

SIX SIGMA FOR SMALL AND MEDIUM ENTERPRISES

 DR NEVAN WRIGHT, AUT UNIVERSITY, NEW ZEALAND, E-MAIL: NEVAN.WRIGHT@AUT.AC.NZ

In the series of articles on LEAN and related supply chain management principles, we have – in perfect alignment with the theme of this issue of the SBR – through Erik Juul Rasmussen received the following article from Dr Nevan Wright, whom we trust need no further introduction after his previous highly appreciated articles in this series.

In my last article, *6 σ Six Sigma: Myth?*, FIT Sigma was introduced as a user friendly alternative to Six Sigma. In its pure form, Six Sigma uses statistical methods to achieve zero defects (99.99966 per cent correct or 3.4 errors per million opportunities) by elimination of variance from agreed standards. In theory, six sigma is aimed at improved customer satisfaction. Our contention (Basu and Wright, 2004) is that zero defects is not practical or even desirable. Additionally, from a survey of large companies using Six Sigma, it was found that in reality most use six sigma as a means of cutting costs (mainly by getting rid of people) rather than focussing on customer satisfaction. We also found that a drawback for smaller companies, if considering adopting six sigma, is the cost of training practitioners (Master Black Belts, Black Belts and Green Belt, etc). In recognition of these issues; impracticality of aiming for zero defects and the cost of employing specialists, we developed FIT Sigma which enables the adaptation of Six Sigma at little cost to any size organisation. With FIT Sigma, expensive Black Belt training is not required and self-assessment is encouraged. Our approach is truly customer focussed rather than the usual approach, which is to begin with looking for areas to reduce cost. We begin with the customer and work backwards from customer needs and expectations to determine where we need to get more efficient so as to meet customer requirements. I compare FIT Sigma to going to the gym to get fit. Your

fitness trainer will first determine how fit you are, understand why you want to get fit (fitness for purpose), and then set you a training and diet regime to get you fit and to sustain your fitness. The objective of the training regime is not only to lose fat but to build up muscle so as to get you fit for whatever your goal is (run a marathon, climb Mount Everest, be a tennis star, etc.). Different sports require different exercises and diets and the development of different muscles. Getting fit does not just mean losing weight. Underweight people generally lack strength. Likewise in a company, getting rid of people and cutting costs will serve to weaken the organisation, not to strengthen it. Certainly, there might be some areas where there is fat in the system, but the objective should be to turn flab into muscle. The reason that some people are not working efficiently will be because they have not been properly trained, they don't know what is required, supervision is poor, materials are substandard or not of a consistent quality, plant has not been properly maintained, etc. When any of these factors exist, it is no wonder that people become de-motivated and treat work as nothing more than a pay packet.

In this article, I show how to get started with FIT Sigma and how to build flab into muscle. In a subsequent article, I will look at how to keep your business fit. Sustaining a level of fitness is the hard part!

Many organisations start an improvement programme without identifying the real requirements. The first step is to understand

how fit the organisation is. To establish this base line, an analysis of Strengths, Weaknesses, Opportunities and Threats (SWOT) will be required. SWOT analysis is best tackled from the customer perspective (the voice of the customer). In the model below, the Customer and Supplier are shown as the central focal point. Unless we have satisfied customers and are growing our customer base, we will not survive. Likewise, unless we have reliable suppliers in terms of consistent quality and delivery on time, we will not survive. The supply chain management process has been covered in earlier articles for the SBR, and here the importance of the Marketing function was discussed and the 'Four Ps' of Product, Price, Place and Promotion were discussed. For the purposes of this article, we will assume that the 'Four Ps' have been specified in a Marketing Plan and our concern is the operational issues of turning this plan into reality as efficiently as possible. With FIT Sigma, we approach the subject of efficiency by identifying Strengths and Weaknesses with the objective of building up strength and turning flab into muscle so as to be able to take advantages of opportunities and countering threats.

Before we look internally to improve efficiency, I recommend looking externally to identify threats and emerging threats. There is no point in adding extra resources and capacity if the external environment is about to change.

