Reading: Introduction to operations management

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Written by Paul Walley for the Open University module B207
Shaping business opportunities

Introduction

This reading will provide a basic introduction to operations management perspectives and concepts.

There are a few important points to be made at the outset. First, although operations management does not always feature as widely in business studies degree programmes as other functions, the discipline is hugely important for both the short- and long-term success of any organisation. Second, more people who occupy managerial positions are actually operations managers than might first be realised. Through this course, you will find that if you manage any kind of resource, *you* are an operations manager. Third, the operations management function needs to be fully integrated into the organisation and involved in any new developments or organisational changes. Operations managers often are the implementers of the organisation's strategies. The subject will be presented within this course in the context of introducing and implementing new ideas as well as analysing existing situations to see why operations are successful or not.

This reading will take you through an input–process–output framework that allows you to structure the key ideas and concepts. The operations manager's role is studied to see what tasks they perform and how they can affect both the short- and long-term success of an organisation.

1 What is operations management?

The operations management function is responsible for the efficient delivery of goods and services to customers through effective management of the organisation's resources to meet their customers' needs. If you look at the balance sheet of a typical company, you will see it records a lot of fixed assets such as manufacturing plants and equipment. There will often also be other resources, such as raw materials, work-in-progress and unsold finished goods, listed as assets in the company report. These assets tie up the capital invested in the business, often costing the company much in interest payments.

Many organisations get into difficulties because of cash flow problems created by factors such as over-stocking of materials and they then fail, even though, on paper, they are still making a profit. An effective operations manager will manage a process ensuring these types of assets are

not kept unnecessarily or wasted. This efficiency is achieved through good process design, effective planning and control systems and an entire workforce that is involved in continuously improving processes and systems.

This set of roles is usually summarised in a simple input–output–transformation model, shown in Figure 1.

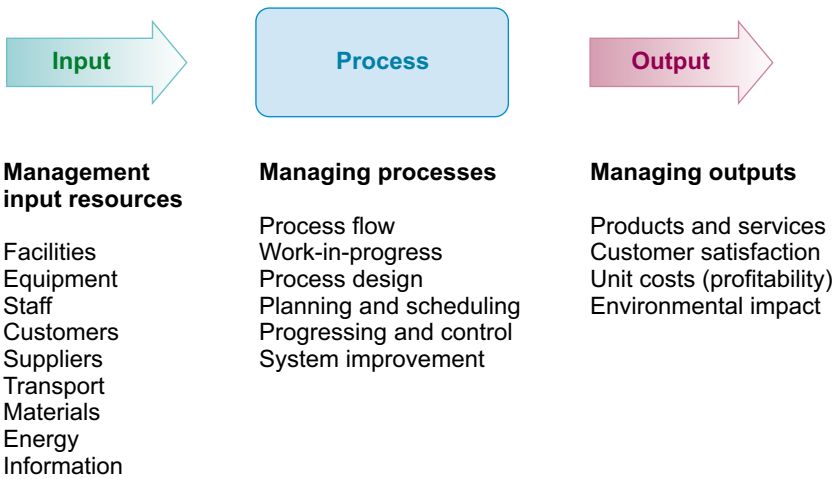

Figure 1 The operations input–process–output model

The diagram shows the types of resources that operations managers have to collect and use efficiently and effectively. These include the fixed assets of facilities and equipment, materials and information used during the process. In many services, the management of the customer during the process is a key task. Often the customer who is used as a resource, such as in a self-service process, also participates in the transformation process.

As the diagram highlights, the operations function is actually responsible for the output of goods and services that the customer pays for. Operations need to produce the right goods and services – the ones customers want – at the right time in the right location. This performance leads directly to levels of customer satisfaction or dissatisfaction. However, this must be achieved without overspending or excessive resource consumption, otherwise the unit costs will be too high and budgets or profitability will be constrained. Operations managers should consider other impacts of their activities, such as the environmental impact of the operations.

Are all operations the same? The diagram above is just one framework that explains and characterises operations management in all economic sectors, covering both manufacturing and service, in public and private markets of all sizes. This reading's approach will be to identify the common features in all operations and then tease out some of the reasons why they can be different. All operations have some common characteristics and the same core theory can be used to start while then also learning from the differences.

