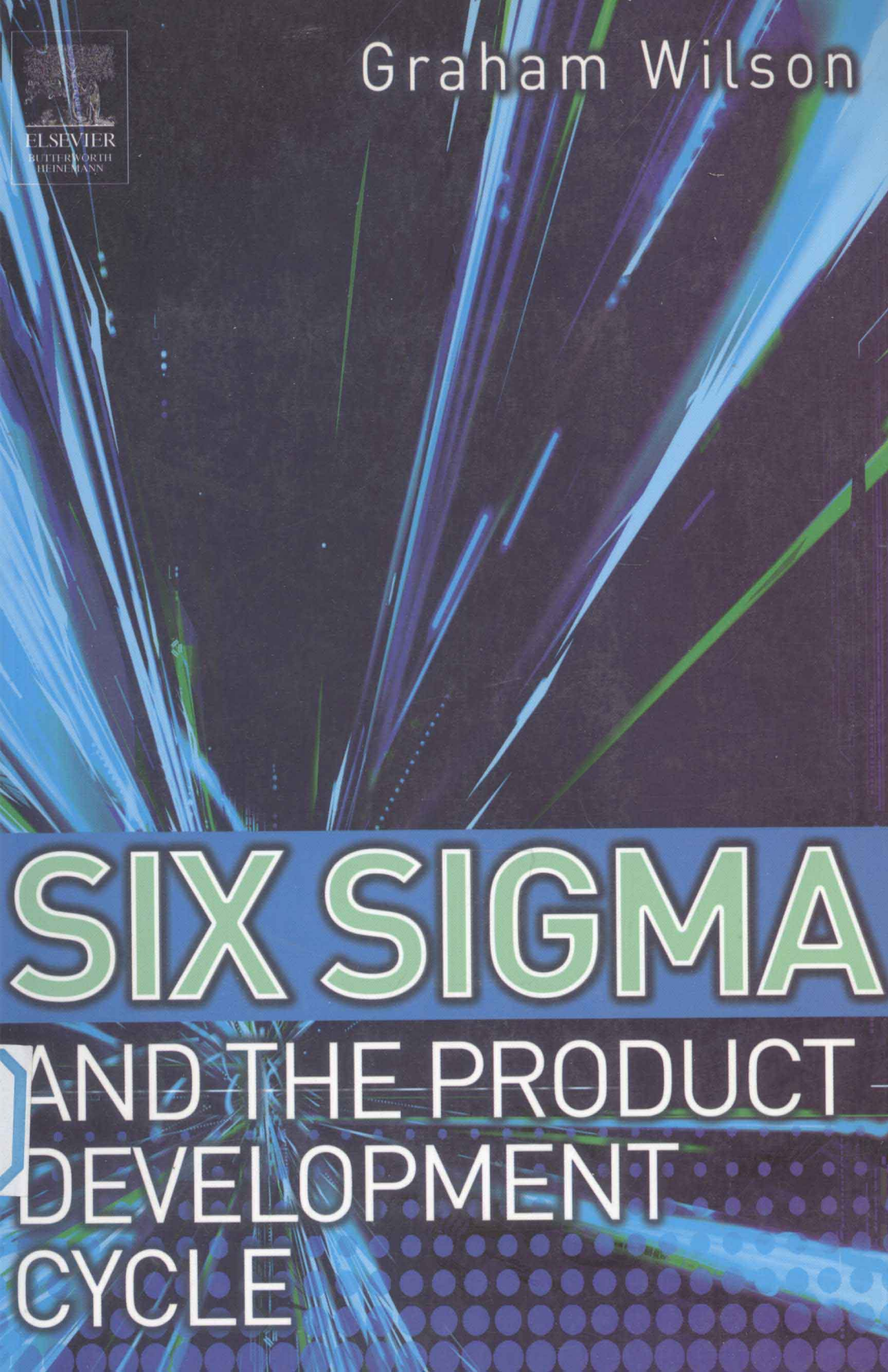
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AND THE PRODUCT
DEVELOPMENT
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Six Sigma and the Product Development Cycle

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AMSTERDAM • BOSTON • HEIDELBERG • LONDON • NEW YORK • OXFORD
PARIS • SAN DIEGO • SAN FRANCISCO • SINGAPORE • SYDNEY • TOKYO

Elsevier Butterworth-Heinemann
Linacre House, Jordan Hill, Oxford OX2 8DP
30 Corporate Drive, Burlington, MA 01803

First published 2005

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloguing in Publication Data
A catalogue record for this book is available from the Library of Congress

ISBN 0 7506 6218 2

Typeset by Charon Tec Pvt. Ltd, Chennai, India
www.charontec.com
Printed and bound in Great Britain by Biddles Ltd, Kings Lynn, Norfolk

Six Sigma and the Product Development Cycle

About the author

Graham Wilson works behind the scenes with executives in a small number of well-known companies as they progressively transform their organization and, in turn, themselves.

