MANAGING WITH S.A.M. (SYSTEMS ANALYSIS METHODS)

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1. INTRODUCTION

The authors of "In Search of Excellence", Thomas J Peters and Robert H Waterman, Jr, highlight that : "Most organisations are governed by rules that assume the average worker is an incompetent ne'er do well, just itching to screw up." "Treat workers as adults, treat them as partners, treat them with dignity and respect. Treat them - not capital spending and automation - as the primary source of productivity gains. The Worker is the most important asset of a Company."

Dr. W. Edwards Deming, a well known Quality guru, earnestly advises management to communicate with their workers. This is stressed in his fourteen (14) points for management in his books "Quality,Productivity and Competitive position" and "Out of the Crisis". "Breakdown barriers between departments, drive out fear" and "the worker is the most important asset of the company" are some of the familiar points of Dr. Deming. "Use statistics as a language of communication" is perhaps the most powerful and misunderstood statement ever made by Dr. Deming.

The "Systems Analysis Method" (S.A.M.) was developed to assist in the clarification and implementation of Dr Deming's statement above and is primarily a language for communication which successfully bridges the barriers between management and workers as well as the barriers between workers themselves. S.A.M. allows this effective management and worker communication by identifying and distinguishing between management controllable and worker controllable errors. Normally 80% to 85% of inefficiencies are due to management controllable errors (the System), whilst the balance are attributed to worker controllable errors (within the system).

2. BACKGROUND

In the 1920's Professor Walter A. Schewhart developed statistical methods that analyse the different types of variation in the system. These analysed variations can be used to identify the difference between "Management Controllable" and Worker Controllable" errors.

However, it was not until Dr W Edwards Deming introduced these methods and techniques to Japan in 1950, did the world

have much exposure to these statistical techniques. The use of these statistical methods and techniques contributed significantly to the capturing of WORLD markets in just five (5) years. The Japanese applied these methods as a language for communication between management and worker. This not only developed worker trust and involvement, but also helped the worker to produce a better product in less time and at a reduced cost.

Systems Analysis Methods (S.A.M.) are based upon the understanding and use of a number of simple statistical methods and techniques and is applicable to all fields, (ie Engineering, Administration, Financial, Training, Production, etc.) in all types of Industry (ie Chemical, Mechanical, Electrical, etc.), be it in either the service or manufacture areas.

The fundamentals of "Managing" with S.A.M. are explained below:

DEFINITIONS

System :	A system is any set of conditions, or set of causes, which work together to produce a given result. Refer to 3.0 below
System Causes:	When the system varies within its natural limits, this variation is known as a system cause. Refer to 3.1 below
Assignable Causes:	This exists when the elements (inputs) or sub-elements of a system vary outside of their natural limits - this causes the output to vary in excess of its natural limit in an unpredictable fashion. Refer to 3.2 below
Worker :	Any person working within the system, be it an accountant, operator, clerk, nurse, teller, etc.