This reading will begin to explore how there are differences in the ways that operations are designed and managed due to:

- the types of resources that are predominantly transformed in the processes

- the levels of volume and variety present in the process. (The next reading will explore the impact of volume on process design.)

Much of the effort of an operations manager goes into the management of the transformation processes that form all operations. Operations see all activities as a set of processes, often linked in a more complex system. The nature of the process depends partly on the type of resource being transformed and that of the transformation taking place. There are three main types of transformation processes:

Material processing – Manufacturing operations, mining operations and logistics operations such as shipping, trucking, warehousing and postal services all predominantly transform materials within their processes. There is also material processing that takes place in retail operations – the focus is usually on customer service operations in environments such as retailing, but there can also be extensive material transformation processes that occur.

Information processing – Banking, accounting, news services, telecommunications and research organisations all predominantly process information as a core part of their business. Think how this type of process might differ from a material transformation process. The information being processed is not necessarily as visible as the material. There are considerable challenges associated with the accuracy of these processes. For example, a bank cannot afford to have errors in money transfer processes or account management.

Customer processing – Some of you may dislike the idea that operations process customers, and most people do not like to think of themselves as being 'processed' when they visit somewhere, such as a hotel, hairdresser, hospital or theme park. However, many of the principles of operations management are readily and beneficially applied if some systems are viewed as customer processing operations.

The next consideration is what type of transformation takes place. Within a process, there can be the following types of transformational change:

Physical transformation – Activities such as the preparation of food in a restaurant kitchen, the machining of metal in an engineering workshop or the mixing of chemicals in a laboratory create a physical transformation of the resources involved.

Informational transformation – Practically all operations involve some sort of informational transformation, including transforming data in company reports or research projects through to simpler data processing such as recording booking information for a customer's stay in a hotel.

Possession transformation – Most retail operations involve the change in possession of goods, but there are other operations with similar transformation processes. Think about the operations involved in conveyancing and buying property. Data sharing may also be considered as a change in possession.

Location transformation – The obvious examples of location transformation would include logistics processes of getting material to suppliers or any customer transport service.

Storage transformation – All types of resources can be stored in some way. Inventory is stored in warehouses, people are stored in waiting rooms and data are stored on servers. This storage serves some sort of purpose, usually to create availability of resource or to maintain utilisation of systems. There are costs of storage, and many operations experts see unnecessary storage as waste.

Physiological or psychological transformation – Many types of services involve the physiological or psychological transformation of the customer. The most obvious examples would include medical treatments such as surgery, or counselling for mental health issues. You should also think about the physiological or psychological transformation of customers at a hairdresser, at a spa hotel or on a scary ride at a theme park.

Worked example 1: Transformation processes at a bakery

It is useful to understand all the different transformation processes that occur within just one operation. Table 1 is a worked example that shows the transformation processes you would be likely to see in a typical bakery.

Table 1 Transformation processes at a bakery

TRANSFORMATIONAL CHANGE	TRANSFORMATION PROCESSES		
	Material processing	**Information processing**	**Customer processing**
Physical	The bakery is converting flour, yeast and water into bread through its core process.		
Informational		Customer orders will be converted into schedules.	Customers may need to be informed of the delivery schedule.
Possession	The bread is being sold to someone. This could be to a customer directly or to a wholesaler.	Production information such as schedules or quality reports may be shared with suppliers, customers or other departments.	
Location	The bread will need to be moved from inside the factory to the customer, possibly via a logistics warehouse.	Information will be sent from one location to another during the planning and delivery processes.	
Storage	Raw materials and finished goods may have to be stored before use or transportation.	Information about orders and schedules will have to be stored.	

Physiological/ Psychological			It would only be if the bakery made specific efforts to engage customers that a psychological transformation took place, e.g. reassuring the customer of supplying the product on time.

As you can see, the dominant transformation here is in material processing because the core activity is manufacturing. However, there is also a lot of information processing that takes place in the background to ensure that the factory operates to schedule and the customer can be informed of delivery times.