EXTERNAL ANALYSIS

Political, Legal and Societal factors: Laws and regulations might be considered as limiting factors, but laws and regulations also serve to protect an organisation. Whatever the laws are, it is important that an organisation is aware of what is required. For instance, laws can limit the number of hours drivers work, the amount of maternity leave entitlement and so on. For our home market we will know what our legal obligations are, but when operating in other countries, it is essential that we know what the legal requirements are. It is equally important to be aware of local customs and what is socially acceptable in another country. Generally, laws are enacted to meet a concern of society, as a whole. Thus, it is useful to be aware of popular issues and to be seen to be socially responsible rather than wait for politicians to take action as a result of public pressure. In a previous article, we considered social and government pressure for environmental and sustainability and discussed economic benefits to be gained by the 'greening' of the brewing industry supply chain (*The Green Supply Chain*).

Economic: The economy, tax rates, exchange rates, interest rates, discretionary income, population growth, the average wage, unemployment and other statistics are all relevant to the brewing industry when forecasting demand and the need for capital expenditure. The issue is to keep abreast of what is →



SWOT analysis



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happening and knowing where to obtain accurate information rather than relying on headlines and guesses by so-called business analysts and political pundits.

Technology: Being a pioneer is not always the best strategy. Often it is better to be aware of changes in technology and what the competition is doing and to delay adopting new technology or methods until the new technology is tried and proven (and cheaper).

Competition: In deciding what we are going to supply to our customers, at the very least, we have to know who our competition is and what they are offering in terms of product, quality and price, terms of payment, marketing support, etc. We also have to be aware of emerging new competition and new products. Competition is always a threat, but competition is also an opportunity. If we can perform better than the competition in terms of what we offer (product, service, consistent quality and price and delivery on time), then it will be the competition who will feel threatened! We also need to be aware that in the short term, customers can be influenced

by what the competition says it can do and the image that they project rather than what they actually do. In the longer term, providing we have correctly judged what the market wants, consistent quality and service will win through. Although the competition is external, the questions we ask concerning the competition are directed inwards.

The following questions are a guide to self-assessment. For each question, rate your organisation on a scale of 1 to 5 where:

- 1 = WEAKNESS – IMMEDIATE ACTION REQUIRED
- 2 = NOT GOOD – AREA OF CONCERN
- 3 = ROOM TO IMPROVE
- 4 = REASONABLE – BUT NO ROOM FOR COMPLACENCY
- 5 = STRONG – A DECIDED STRENGTH WHICH WE SHOULD MAKE THE MOST OF!

Competition

1. How well do we know the true market size and our market share?
2. How good is your knowledge of your top three competitors' strengths and weaknesses?
3. How well do you know the capacities of key competitors' and their suppliers' manufacturing units and distribution centres?
4. How well do you know and compare the service level which your key competitors provide?
5. How well do your sales and marketing team know the relative importance of factors that affect customer satisfaction (cost, quality, lead time, order fill, promotional support)?

INTERNAL ANALYSIS

I suggest beginning with **People and the Culture** of the organisation.

6. Are we a top down organisation where orders are given and people are expected to obey without question? The culture being that management do the thinking and workers do what they are told, and little if any feed-back is sought from lower level staff? Rating of 5 if there is an open culture

where management trust the workers and the workers trust management. Rate 1 where there is a top down bureaucratic organisation and workers are afraid or *not sufficiently interested* to express an opinion.

7. Are workers apathetic and only interested in the pay packet, or are they proud of where they work, proud of the product and eager to be involved in making suggestions?
8. What is the level of absenteeism, sick leave, and staff turnover?
9. How well trained are our people, are they multi skilled, are they encouraged to take responsibility?
10. Do we have enough people? Do workers feel over worked and stressed? Are we frequently late in meeting delivery times?