THE MODEL

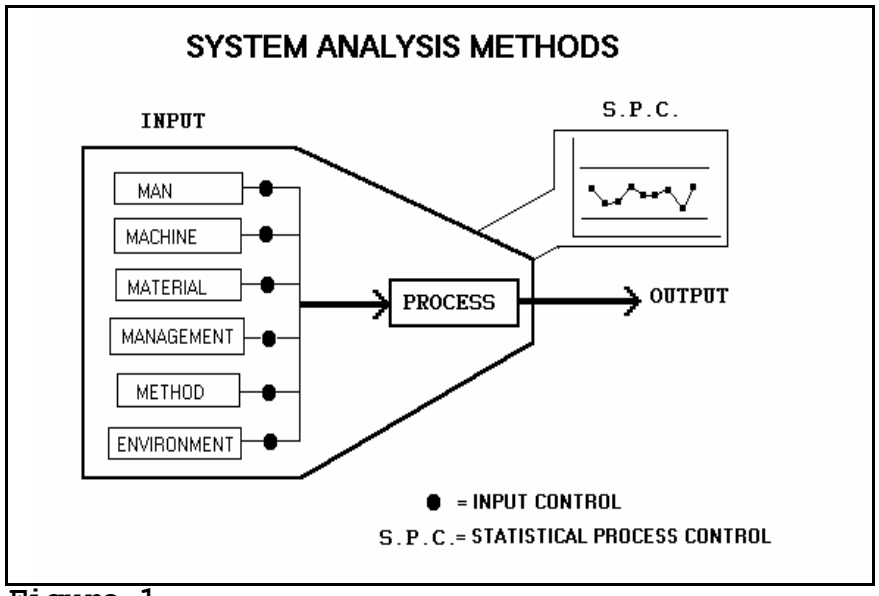

Figure 1

3. OVERVIEW

Variation in the elements and sub-elements of the system, and combinations thereof, cause the output to vary over time. This variation is inherent in all systems. As long as the elements vary within natural limits, the variation of the system will be repetitive and predictable. This enables a person to predict the - quality of output - variation in products and/or services and the process mean.

Should any one of the inputs (elements) e.g. man, machine, material, method, measuring system or management, vary outside of its natural limit, the system will also tend to vary outside of its natural limits.

Management has an extremely responsible role in establishing, maintaining and continually improving the system. The workforce are responsible for working with-in the system.

Only after assignable causes have been removed, is it

possible for management to conduct effective planning and to set about improving the system.

The workers who are closely associated with the process can usually identify an assignable cause the easiest, for example, unnecessary setting of the process, or vibrations in the equipment. Usually it will be found that an input from management is necessary to remove assignable causes, for instance, the training of a setter or equipment maintenance (both outside of the workers control).

3.1 System Causes

If a system, which has no assignable causes, was measured in sequence over time then we would expect the following type of pattern:

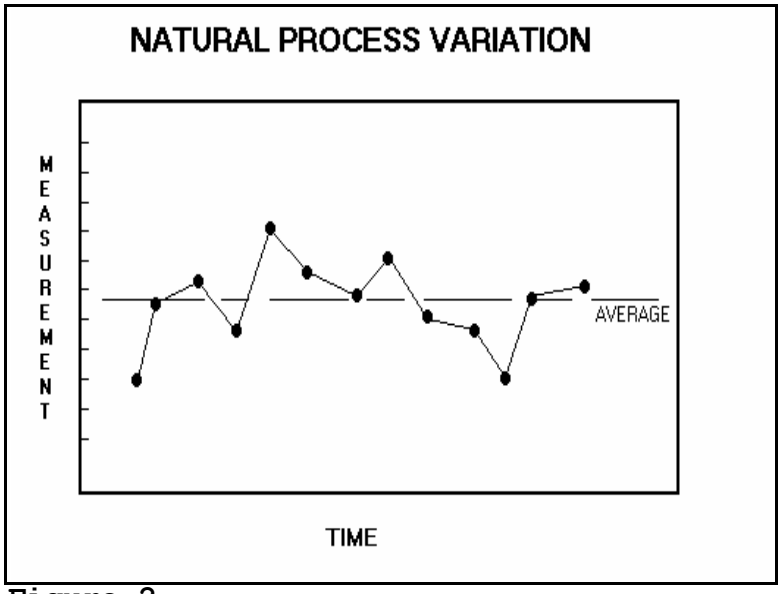

Figure 2

3.2 Assignable Causes

If an assignable cause exists the system will vary outside of its natural limit and can be visually illustrated below :

