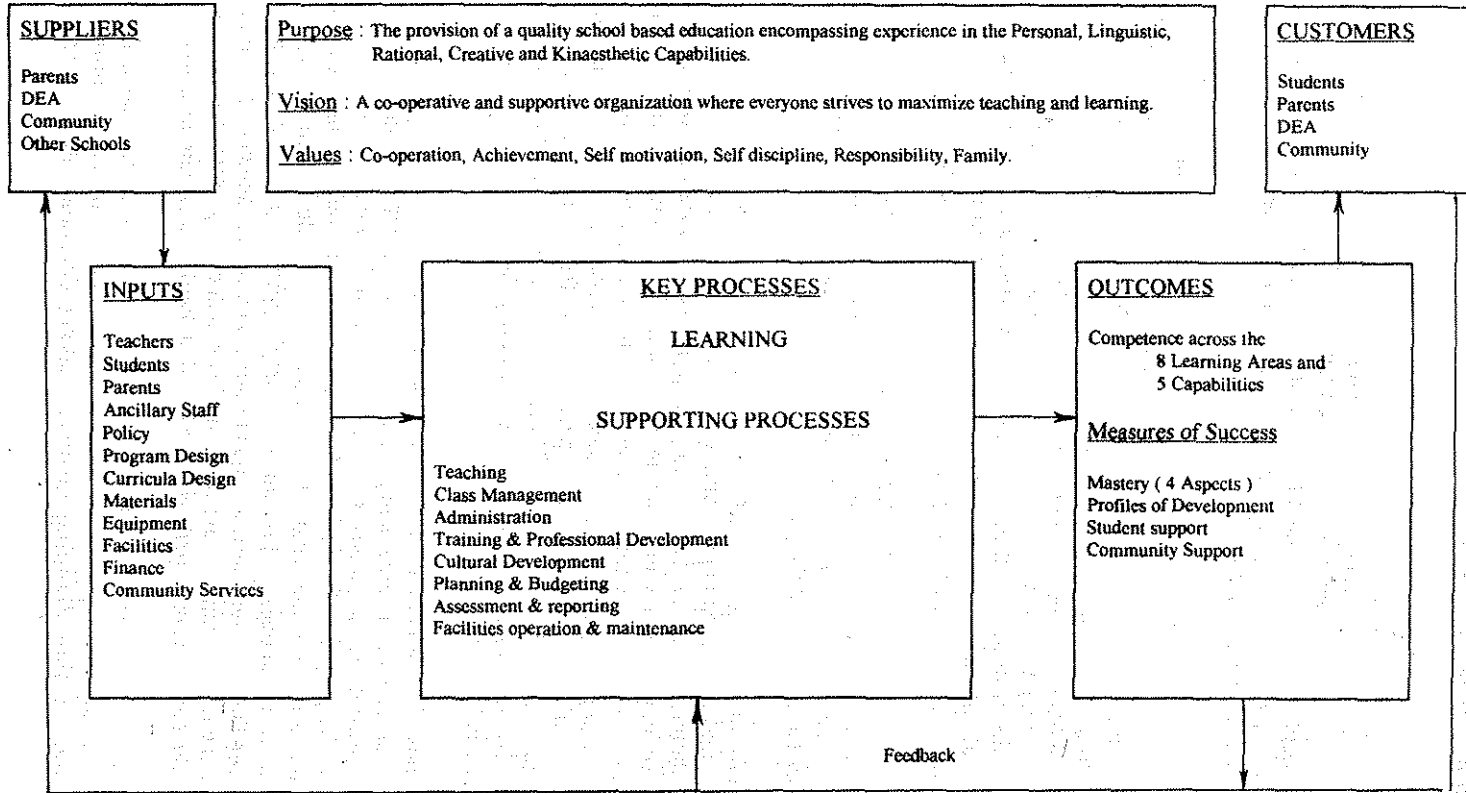
Principal + Teachers + Resources + Facilities = Outcomes