He originally studied behavioural science and was awarded his PhD by the University of Bristol. After a spell at a leading London teaching hospital, he joined Exxon, where he worked as an internal consultant specializing in workplace change, employee empowerment and quality improvement.

His career has taken him around the world and continues to provide a wealth of exciting and unusual situations in which to learn. He has been a part of the leadership team of a number of start-ups and, in an interim role, within a number of established companies undergoing radical transformation. While he balances a portfolio career involving writing, inspirational speaking and coaching, he is a non-executive director and serves as a charity trustee.

Graham has a particular interest in the strategic opportunities that the future holds for organizations and individuals. He can be contacted via his website (www.grahamwilson.org).

Preface

Some management concepts seem to be so pivotal at the time they are first mooted and yet all too soon they disappear from the vocabulary and the next one takes over.

At first sight six sigma ought to be one of these. It is a tough concept to understand, being rooted in statistics. The standard it demands is hard to imagine happening in most organizations. The kind of mindset that is needed to make it work is dedicated and unswerving. It is not an overnight fix, typically taking several years before an organization can really claim to have 'made it'.

Twelve years ago, in 1992, I do not think many observers would have thought that six sigma would last more than five years or so. Nevertheless, it seemed to me at the time that this was an important approach. At the time I was working as an organization development specialist across several industry sectors. Despite six sigma having particular appeal to people of an engineering persuasion, the issue that my clients kept returning to was its potential to eliminate so much of the cost of developing new products. With one or two in particular, they had no alternative but to focus on this aspect, and soon we found ourselves breaking new ground. There were a few others trying to apply the six sigma approach to design and development, but we soon found that they were missing a trick. They had not thought of integrating more than one of the sophisticated tools at their fingertips together. What we did was to link a way of gathering detailed insights into customer needs, to a tool that would optimize the products or services to meet these needs at the lowest practical cost, to one that ensured that this performance was maintained.

We applied the approach in the nuclear industry, in motor manufacturing, in an assessment of the potential for transforming the inland mail, and in three different 'emergency response' organizations. It always needed adapting, and some relied more heavily on certain aspects than others, but fundamentally it worked.

In 1993, I wrote a book about the approach, called *On Route To Perfection*. I did not expect it to be an overnight best-seller. In the intervening years, I have written five others, and they all sold well, being translated into a dozen or more languages and produced in a couple of editions, but *ORTP* continued to quietly sell for a decade or so. I began to wonder why and did a little research.

Six sigma has continued to be a sound management approach. In particular, it has been very popular with multinational companies, and especially with those whose manufacturing bases are in the Asian and Pacific rim areas. My book, it seems, was doing very well in those countries particularly.

In the meantime I had gone through quite a transition myself. I had invested a lot in my own development, especially in the whole area of human development, and was primarily working as a coach to senior managers. Then, out of the blue, I was asked to work with a number of executives of a financial services company in Europe who were implementing a six sigma process.

My reservation with six sigma has always been around the plethora of 'experts' who were involved in some relatively restricted way in a project with one company, and who then try to apply the same ideas in a completely different organization. I soon discovered that this was very much the case for the company by which I had been approached. The simple tools and techniques were in place, but the executives had not bought in adequately to make it work.

With a revitalized interest in six sigma, and by now a lot more wisdom about the process of transformation in organizations, I thought it was time to revise the original approach, to bring it up to date, and to offer it in a way that may appeal to today's management teams.