Worked example 2: Transformation processes at a library

Table 2 shows examples of the transformation processes at a library. This example is quite different to the bakery example in the emphasis of what types of resources are being transformed and the nature of the transformation processes.

Table 2 Transformation processes at a library

TRANSFORMATIONAL CHANGE	**TRANSFORMATION PROCESSES**		
	Material processing	**Information processing**	**Customer processing**
Physical	There may be some minor material processing of the books to insert bar codes or RFID tags. The facilities will undergo maintenance that could involve physical transformation.		
Informational		The data about book availability, return due dates, fines for late return, etc. will all have to be processed, often in real time. Research databases of journals will also have a lot of information processing.	
Possession	Books and articles will change possession, albeit usually on a temporary basis.	Information is shared or provided to others in many processes.	

Location	Physical books will be moved from one location to another, such as from book returns back to the shelf.		Customers may have to move around the library searching for items. In large libraries travel distances could be significant.
Storage	Book storage is one of the main processes.	Information is stored in databases ready for use.	
Physiological/ Psychological			Customers visiting the library will go through psychological transformation at key points whenever they receive some customer service.

The library is an example of an operation where all types of resources are being processed. The dominant resource being utilised is information but the customer engagement activities or the material processing that occurs must not be overlooked.

Exercise 1

Allow approximately 15 minutes for this exercise.

The two examples above highlight the similarities and differences between a primarily material processing operation and a largely information processing operation. What will be the key differences in what the operations managers in these two jobs do?

Comment

There are many aspects that you might pick out when comparing the two operations. In the bakery the operations will probably be managed to a very tight schedule of which products are made, and in what quantities, at very specific times. This will be to ensure that activities such as material arrivals and product deliveries run smoothly without piling up too much work or causing delays resulting in out-of-date products. The library will not necessarily have that kind of scheduled activity, allowing customers to arrive and depart fairly flexibly. The library operations, such as the helpdesk or book check-out desks, will have to absorb some variation. It could be they have to have extra librarians available to manage likely peaks in demand at certain times of day.

Another key difference is in the level of contact with the customer. The library will be much more concerned with customer-focused activities, and its entire design, which is the physical space or the digital forms of contact, has to be designed with the customer in mind. High customer contact requires operations managers to develop a new range of skills.

2 What do operations managers do?

The theory behind the input–process–output model suggests a number of roles that operations managers perform, including:

- **Organising the input resources** – It is largely up to operations managers to decide what resources, such as people, facilities and equipment, to obtain to serve their market requirements. They are subject to constraints, such as financial restrictions on how much they can spend or lack of availability of specific skill sets. A legacy has also been built over time of what infrastructure and other resources have been developed that the manager has to work with. These decisions have to be repeatedly taken as markets and strategies change.
- **Managing the outputs** – The operations function is usually responsible for providing the products and services the customer needs, on time, to a high standard. Managers must therefore be completely aware of what the market requirements are and work towards developing capabilities whereby their processes can meet these market requirements in the longer term. In the short term operations managers must meet the delivery promises made by the organisation. Sometimes these promises are made in other departments and can be difficult to keep.
- **Managing processes** – Arguably the biggest focus in operations management is on the transformation processes themselves. Slack et al. (2011) divide the process management tasks into three separate areas (Table 3):
    - **The design of processes** – Operations managers must work with other functions to design and develop processes that meet customer needs efficiently and effectively. The performance of an operations system is largely dictated by the design of the system. A badly designed process will always produce poor outputs irrespective of how hard operations managers try to 'performance manage' the people within the system or work around its faults.
    - **Planning and control** – Once a system is in place, plans need to be made to timetable or schedule activities including the arrival of inventory, the shift patterns of staff and the sequence of work through the processes. Planning activities like quality assurance, where plans are made to produce specifications and quality control activities, are also important. Control activities are also needed to check that plans have been conformed to. Operations managers must have systems that highlight issues such as missing items of stock, poor-quality output or late deliveries to the customer.
    - **Improvement** – One of the biggest changes in the scope of the operations manager's role in recent years has been the increasing emphasis on continuous process improvement. Operations managers are now expected to lead process improvement activities so that performance improves over time. In the most extreme cases operations managers can be overseeing thousands of improvement activities each year.