Stage 2

| | | |
|-------------------------|--------------------|-------------------|
| Providers | Principal | Recipients |
| Department of Education | Staff | Students |
| Families | Students | Parents |
| School Community | | and others |
| Other Schools | | |
| + Inputs | + Processes | = Outcomes |
| | Resources | |
| | Facilities | |

Stage 3 Primary School - System Diagram

Stage 3



Stage 1 reflects a view of the school which is commonly held at present, in which 'the school' means the Principal and staff and/or the set of resources and facilities with which they are supplied. The assumption is made that because resources and facilities have been provided, the Principal and staff will consequently deliver some kind of learning outcomes to students and their families as individual consumers.

Stage 2 is a more refined model of the school which realistically recognizes that the school operates as part of a system which includes 'providers' (suppliers) and 'recipients' (customers) who interact and affect educational processes and outcomes. This model can be refined to produce the system shown in Stage 3 which has as its focus educational provision for students. In this model the school community, Department of Education, family and the school interact together in a self supporting system in which outcomes are influenced through refining the educational provision made for students.

This view is at odds with a developing trend in present educational thinking, which appears to be concentrating on outcomes alone and abandoning any consideration of the processes that produce them.. This approach would appear to be based on a belief that a process approach was tried in the past and that it didn't work, but as Webb (1993) has stated, this has the potential to be 'a dangerous misunderstanding'. There was certainly over attention to the environmental conditions thought to be necessary for the processes to work but there was little, if any, attention to the details of these educational processes. The writer believes that quality improvements to educational outcomes will only come from a conscious effort to define the various processes taking place within educational systems and refine them on the basis of accurate data.

This belief is based on the observed difficulty of many educators to accurately describe, detail or depict the actual processes taking place in teaching and learning. Before processes can be improved they must first be defined and there is little evidence that the accurate definition of processes has occurred in the past.

It is useful to recognize that there are two basic forms of information upon which educational decision making can be made, namely qualitative and quantitative. Qualitative information is that gathered by means of teaching judgements, interviews, portfolios or diaries where subjective judgement has an important influence. Quantitative information can be expressed in some kind of numerical form and analysed in varying degrees using statistical techniques. While teaching has placed great reliance on qualitative sources of information, it can be argued that quantitative information has not been used as effectively as it could be, except perhaps in the world of educational research. There is much to be gained by using both qualitative and quantitative sources of information and regarding them as complementary tools for refining processes and improving outcomes.

Both kinds of information can be used to search for relationships, patterns and trends between different aspects of the area being studied, but they are not necessarily mutually exclusive. It may be possible on occasions to express qualitative information in some kind of quantitative form for the purpose of analysis. An example of this would be the expression of subjective opinions through some kind of numbered rating scale which could be analysed using quantitative techniques. This can be a useful approach provided that the information users remember that neat summaries of quantitative data reflect subjective opinion rather than hard measurement. The patterns and relationships which emerge from this process can still prove to be as valuable for management as those based on hard data or pure intuition.

Without meaning to be overly simplistic, the information gathering and analysis process has two important functions for school administrators, namely **action planning and information selection**. **Action Planning** involves making decisions about programme design and

implementation in four main areas - single or multiple venture activities, educational engineering and process improvement. The single venture decision is concerned with answering the simple question, 'Is this what we are going to do?'. In single venture activities the intentions have already been decided and the particular process is clear, so it is really a matter of deciding whether to go ahead. Multiple venture decisions are more complex for the educational manager because a number of choices may exist, each of which may or may not be compatible with the identified educational intentions. In this situation another question needs to be asked, namely, 'Which of these choices will provide the optimum rate of return?'

This is an important question because a number of programmes may be similar in terms of effectiveness but differ in the degree to which resources are used efficiently. On the other hand, the most efficient programme may not maximize the intended outcomes, so optimum rate of return refers to the level of outcomes where the expenditure on resources is balanced against the drive for efficiency.