So here is a substantially rewritten account of the integration of quality function deployment, Taguchi's methods of experimental design and statistical process control. I have not tried to write three textbooks in one, and you will find some of the approaches a little quirky: the important thing is that they work. One academic who reviewed my proposal felt that there needed to be more tools included and then suggested one or two; I am afraid he had missed the point: this is a book about six sigma and product (which includes service) development, not a comprehensive book of quality techniques, of which there are some excellent ones already. I have deliberately not included the basics of problem solving, which

are essential in working towards six sigma, because I have already written a whole book on these (Wilson, 2000). Nor have I spent much time exploring the detail of the management of change because, again, I have written already on this (Wilson, 1995). I hope that you will add this to your repertoire of approaches, and that you will let me know of your successes: I love hearing from people and am happy to discuss any aspects of how you intend to apply, or are already applying, this approach to your work.

References

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Acknowledgements

In the first edition of this book, I included a separate chapter on Motorola as a case study. The material was very kindly reviewed by Shelagh Lester-Smith, Tonnes Funch and Bill Wiggenhorn of Motorola. As a result, I was invited to spend a considerable amount of time meeting and discussing matters of organization development with a wide range of fascinating people throughout the USA. I am indebted to them for their support and encouragement.

This book draws on my experiences with many clients. I thank them for their constant source of fascinating challenges.

On the subject of support and encouragement, my partner, Gilli Hanna, has had to put up with my prolonged immersion in this revision. Despite her understandable reservations, she has kept me motivated throughout. We both look forward to rediscovering the world outside the laptop together!

At Elsevier, Maggie Smith was quick to respond to the idea of this book, and her colleague Francesca Ford has been the one who has listened to my interminable excuses for not having it quite ready yet!

Thank you all.

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Culture

I am going to begin with a highly personal perspective on the evolution of the six sigma movement. This is not going to be a soft sell for six sigma. If I put you off pursuing this process, then the book will have been well worth your investment in it. If I demonstrate that the process is much more complex than you had expected, then I will have grounds to add another star on my fuselage. Six sigma is a highly worthwhile goal. But it is not to be undertaken lightly: the effort involved will reap profound rewards, but the pain is too great for many organizations (or the leaders of them) to endure.

There has been a revolution taking place in business. The world of work has never before had the flavour that it has now. And it never will again.

A time in which minds were expanded, but products lagged behind

Since our minds would struggle otherwise, when we describe the history of business, we often talk in terms of decades. Some people are still at work today who worked in the 1970s. This was a decade characterized by design, innovation and industrial disputes. Ask most teenagers today when the Vietnam War ended and they will say it was in the 1950s, although actually it did so in 1975.

Innovation and design remain crucial elements in the mixture of success-making ingredients for business. Of course, the 1970s did not

have a monopoly on them. (It is sometimes interesting hearing someone describing a stylish chair as so '70s' when it dates back to the 1930s. Innovation blossomed in both decades.)

The search for human beauty

Each decade seems to contribute something. While the 2000s might be seen as the era of technology, there has also been a dramatic growth in demand for antiquity, craftsmanship and the artisanal skills that were heralded by William Morris in the 1880s. Experiments in open-studio working today are replicating the model of the arts and crafts community that he set up in the Cotswolds.

The first step: appreciating quality

In the 1980s, in some ways people had grown tired of innovative products, manufactured quickly, using new materials and processes. Not because they did not like colour television, low-cost microwaves and budget hi-fi, but because they did not like them breaking down all the time. This was the world of the adults who conceived six sigma.

Behind the scenes, in the defence industry, and very much a consequence of the Vietnam War and other conflicts at the time, there had been a silent revolution brewing. The defence procurement specialists had evolved a code, a series of standards that could be applied across the board to ensure that suppliers delivered items that worked and were reliable.

In 1979, the first civilian equivalent of these military standards was launched. It was called BS5750 and it eventually evolved into ISO9000. It heralded a new era for the 1980s, of quality. This was not to say that the Quaker manufacturers of the 1870s, or the engineers who produced the first Fords, had not understood quality, but in the 1980s it became the buzzword. Suddenly everything to do with management had some connection to quality. To some extent this was a natural coalescence, but it was also a bandwagon.

Depending on who they were or what they did, individual managers clutched at a particular thread. (And boy, are some still clutching!) Engineers, outside the production area, seemed to resonate with quality

management systems (as the ISO9000 fraternity called them). People in production loved the tools and techniques of quality control. (Its proper name, statistical process control, was clearly not hip enough.)

