

ESSENTIAL GUIDE TO OPERATIONS MANAGEMENT

Concepts and Case Notes

DAVID R. BAMFORD
PAUL L. FORRESTER



A John Wiley and Sons, Ltd., Publication

‘This book combines technical theory ‘book smarts’ with real life experience ‘street smarts’ in a flowing read. The kind of book you can easily read cover-to-cover or dip into occasionally as a quick reference. It is applicable for all levels and functions within a company. At a high level, it enables an appreciation of the tasks and responsibilities of peers. At a detailed level, it provides practical examples to copy or to adapt into local work flows and processes to bring immediate benefits in understanding, process efficiency and subsequent increased margins.’

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Dr Mike Niblett, Programmes and Accreditation Manager

The Manufacturing Institute, UK

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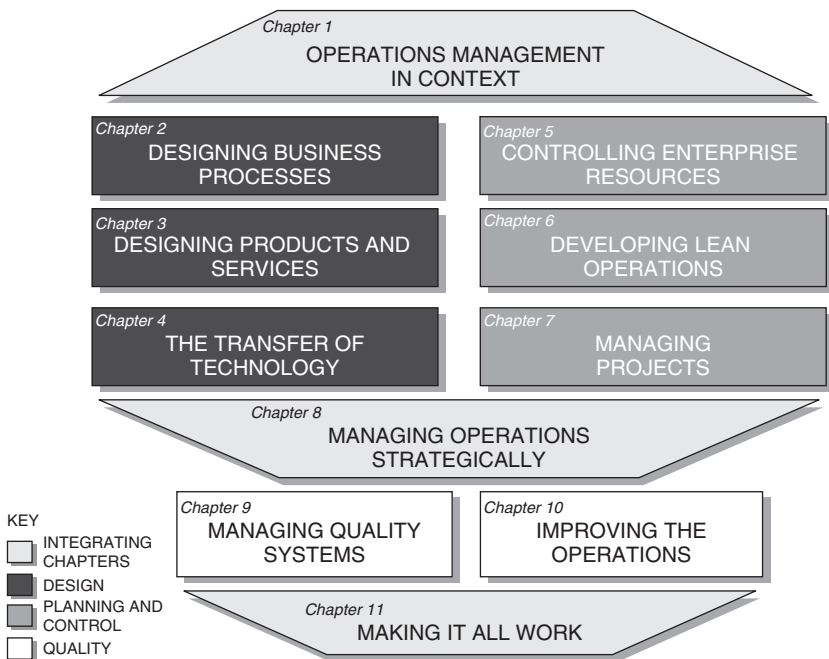
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1 OPERATIONS MANAGEMENT IN CONTEXT



Conceptual model of operations management

Introduction

The aim of any service, public sector or retail or industrial operation is to deliver goods and services of the quality, quantity, cost and availability that will satisfy the customers' needs while at the same time making most effective use of resources. This can only be achieved by giving attention to the design of products, processes and work for employees, and through competent planning and control. This is what Operations Management is about. This book presents the fundamental principles of operations management in a novel and structured way that is appropriate to the needs of contemporary Operations Managers, and students in this field.

Operations management covers decision making in the organization, from top level management issues such as developing an operations strategy congruent with the company's business and marketing strategies, to the immediate control of operations. It is, therefore, more than operational management. Each chapter develops an understanding of the theory and practice of key operational concepts to enable delivery of the strategy.

The book is structured in a unique manner, to better reflect the concerns of the contemporary Operations Manager in the twenty-first century. The book is based around the conceptual model of operations management.

The model centres upon the idea that operations management comprises three essential components:

1. *Design of operations* processes, products and services, and the work of individuals;
2. *Planning and control* of operations once designs are in place and operational; and

3. Ensuring *quality* of products and services produced and delivered, and (wherever possible) improving on these.

However these cannot be addressed in isolation. The essential element in *effective* operations management is the *integration* of these components. The book therefore contains three integrating chapters:

1. We need to understand **operations management in context**. What is its purpose in a business sense? And how and where does it relate to the other business functions.
2. How might we **manage operations strategically**? Design, planning and control activities must not be conducted totally independently of one another, so we need the means to coordinate our activities within a formulated operations strategy. We believe that operations strategy is best covered not at the start or end of the text (as you find in most other operations management books), but in the middle, after the principles of design and operations planning and control are well understood.
3. We need to consider the implementation of the principles contained in this book, so we need to look at **making it all work** in the final chapter. Implementation is identified by practitioners as the most critical activity, but is often overlooked or skimmed over in texts, so we address this head-on in this book.