Problems in educational engineering are related to curriculum and programme design, school and system organization and other matters related to the delivery of educational services. Here a decision to do something has been made and the basic question is, 'How are we going to go about this?'. For the best results any process of educational engineering will develop a number of possible models so that the engineering problems become a multiple venture decision in which the optimum rate of return must be evaluated. Process improvement involves a conscious decision to make some aspect of education better in terms of effectiveness and/or efficiency. To do this demands knowledge of where the process is at a particular point in time so that a judgement can be made as to whether an improvement has in fact taken place.

Information selection is a process which has become of significant importance to the educational manager at all levels. Too little information may consign us to not only repeated errors but also wasted effort, while too much can render our minds a vast waste basket of information unsuitable for the tasks we need to undertake. In order to handle the flow of information with which we are surrounded it is necessary for management to be able to condense and aggregate it. This however, is a process fraught with danger, as when aggregation takes place information is discarded and it is possible to discard information which is highly relevant to the decision making process.

This process of aggregation takes place at various levels in an educational system as administrators condense information and pass it on to Principals, who in turn condense information flowing into them to pass on to teachers, who in turn condense it again. At each of these levels administrators, Principals and teachers aggregate and condense the information passed on to them as well as information gathered from their own sources and networks. It is absolutely essential that every effort is made to select the information that is most important and that relevant information is not discarded.

In order to make the best possible decisions in action planning and information selection it is useful if both qualitative and quantitative sources of data are used so that each form of evidence can be mutually supporting and provide opportunities for cross checking perceptions and evaluations. Effective action planning can only take place on a foundation of appropriate information that is necessary in terms of relevance and sufficient (but not excessive) in terms of quantity. It is not the purpose of this paper to describe in depth techniques for the collection of qualitative and quantitative information, but rather to show how quantitative information can be used to improve aspects of school operation.

The value of using quantitative analysis as a tool for school improvement is beginning to be recognized, with some literature beginning to appear on its application to educational

administration and management through, for example, the quality movement. It is more difficult to apply the same techniques to the improvement of teaching and learning simply because it is a frontier area, but this is not to say that it cannot be done. The examples below will illustrate how quantitative information can be applied in the above areas for the purpose of improving some aspect of school operation.

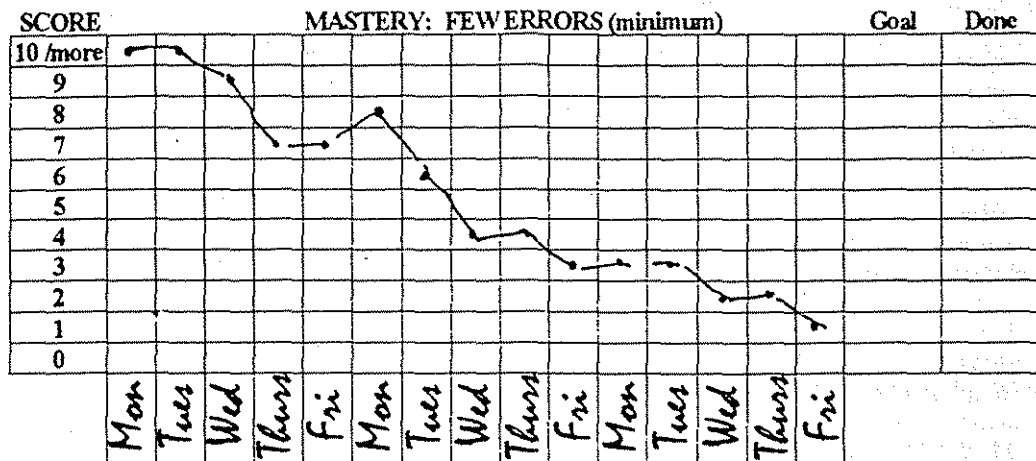
The first example is concerned with an aspect of school administration, namely safety and its impact on the efficient use of time. Figure 1 is a graph showing the amount of time spent in the provision of pastoral care for students as a result of injury incidents in the playground. The black bars refer to time spent in pastoral care during a school term in 1992, while the grey bars refer to the corresponding term in 1993 after a variety of incentives were offered for improved playground safety. The increase in injury incidents during the first measurement period is perhaps expected, because children probably become more tired and restless as the term progresses, resulting in an increase in incidents. The trend during the second measurement period is interesting for two reasons - not only has the overall time spent on pastoral care been reduced, but there was also a marked decrease in incidents toward the end of the term.