Desire for Quality

11. What is our level of returns and/or complaints? Are complaints recorded, followed up and analysed?
12. Do we seek feedback from our immediate customers, and from end consumers?
13. What is our level of waste, for example how much water is required per litre of beer? (See our article in the October 2010 issue of the journal.) Have we considered re-cycling and sustainability issues?
14. How much do we spend on inspection and supervision? If workers were trained, knew the required standards and were encouraged to take responsibility (become own quality inspectors), how much would we save on inspection and supervision costs?
15. Are people made aware of the cost in monetary terms when things go wrong? Do we stress it is always cheaper to do things right the first time? What are the costs of poor quality, re-work, waste, breakages, over-time work, management time and, in extreme cases, loss of customers?

Information flow

16. Is our website user friendly, can customers order on line?
17. How effective is our re-order system. Do we order on line?
18. Do **all** our department heads meet as a group at least once

a month to review and update demand forecasts? Does this review include agreement of resources required to meet the updated demand forecast?

19. Do all senior management know and understand key performance indicators? How timely is the feedback of actual performance for comparison to budget and updated forecasts?
20. How well are people at all levels kept up-to-date of important company developments? Information flow helps to help foster a sense of belonging and team spirit. Human interest news of long service awards, sporting successes outside of the company, marriages, births and so on through emails and news-letters are an important aspect of communication.

Finance and Ownership

If it is possible to obtain industry indicative figures for benchmarking purposes, answers to the following questions will be more valuable. Your accountant should be able to provide some benchmarks.

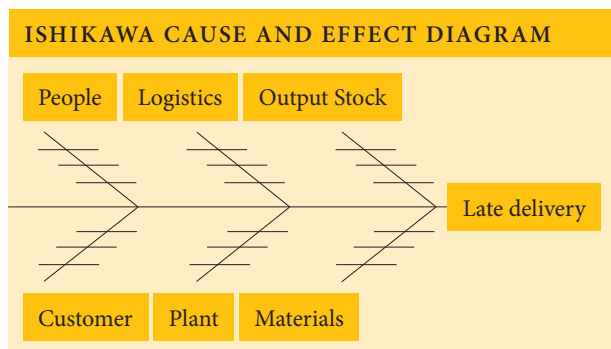
21. How sound is your working capital? What is the ratio of short-term assets to liabilities?
22. How good is your return on assets/capital employed?
23. How good is your cash flow? Consider debtor days and stock turn.
24. What is your profit margin on Sales? Is the trend upwards?
25. How effective and up-to-date is your accounting information? Is information accurate, relevant (useful) and timely? Do we have a dashboard of key indicators or are we swamped with too much information? Measuring performance costs time and money, and if the measurements do not show where action is needed, then they are a waste of time and effort. (In the December 2010 issue of this journal, Supply Chain Performance measures were discussed.)

Answers to the above 25 questions will give us a good understanding of our strengths and weaknesses. If a strength is →

indicated, we should consider how we can make better use of our strength, and if we have a weakness, obviously we need to take action to improve.

HOW TO TAKE ACTION

Having identified from the above 25 questions what has to change, a project team with members from each of the key functions of Marketing, Sales, Research and Development, Finance, Human Resources and Operations should be set up. (In a smaller organisation some of these functions might be overlapping). The areas where improvement is needed can be examined using an Ishikawa cause and effect approach, see the diagram below. If several areas require attention, it might be necessary to prioritise which to examine first. As an example of how to tackle a problem, consider Question 11. Assume that it was found we had a high level of customer complaints and these were mainly for late delivery and inconsistent quality of product. First, we would identify the incidence of complaints, the type of complaints and how many customers were making the complaints. It might be found that only customers in the North East were complaining of late delivery, but all customers had issues with consistency of quality of product. The late delivery issue should be the easiest to address and a team could be set up to look at this problem. The first step is to quantify the problem, in this case, how late, how often and how many customers (if only one customer, finding the cause should be relatively easy).



The answer might be at the extreme 10 days late, but on average four days late with the incidence of late deliveries being 32 per cent.

32 per cent late deliveries indicate that 68 per cent were delivered on time. In Sigma terms, 68 per cent is equivalent to One Sigma (statistically, one sigma represents one standard deviation plus or minus from the mean which, in a normal distribution, covers 68.27 per cent of the population). If we strive for Six Sigma (six standard deviations from the mean which represents 99.99966 per cent of the population), we would only be late 3.4 times out of a million deliveries; in essence, we would be near perfect in delivering on time. One method used in Six Sigma, but originally pioneered by Ishikawa in Japan, for determining the cause of a problem is the Ishikawa Cause and Effect analysis (sometimes known as fishbone analysis).