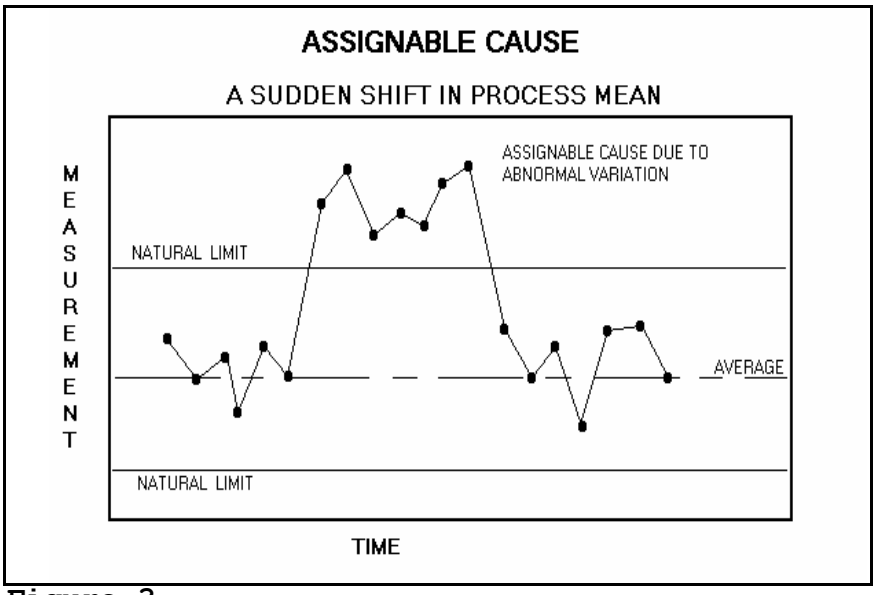

Figure 3

3.3 Practical examples of management controllable errors and communicating with statistics.

3.3.1 Whilst working for a previous employer it was brought to my attention that an operator on a CNC lathe was on the verge of being fired as he was still not producing his daily quota even though he had been given several written warnings previously. I decided to investigate.

After explaining my intentions to the operator and developing some mutual trust we commenced with the hunt for assignable causes in his system by plotting a chart.

The chart highlighted that there were no assignable causes in the system and it became apparent that the operator was not reaching his quotas because the system variation exceeded the drawing tolerances, thus forcing the operator to rework almost 40% of his production (a management controllable error).

Figure 4

A quick discussion with the design engineer, explaining the chart, showed that the part was over toleranced and that these tolerances could be opened to accommodate the process capability. The Operator's productivity increased by approximately forty percent (40%), he later proved, contrary to managements previous perception, to be the most conscientious worker in his department.

3.3.2 By plotting and analysing the consecutive scores of a golfer it was clear that his scores were inconsistant and unpredictable due to assignable causes. Investigating the assignable causes revealed that the golfer was a beginner and that training was needed to improve the system. After training his improved scores were plotted and analysed, this time showing that should no assignable causes re-enter the system, his scores will be consistant and predictable.

Figure 5

3.3.3An experienced golfer who hoped to improve his score by taking lessons, found that the lessons did not improve his golf system. The system had no assignable causes and the chart clearly indicates that further training is futile and that the golfer has reached his ultimate capability.

Figure 6

3.3.4A torque was measured in sequence and the results plotted on a chart.

Figure 7

An experienced operator was used initially and when a new operator took on the job (who was not sufficiently trained - a management error) an assignable cause was immediately seen on the chart. Once the necessary training was provided by management his performance improved as reflected on the chart.

3.4 Possible causes for typical assignable causes

Assignable Cause	Some Possible Causes	Responsibility
Shift in Process Mean (as per figure 3)	* Operator incorrectly adjusting process (needs training)	Management
	* Different operators or shifts	Management
	* Different suppliers of input material	Management
	* Input material variation - hardness	Management
	* Incorrect/inconsistent methods being applied	Management
	* Tool changes - poor tools	Management
Increasing variation (as per figure 3)	* Loose tool holder	Management
	* Lack of maintenance	Management
	* Machine/system not capable	Management

4. CONCLUSION

In order to communicate with the worker it is imperative that

management are capable of distinguishing between management controllable and worker controllable errors. If a worker is held responsible for management controllable errors then the worker will become demotivated and noncommitted to attaining quality or improving his productivity, he will be managed by fear. Most of the management controllable errors highlighted in the examples could not have been detected without analysing the system for assignable causes.

In order to drive out fear in an organisation, management must implement an ongoing program for the removal of assignable causes in the system. Only when all assignable causes have been removed will the ratio of controllable errors become 80% worker and 20% management, thus allowing worker involvement programs such as Quality Circles to be effective.

The Systems Analysis Method is the key factor to the successful implementation of any or all of Dr. Deming's fourteen points for management.