The conceptual model offers a comprehensive and up-to-date view of the operations management function and it can be seen that we have integrated contemporary topics such as technology transfer, project management and lean operations (often discussed and also critical in business, but often overlooked in any depth within existing texts). But, before embarking on

these topics, it is important that we fully grasp and comprehend what the practice of operations management comprises, and also where it has evolved from in an historical and theoretical context.

Basic principles of operations systems performance

The task of the operations manager can be summarized at a basic level as converting a range of resource inputs, through the operations process, into a range of outputs in the form of products. However, the various elements that together make up this management function are diverse and complex in nature. The operations manager must have competencies in human resource management, strategic awareness, product knowledge, systems and organizational design and, at the operating level, of planning and control. Moreover, the task of the operations manager is often misunderstood and is often relegated to a reactive rather than a positive and proactive role within the organization. To indicate the importance of the operations function to the business it is useful to identify five key performance indicators for any operations system. These are quality, speed, dependability, flexibility and cost, where:

1. *Quality* reflects the extent to which operations are performed in line with specifications and/or satisfy the customer (i.e. *getting things right*);
2. *Speed* reflects how quickly and responsively we supply and deliver our products and services (i.e. *doing things quickly*);
3. *Dependability* indicates our reliability to the customer or recipient of the product or service (i.e. *doing things consistently and on time*);

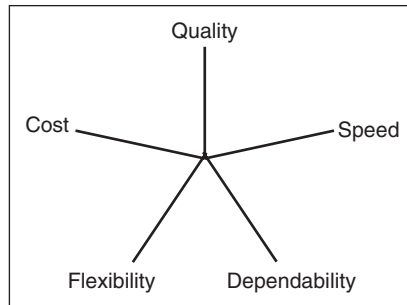


Figure 1.1 Five key performance indicators (KPIs)

4. *Flexibility* reflects our ability to adapt and respond to differing needs (i.e. *being able to change what we do*); and
5. *Cost* reflects the expense we have incurred in a financial sense to deliver the product and/or service to the recipient (i.e. *doing things cheaply*).

In a simplistic sense, and in the ‘ideal world’, we might argue that an operation should seek to optimize all five of these performance objectives. If an operation delivers the best quality, in the fastest time, more reliably, in the most flexible way and at cheapest cost, it is inevitable that this operation would perform better and therefore more effectively than its competitors. However this is a panacea. As Hill (1993) originally, and others have since argued, operations management comprises a set of ‘trade-off’ decisions, whereby a decision to improve performance for one indicator often (though not always necessarily) results in a negative effect on another. Most obvious in this respect is cost. Often decisions to reduce cost can impact upon quality, speed, reliability and flexibility if improperly thought through. This book will, later, indicate where costs and other indicators might be simultaneously improved, but we need to recognize there are often *constraints* on what we might be able to achieve. And this indicates the second important factor of operations management: it

is about managing constrained resources (human, physical and financial) which places limitations upon what we can achieve.

In the same way as the performance objectives above in Figure 1.1 can be used to compare and contrast different operations systems, so can the 'four Vs'. Let's investigate each of these individually, starting with volume. Figure 1.2 shows low volume on the left-side of the continuum and high volume on the right. Operations systems producing low volumes of products and services invariably result in: low repetition of tasks; operations performing a large proportion of the job (and perhaps the complete set of activities); less systemization; high unit costs. The opposite applies to high volume operations: greater repetition, a greater division of work, greater systemization and lower unit costs through economies of scale. The other three Vs run counter to volume, with 'high' on the left-side and 'low' on the right. This reflects the tendency for low volume operations systems to have high variety, high variation and frequently higher visibility. So high variety operations, those that produce a wide range of products and services, offer flexibility, are able to cope with and match customer needs and tend towards higher unit costs. Low variety operations, producing more standard products and services, have the opposite features. Variation reflects

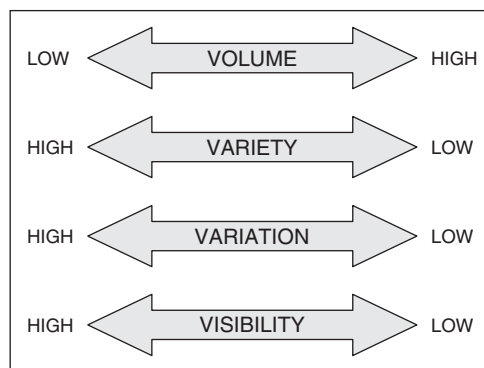


Figure 1.2 Volume, variety, variation and visibility (the four Vs)

ability of the operations systems to flex and change, usually in response to the nature of demand (frequent and rapid changes on the left-side, very stable, unchanging demand on the right). High variation operations systems feature the ability to change capacity of output, anticipation, flexibility response and generally high unit costs. Finally visibility reflects the extent to which operations facilities and workers are physically seen or capable of being monitored by customers and clients, or whether they are out of sight and contact (back office type operations). High visibility operations feature short waiting tolerance, the need for customer contact skills, variety and responsiveness in service, and high unit cost.