When human values matter

In the background were a few people who were pointing out that one-solution answers were unlikely to work and a more holistic approach (well, they would have called it that in the 2000s) was needed. One such guru of the time, Tom Peters, espoused four characteristics of 'excellent' companies: customer obsession, employee empowerment, transformed leadership and innovation. The formula still works, but it is, and always will be, 1980s' speak.

What Peters was saying very clearly (and he had a powerful style of oratory) was that excelling in business was as much about how you relate to your employees as it is about the nuts and bolts. His message, too, had its precedents. In the 1920s, Dale Carnegie and his associates penned *How to Win Friends and Influence People*, in which they outlined the basic principles by which people could work better together and by which managers could lead their staff. In the 1960s, especially in the USA, there had been the 'quality of work life' initiative that promoted engagement of the brains as well as the brawn of employees. (Had this not been sponsored by the organized labour movement it might have had more impact, and now that the nature of the relationship between unions and management is radically different, perhaps it is time for a forward-thinking union to try again.)

Understanding people at work

The first half of the twentieth century had represented an unfolding of the science of psychology. By the 1940s, a lot of attention was being paid to the interrelationships between people, especially at work. Psychologists were employed in the war machinery. Little did anyone know of the extent of this 'research'.

In the 1910s, early experiments by one man, Taylor, had led to the 'discovery' of scientific management or, as it is sometimes called,

'Taylorism'. The idea was elegant. Divide work into simple, short, repeatable units and have workers perform them for prolonged periods. In this way they become both proficient and efficient, and the overall process becomes highly economical and of the best quality. The trouble was that people did not like doing the same mindless task hundreds of times a day.

The result was riots: literally. Scientific management was outlawed by Act of Congress in the USA, and then under French law after further riots there. Despite this there are still some managers trying to implement it today.

Scientific management was a precursor to the science of organizational behaviour, but this had to go through one more desperate evolution before it would be applied appropriately. It was only in evidence at the Nuremburg war trials that the work of Wirth, especially in designing the processing plants at Belzec and other concentration camps, came to light. He had created a system, operated knowingly by human beings, with the sole purpose of killing and disposing of as many people as possible in as short a space of time as possible.

So we entered the 1950s. Psychologists knew that there must be positive applications of their work in peacetime. One man stands out above all the rest as the father of organizational development (OD): Ed Schein. Organizational development is perhaps best defined as the application of the science of organizational behaviour, but with a clear set of humanist values underlying it.

Essentially, organizational behaviour scientists were saying, 'It is all right to intervene in the way people behave at work, provided that they are enriched by the experience and not manipulated purely for the corporate advantage'.

Many critics of the 'change programmes' of the 1990s pointed out that they did not generally have the enrichment of the employees among their criteria for success. They were therefore manipulative and, in the worst cases, clearly corporate bullying in disguise.

If OD was the buzzword of the 1970s, in the 1980s it was called 'total quality management', and in the 1990s the 'management of change' (not to be confused with 'change management', which is an IT term). Since then it has diversified, and today we hear a lot about (inner) leadership, authenticity, emotional intelligence and spirituality at work. In each case, they are essentially about creating a workplace that is enriching for

employees and at the same time successful for the organization. The themes mentioned are all reflections of the need for managers to have a more grounded sense of themselves and their own values before they attempt to manipulate people at work.

Listening to customers; anticipating their needs; building a relationship

If the 1980s saw a focus on quality, what next? It really did take the likes of Tom Peters shouting at management audiences for them to realize that quality means giving customers what they want. Even then, in the 1980s, many tried to avoid this by focusing on internal customers (to the exclusion of the ones outside who parted with cash). Most quality consultants of the time will tell you that the hardest group to influence through total quality management were salespeople: sales managers and sales directors. With hindsight, many were right to be sceptical, for their organizations focused exclusively on internal issues and paid lip-service, if that, to the real world of the buying customer.

By the 1990s, it was trendy to be totally focused on customer satisfaction. Sadly, a few companies were sold the idea that quality management systems would achieve this, and were rudely awakened when they discovered that staff who had boring jobs, and who were underpaid and bullied, rarely delivered satisfaction to their customers, regardless of the bureaucracy surrounding them. An industry was born servicing these needs: workshops, books, experiential groups and even, in one case, a company selling mirrors with a half moon on them, to which you were meant to match your grimace before speaking to punters.