Table 3 Examples of operations management activities

Design tasks	Planning and control	Improvement
Product/service design Layout and flow, especially detailed layout	Workforce planning Shift patterns Work allocation Scheduling of orders Capacity plans Stock control Quality planning and control Error correction	New product introduction Continuous improvement 'Lean thinking' Team-based quality improvement

Short-term versus long-term perspectives of operations management

If you take a look at an operations management role to see what activities are performed on a daily basis, you will find that long-term developmental activities are sometimes pushed back. Managers may be involved in short-term crises such as the failure of a supplier to deliver some urgently needed materials, a machine breakdown or a problem that has resulted in late delivery or poor-quality service to a customer. This type of work takes up much time in practice. Many of the short-term problems can be reduced or even prevented by good long-term decision-making in areas such as supplier selection, supply chain design, technology, maintenance, quality planning and scheduling. There is a constant tension between dealing with short-term issues and longer-term, even strategic, development work.

Simplicity versus complexity

The best operations processes are usually simple to understand, where progress of work through the system is highly visible and flow of resources is smooth and even, not intermittent. Operations managers therefore prefer simplicity to complexity when managing their processes, and this would include a preference for limited variety, stable schedules that are not changed at the last minute and standardised methods of working. External market environments often threaten to disrupt this stability. Many marketing strategies, for example, can target highly seasonal markets that appear to have higher profit potential because of fewer competitors and less price sensitivity. This type of market can be very difficult to serve once you see the situation from the operations perspective.

3 The importance of operations management

Every management specialist considers their function or department as mission-critical or important for the prosperity of the organisation. Operations management is no different. Operations managers can make a positive impact on an organisation by:

- reducing costs through efficient operations
- enhancing revenues by providing more marketable goods and services through quality, service and innovation
- minimising the capital needed to establish a viable operation
- developing capabilities and competences that allow markets to be served more effectively or new markets entered.

The Hayes and Wheelwright four-stage model

One model that helps to understand the role of operations in a competitive market is the four-stage model of operations strategy (Figure 2) by Hayes and Wheelwright (1984) as represented by Slack et al. (2007).

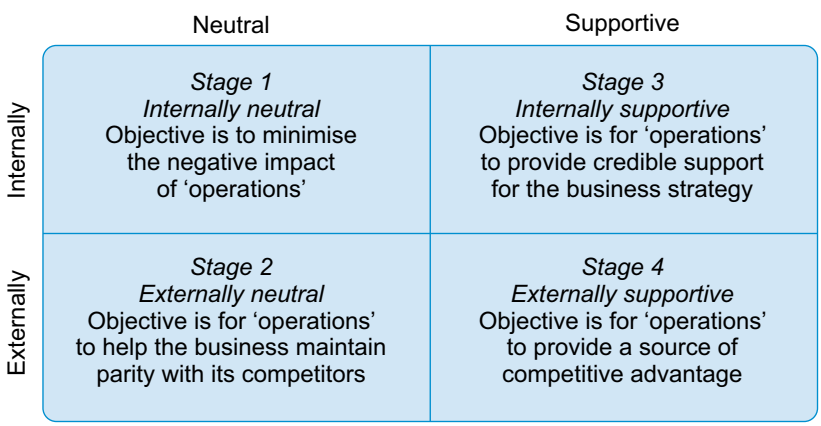

Figure 2 The Hayes and Wheelwright four-stage model

Each of these levels can be explained:

Stage 1: internally neutral

At the lowest levels of capability the operation is seen as holding the organisation back. This is because the operation regularly underperforms relative to its market requirements and/or regularly makes mistakes that can deliver low-quality product or service to the customer at the cost of loss of reputation and rework. The organisation cannot exploit existing market opportunities and, rather than spending time developing new ideas, managers are more likely to be focusing attention on solving existing short-term problems.