It has already been noted that the four Vs are arranged in Figure 1.2 so that volume has low on the left and a high on the right, whilst the others run opposite. This is for a reason. The features of operations systems occupying positions near the left-side of the continuum feature *flexibility* as a major concern: the ability to be flexible, to provide a flexible service. Whilst the right-side concurs with *repeatability*: the ability to economically produce products and services in high volume and at a relatively low unit cost. An example at this point serves to illustrate this.

Example 1

You have decided to take a vacation at an Island Resort. You wish to treat your nearest and dearest to a nice break in paradise; you want to be accommodated in a small house on stilts over the ocean. It's an oasis where people come out to you in little motor boats and cook meals for your family, then slip away to leave you in peace. You don't see anybody else. For this Island Resort volume would be relatively low, given our definitions above. The variety would be high. You expect them to provide a range of facilities. If you want to Jet Ski, they would be able to provide a Jet

Ski. If you want to go Scuba Dive on the coral reef, they would be able to arrange this, plus transportation and any necessary instruction. The cost to you might be high, but the Resort can supply this. Variation is potentially high for the Island Resort because of the unpredictability and needs for varied control systems for the services. Finally, visibility is high. You want to see a chef wearing the necessary outfit and hat preparing and cooking for them on a 'desert' island. You are likely to have a short waiting tolerance: if you are paying considerable amounts of money you want and expect efficient service now. The Island Resort, therefore, needs to design and plan their operations with the needs of its customers in mind. The Resort needs excellently designed and constructed accommodation and administrative buildings; staff with good customer contact skills; there is a need to recruit flexible employees who seem genuinely pleased to meet and greet customers and efficiently respond to their every need. All this comes at a high cost, but the customer is willing to pay for this.

Now contrast the Island Resort with a chain of Express Hotels, serving the needs of people who are on business or touring, and need to stay just one night, usually for about 8 hours. The Express Hotel needs to have a bed, a television, tea and coffee making facilities, and sometimes a telephone, not often though because we all have mobile phones. As a customer you need to be able to check-in and check-out quickly, and know that the room meets a standard quality. You don't care whether you see a member of staff or not. You just want to get into your room for the night, pay your bill and leave. You probably do not even want breakfast because you will take 'breakfast to go' with a coffee when on your way to your next destination. So, in contrast to the Island Resort, volume is high, because the

Hotel and customer alike require fast throughput and high repeatability. They are geared to a high volume of customers with very similar needs, and only willing to pay budget prices. Variety is low. Most of the Express Hotel chain's rooms look and feel identical. Variation is low because you, as the customer, are not expecting any differences. There is a stable routine, predictable operations and high utilization. Most of these hotels are located adjacent to major highway intersections so they are convenient and easy to get to. Visibility is low. Ideally you do not want to see anybody. After a long day's work or journey you are in no mood to talk to anybody and just want to soak in the bath or take a shower, then get a good night's sleep and depart.

To summarize, the four Vs are used within organizations to assess their operations. Organizations can profile customer needs across the four continuums, compare this to their existing facilities (where the operations are currently placed in terms of product or service delivery) and can also develop profiles for direct competitors. Such profiling enables *gap analyses* where, for example, one can identify any problematic differences between customer needs and actual delivery from our operations system, as well as benchmarking against competitors.

The scope of operations management

Operations management relates to that function of an organization concerned with the design, planning and control of resources for the production of goods or provision of services. As a discipline it is not merely confined to a collection of techniques and quantitative methods. It makes appropriate use of the tools of operational research and statistics where relevant, but is primarily concerned with the broader issues involved

in the design, planning and control of products, services and processes.

There are a number of ways of conceptualizing the scope of operations management, some of which are suggested below:

By considering the components of an operations system: Utterbeck and Abernathy's (1975) model of innovation suggests that any productive unit should be considered as comprising three main elements: product, process and work organization. It is useful to consider the operations manager as having responsibilities in all three of these areas.

By considering the life cycle for products: The operations management function is concerned with, and should have an input to, all stages in a product's life cycle. The product life cycle of introduction, growth, maturity and decline can be equated to a process life cycle, as illustrated in Figure 1.3. The responsibilities of the operations manager, therefore, should not be merely confined to the *production* stage, but to all stages of the product and process life cycle.