As we entered the new millennium what began as an obsession, something with passion, had been systematized, regulated, legislated and turned into the field of 'customer relationship management'. In a number of cases, so important is this relationship with their customers that companies have transported their 'customer service' professionals (the jobs, if not the people) to the other side of the world on the basis that it is a lot cheaper there. Of course, it was only a matter of a year or so before they realized that if you ask people who are earning £1500 a year (if they are lucky) to handle loan applications for ten times that amount they might just resent it! And people who resent things can be tempted

to redress the balance in their favour. Brains, it seems, are not necessarily a prerequisite for corporate strategists.

'And what', you might quite rightly ask, 'has this got to do with six sigma?' Two things immediately come to mind. First, some people will tell you that six sigma is a thing of the past. It was relevant in an emergent US economy in the 1980s, but not since and nowhere else. The answer is that it is neither time dependent nor determined by the climate (economic or otherwise); six sigma is the natural next step for a handful of organizations, for which the culture is ready.

By the early 1990s, and certainly by 1992, half a dozen companies were in active pursuit of six sigma: ABB, Motorola, TI, IBM, DEC and Kodak. As an aside, despite this broad range of companies being involved, Motorola subsequently claimed that six sigma was a trademark of theirs. They continue to make this assertion very broadly (and in all probability many of the people who make it believe it). Yet, many companies had already embarked on the process and Motorola's claim was restricted to the 'fields of electronics and telecommunications equipment manufacturing'.

Secondly, it tells us something about the external climate in which six sigma emerged. (I will not say was 'born' because it most definitely was not an invention of the 1980s, but stems instead from the pioneering work of a few souls in and around the 1950s (Deming, Shewhart, Ishikawa *et al.*).

Since then, GE, Allied Signal, Nokia, Sony, Navistar, Whirlpool, Bombardier, GenCorp, Siebe Foxboro, Lockheed Martin, John Deere, Siemens, Compaq, Seagate, PACCAR, Toshiba, Dupont and Dow Chemical have all launched six sigma processes. More recently still, in 2000, it seems there were active six sigma processes at Air Products, Honeywell, Johnson Controls, Maytag, Praxair, Ford, Zurich Financial Services and Johnson & Johnson.

The chief executives' embrace

The world around us moves on. Companies (usually one or two members of the management team) embrace ideas that appeal to them. Some will be a century ahead of the game. Others will be a bit behind. What was right for Motorola in the 1980s appealed to Zurich Financial Services (ZFS)

in the 1990s, and may suit your company in the 2000s. Just as the approach adopted by ZFS was very different from that applied at Motorola, so the approach that you adopt will be different to either of them.

Organizational maturity

When a company embarks on six sigma and comes to a halt, it is not unusual for the problem to be that they tried to copy too closely the approach of one of the exemplars, they were not discerning enough or they were sold a mechanistic process developed by someone who only knew part of the story. Into this last category, I would especially lump the firms who will sell you 'black-belt' courses in problem solving. Not only are these short courses an insult to the martial arts fraternity, but they are also an insult to the intelligence of managers and staff in organizations. Fortunately, a few courses are emerging that do teach the practical application of human behavioural science and that treat their students as articulate, intelligent human beings. These are typically part-time MSc courses, lasting a year or more. (I mention these in more detail in Chapter 3.)

You will be glad to know that this book will describe a set of tools that have been used to good effect in companies in pursuit of six sigma, and show you how to integrate them, especially in the area of (new) product development. But it expects you to be discerning in your application of them, and not slavishly to follow someone else's (my) approach.

Six sigma, as you will see later, is a statistical term. The tools that I describe were all developed and shared among organizations seeking to achieve better levels of productivity, often from customer to supplier. There are some individuals, masquerading as organizations, who would seek to label this integrated approach and stick a copyright symbol on it. To my mind they are not only exceptionally immature and sadly lacking in more appropriate measures of their own self-worth, but also missing two important points: first, pursuing six sigma, or whatever you wish to call it, is not a competitive thing. It is about your own performance, if that performance gives you a competitive advantage that is a bonus. Secondly, it is out of sharing and collaboration that most innovation emerges. If you want to get ahead, get out there and share. If you want to die off through stagnation, then keep it all to yourself.