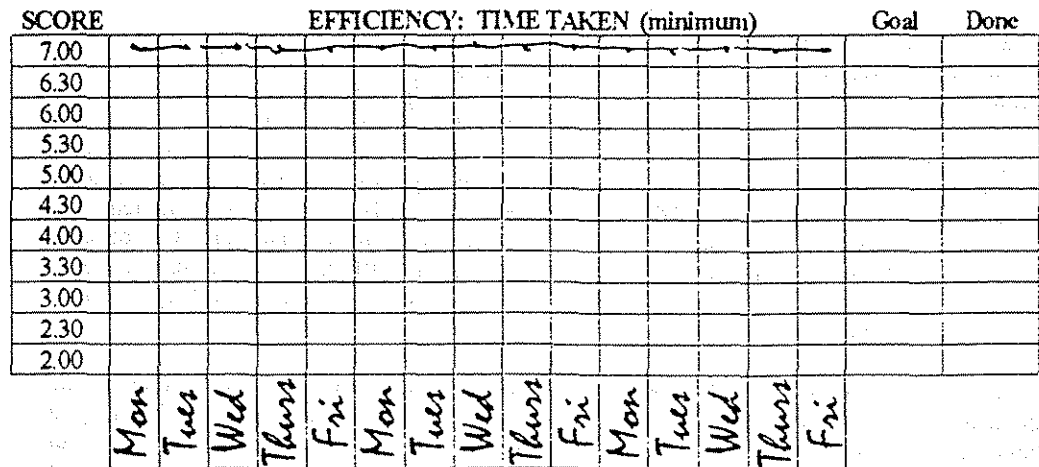
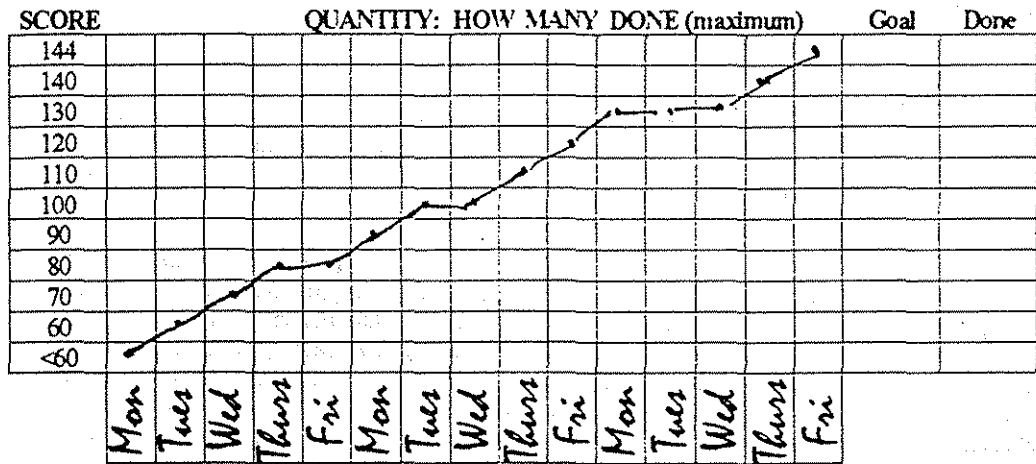
RIVERSIDE PRIMARY SCHOOL

QUALITY RECORD CHART

TOPIC: *Number Facts*

Name: *Ben*





The difference between the two trends is more marked than the graph actually shows because qualitative evidence collected through an injury log showed that the pastoral care in the first measurement period was spent dispensing first aid, whereas in the second it took the form of cleaning up minor cuts and abrasions and dispensing sympathy. Not only was the time spent in care reduced, but there was an observable change in the nature of the incidents occurring. As a result time that was previously spent on pastoral care could be diverted to other activities and the students involved were returned to class more promptly with a consequent increase in time on task. All of these changes helped contribute to an increase in efficiency and effectiveness within the school and in a resource scarce environment all such improvements should be actively pursued.