By considering the organizational scope of operations management: 'Operations management' should not be confused with the

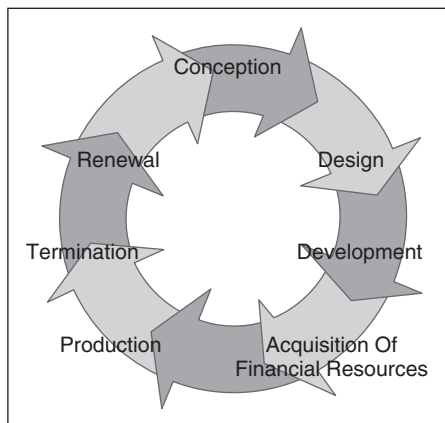


Figure 1.3 The process life cycle

term 'operational management'. The management of operations permeates all levels of organizational decision making and is not merely confined to less important, low level and short term decisions. The operations manager should, in turn, enter more widespread strategic debates in addition to maintaining contact with day-to-day operations. Thus the scope for operations management in decision making covers operational management right through to strategic management (see Figure 1.4).

The conceptual model employed in this book identifies and distinguishes 'design' activities from operations 'planning and control' and 'quality'. Design, covered in Chapters 2, 3 and 4, involves:

- *Business process design*: The organization and arrangement of physical facilities, information and material flows, and labour resources to enable the conversion of inputs (materials, orders, labour, etc.) into outputs (goods and services).

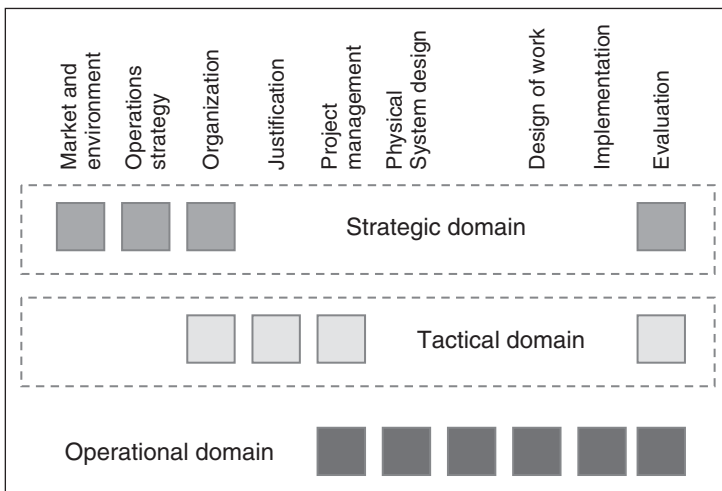


Figure 1.4 The levels of operations management decision making (Bennett and Forrester, 1993)

- *Product and service design*: Interrelated with process design, the configuration of the goods and services our processes are producing and delivering.
- *Technology transfer*: An activity frequently cited and identified as important, but often overlooked in other texts. Design activity will always involve the transfer of 'know-how' from one person, or group of persons, to others in the design process. This is true whether we are talking about new product or processes (research and development transferred from the 'laboratory' into regular operations) or the transfer of existing technologies (e.g. expanding operations, including establishing new facilities overseas based upon home operations, as part of an international operations strategy).

Planning and control is contained within Chapters 5 to 7. Planning and control concerns the organizing and monitoring of operations systems, projects and programmes, together with the feedback of variances from plan for process or programme adjustment where necessary. It includes:

- *Controlling enterprise resources*: The resources of the organization (its facilities, people and materials) need to be effectively managed in terms of operational schedules, workflow, materials management and throughput.
- *Developing lean operations*: The operations need to be managed in such a way that waste (of time, of resources, of money, of effort, etc.) are minimized. Lean operations have evolved in terms of theories and practice over the last two–three decades, so to be competitive organizations must grasp these principles.
- *Managing projects*: Linked with programmes of design and change management, there is a distinctive set of management principles for the coordination and control

of projects. This not only relates to the set of tools and techniques available, but most critically to organization, teamwork and management styles needed for effective project completions.

Quality management has been explored in depth and much written about over recent years. The main themes for operations managers include not only quality control, but also an emphasis on improvement. This is the reason why this book punctuates the chapters on design and planning/control from quality management chapters with the coverage of managing operations strategically (Chapter 8). Our argument here is that 'improvement' forms the core of any effective operations strategy, so the main strategy chapter should be placed here to integrate and link preceding principles from the improvement process covered later. The main principles of quality management, covered in Chapters 9 and 10, include:

- *Managing quality systems*: Quality control systems need to be effectively designed and put into practice, to enable the capture and evaluation of quality data and customer feedback, whether this data is quantitative or qualitative in nature.
- *Improving the operations*: Contemporary 'best practice' indicates that operations systems should not stand still, merely adopting quality management systems which measure whether performance conforms to prior specifications. Instead there should be an emphasis on *continuous improvement* whereby there is a commitment by the organization to future development of the operations.

The practice of operations and quality management is accepted as a necessary function within any organization. When one talks of a theory or discipline of operations management, however, it