In our example, late delivery could be due to:

1. We have insufficient stock of finished product (output stock)
2. Our delivery contractors (logistics) are unreliable
3. Our people are making mistakes
4. We have insufficient stock of raw materials for production
5. Our plant is unreliable
6. Our customers are making unreasonable demands

This working backwards from the effect (late delivery) for 'Customer', we would ask:

- Which customers are complaining (a few or all)?
- Do they make rushed orders (short lead times)?
- Are their orders erratic (large orders followed by no orders)?
- Have we asked them to provide forecasts?
- Could we make ordering easier, e.g. on line?

We would then perhaps look at 'Plant' and consider reliability, downtime, maintenance, etc.?

For 'Materials', we might ask; do we run out of input materials, if so, which materials, is this due to poor

forecasting, are our suppliers reliable, do we have dedicated suppliers, how good is our forecasting, do we share forecasts with key suppliers and so on?

For 'People', the issues might be; do we have enough people, do they have the necessary skills, are they only with us for the pay packet, what is the rate of absenteeism, sick leave and staff turnover, do we conduct exit interviews, how can we improve morale and motivation, and are people encouraged to make suggestions?

For 'Logistics', we would ask how and who delivers our product, how reliable are they, do we have dedicated carriers, what are the steps in our logistics chain (depots, transports, warehouses, cross docking, direct to customer, etc.), and where are there bottlenecks in the delivery system?

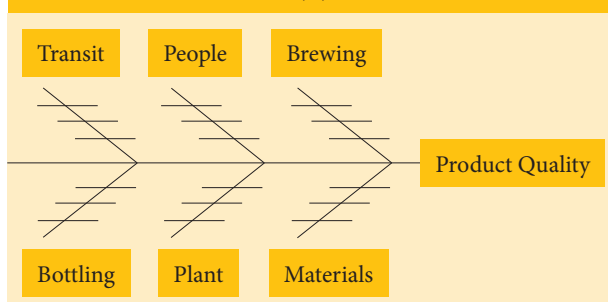
For 'Output stock', how much buffer stock do we hold, how much space do we need and use for output storage, where is output stock held, how do we forecast how much stock to hold and so on?

The above questions are indicative only; once the team begins to look at an Effect, they will readily determine which areas to investigate and by use of a freewheeling (brain-storming) session, questions and answers will emerge. Once an Effect has been defined, it is a straightforward exercise to work back to determine the root cause. Once a Cause (or Causes) has been identified, it should be readily apparent what actions need to be taken.

In our example for Question 11, it was also found that quality of product was inconsistent. A similar approach would be taken. First, quantify the number of complaints as a percentage of the amount delivered over a given period. For example, it might be five per cent of delivered product per month is regarded as below standard quality. In other words, 95 per cent of product is OK. In Sigma terms, 95 per cent represents two sigma, if we are aiming for Six Sigma, 95 per cent is not good enough. The first question is to determine the nature of why the product is deemed to be below substandard. Issues could be quality of the finished product, taste, colour, etc., untidy labelling, incorrect labels, cans damaged in transit, bottles broken in transit. The Ishikawa diagram can then be used to determine the root cause, see the Ishikawa Diagram (2) example. Note that the choice of areas to be examined is different from those areas selected for late deliveries, but the approach is the same – a team approach to identify possible Causes of the Effect. I have not attempted to guess the questions that your team will ask. Your team, in their own environment, will without doubt be able to ask intelligent questions and to find what needs to be investigated.

The approach given in this article does not cover all the six sigma tools. Other, more advanced tools will be provided in subsequent articles. ◊

ISHIKAWA DIAGRAM (2)



REFERENCE

Basu, Ron and Wright, J. Nevan (2004). *Quality Beyond Six Sigma*. Oxford: Butterworth-Heinemann.