This example serves to demonstrate that it is possible to quantify an aspect of human behaviour that is often regarded as random and unpredictable and present it in a manner which can contribute to improved performance within a school. It also serves to show how qualitative and quantitative information can be combined to present a more accurate picture of a situation and highlight patterns or trends which may have been hidden within the limitations of one form of evidence.

Let us now look at an example of how a quantitative style of information presentation can be applied to a task in educational management and used to make an improvement in a curriculum area. Figure 2 shows the results of a mathematics test given to students across a particular age range. The percentage of students making errors is graphed against each question and the key gives an explanation of the educational content of each question. This graph does not tell us why they made errors, but only how many students made errors in each question. It can still be however, a powerful tool for educational improvement. Teacher time is a valuable commodity so anything which allows teacher time to be used effectively must be seriously considered.

One way in which a teacher could effectively use their time would be to identify from the graph those questions which caused the most difficulty for students and endeavour to find out why the questions were a problem. There are many possible reasons - they could not do the problem, had not been taught the subject matter, had not been taught effectively, did not read the question properly, marked the wrong box, were led astray by multiple choice distractors or a variety of other reasons. However any efforts by the teacher to remedy these problems will result in an improvement in the ability of students to read, analyse and resolve a problem in mathematics and therefore improve teaching and learning. The graph also indicates that there is a group of three students (20% of the sample) who experience consistent difficulty with these questions. This group can be identified together with particular areas of weakness and appropriate corrective action implemented.

Quantitative information has allowed teacher time to be used effectively and efficiently and rather than impose the daunting expectation on a teacher to improve teaching and learning in mathematics (a massive curriculum area), we have given them a tool that shows where they can effectively use their time to maximum advantage. We have therefore gone some way to achieving the optimum rate of return on teacher time in improving learning in the area of mathematics.

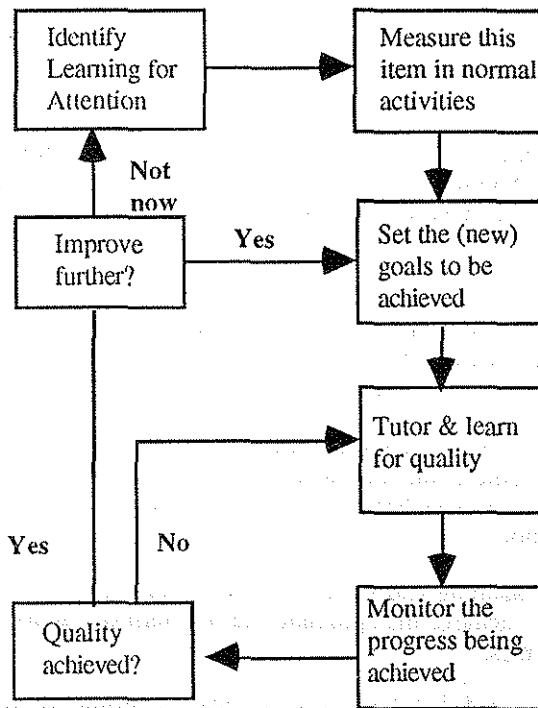
The third example is concerned with the improvement of individual student performance in mathematics as a result of work being undertaken at Riverside Primary School in Launceston under the leadership of Ivan Webb. Here quantitative management techniques are being applied to learning as part of the exploration of the quality movement and its application to student learning. In this work quality learning is regarded as consisting of four aspects:

| | |
|-----------------------|---|
| Mastery: | minimum errors, reliable accuracy, consistency, |
| Effectiveness: | quantity of the work produced on the basis of the learning, |
| Efficiency: | completion of tasks with minimum time, effort and materials, |
| Application: | learning is applied to meet individual needs or serve others. |

Quality teaching is therefore regarded as a matter of assisting the learner to produce quality work in substantial quantities, efficiently and to be able to apply it so that they can move on to more challenging and significant tasks. This is achieved through the following three steps:

1. Moving from criterion based assessment to criterion based learning, so that the particular errors to be given attention are defined.
2. The teacher and the learner identify the particular errors needing attention and develop a measure of the rate at which they are occurring.
3. Strategies are designed with the learner to reduce the number of these errors.

Quality teaching of this nature is concerned with the identification of the particular learning to be improved and then taking the necessary action to ensure that it is improved using a process such as that identified by Webb below:



The application of this approach to teaching is demonstrated by the third example where a student's progress in mastering number facts is captured in a set of run charts showing the number of errors, the number of problems successfully undertaken and the time taken for their

completion (See Appendix). While the recording of student progress through some kind of chart is not new, the concept of depicting different aspects of such success as part of a structured process to improve learning as shown above certainly is.

A specific learning need has been identified in which mastery is required before moving on to a higher level of work, with the learner involved in monitoring their own performance and receiving immediate feedback on improvements. Teacher time is used effectively because a specific area of learning has been targeted with specific goals, supported by a clear process for achieving them. Educational improvement has been enhanced by clearly defining the learning process taking place, which in turn has led to effective action planning and information selection.

This shows how a problem in educational engineering, namely how to produce improved outcomes in a resource scarce environment and increasing student teacher ratios, can be developed through creative leadership. The educational outcomes for an individual student in one aspect of learning were improved by refining the learning process through incremental improvements to target clearly identified errors and optimizing the rate of return on the effort invested in the process of learning and correction.

This paper has attempted to draw the attention of educators to some fundamental principle which may or may not be obvious but have the potential to not only contribute to an improvement in educational outcomes for our students, but make school operation more efficient and effective. These principles are:

- (1) Quantitative information can and should be used to complement the qualitative forms of information traditionally used in education to clarify and highlight patterns, trends and relationships in the information being handled and improve action planning.
- (2) Many of the qualitative matters which concern educators can be reduced to a quantitative format which can prove extremely useful, provided we remember that we are working in a 'people business' with all the qualifiers that this implies. However, by presenting information in a visual form, a quantitative based presentation can allow it to be more easily assimilated to again highlight patterns, trends and relationships and help identify information necessary to our needs.
- (3) The application of quantitative methods is easiest in educational administration, but most important in the area of teaching and learning. Understanding how to use quantitative methods in the former area can, with a little imagination, help us apply them to the latter.
- (4) Quantitative management strategies can provide educational managers with a powerful tool for improving outcomes, but this must be achieved by incremental improvements to the associated learning processes based on accurate measurement rather than perception, hearsay, opinion or guess work.
- (5) Sound action planning and information selection based on the principles of the quality movement will help achieve the optimum rate of return on inputs into learning processes and help improve outcomes.

This paper is intended to be a brief look at the value of quantitative management and its potential to support the qualitative sources of information so commonly used in education, but everyone who enters the uncertain world of educational management will recognize that some of the most crucial factors that point toward success or failure will never be quantified. In some areas of decision making intuition and perhaps on occasions sheer luck, form an important influence on

the success of our endeavours, but this does not alter the reality that good intuition used in conjunction with good models will yield good results; bad intuition in good models yields bad results; a bad model will yield bad results regardless of intentions or intuition. A balance of qualitative and quantitative management strategies will help yield better models in which intuition can soar to greater heights.

It is the responsibility of all educators who attempt to venture forth into the vale of uncertainty of the people business to maximize and the probability of success and we can do this by exploring the benefits to be gained by sweeping our nets widely to harvest the wealth of qualitative and quantitative information available to us and use it wisely for the purpose of improving teaching and learning.

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