Stage 2: externally neutral

Stage 2 organisations are typically as good as their competitors at serving their chosen markets, but they don't have any specific source of

operations advantage within the markets they serve. They are striving to adopt best practice in their industry and are aware of competitors' capabilities. These operations are good enough to help implement the organisation's strategy, but currently big development opportunities are created outside of core operations either by exploiting a marketing advantage or by developing new technologies, products and services. The operation therefore has no directly positive impact on competitiveness and is not seen as a source of new ideas. A high proportion of operations are probably at Stage 2.

Stage 3: internally supportive

At Stage 3 the operation offers the best capabilities in the sector and so the competitive strategy can be linked to operations. The organisation can exploit the operations' capabilities to offer better prices, differentiated products, faster deliveries or greater flexibility to maximise returns and increase market share.

Companies that gain a reputation for being able to deliver good quality often achieve additional market advantage through enhanced brand strength. In fact, operations managers would often suggest that brand strength can only be achieved when operations are capable of supporting the overall corporate strategy in this way.

Stage 4: externally supportive

Very few organisations ever operate at the levels described in Stage 4 of the model where operations convey such a competitive advantage through their performance and capability that the entire organisation strategy can be built around the operation. In these situations the market expectations of what can be achieved are changed by the operations' performance.

Operations as a source of risk

It is also important to understand that when operations go wrong, this can impact badly on an organisation's revenues, competitiveness or reputation. There are a number of well-known examples of operations failures that have hit the press in the past few years. In some cases there have been clear and catastrophic failures within operations that have led to significant harm to the public, the environment and to the organisations concerned. Companies are also at more risk of being exposed if their claims of good business practices are not matched by good operations practices such as lack of attention to sustainability issues, poor working conditions in overseas operations, etc.

Box 1: The BP oil spill

Figure 3 The Deepwater Horizon drilling platform

On 20 April 2010 the Deepwater Horizon drilling platform, located in the Gulf of Mexico, exploded, killing 11 oil workers. Over 100 other rig workers had to be rescued by air and sea. An estimated 4.9 million barrels of oil were discharged, threatening hundreds of miles of coastline. The cause was a ruptured well that burst during drilling operations. It took until 19th September for the well to finally be completely sealed and capped, preventing the possibility of further leakage. The impact of this event was far-reaching. As well as a major ecological disaster, many businesses along the coast of the Gulf of Mexico were affected, especially those that relied on activities such as fishing. BP was convicted of 11 counts of manslaughter and, in 2015, agreed on a settlement of $18.7 billion in fines. Investigations revealed that BP and its contractors were responsible for a number of poor operations practices, motivated by cost-cutting and poor attention to safety. BP was temporarily banned from obtaining new contracts with the US government.

(Source: BBC, 2010)

Exercise 2

Allow approximately 15 minutes for this exercise.

Using the example in Box 1 above, reflect on the overall impact of this failure for the organisation involved. Think about the impact on reputation, market appeal and long-term revenue issues that this failure may have caused.

Comment

This failure created huge short-term financial losses across the entire supply chain and beyond. It is important to not forget the tragic loss of life. The impact has lasted much longer than the time taken to recover or restore the

harm. The general point is that brand reputation, market share and the ability to invest and develop new markets can all be compromised by operations failure. Failure in operations affects other management functions as well.

4 Are you an operations manager?

The definition of the role of an operations manager is very inclusive and would categorise most supervisors and managers in all sectors as having an operations management role. It does not matter if the person's job title does not include either the words 'operation' or 'manager'; many managerial positions involve operations. If you take a look at support activities such as human resource management, marketing or accounts, you will see there are still processes that have outputs, there are input resources and there are customers – even if these customers don't pay for the output and might also be colleagues in another department. For example, a manager in an accounts department will have input resources of staff, information and equipment such as computers. An output might be a report, such as a profit and loss report. The process will be to convert the input information into that report, to a deadline and to specifications in terms of accuracy.

It could be interesting to reflect on the applicability of this subject to your own situation, thinking about the resources you have, the processes you are involved in, whether or not you have customers and what output you deliver.

Summary

This reading has four main themes:

- **The management of resources**

  Operations management is chiefly about managing the resources in an organisation in such a way that allows the organisation to meet its customers' needs efficiently. These resources are involved in transformation processes that convert resources into useful outputs.

- **The nature of the operations management role**

  Operations managers are mostly involved in the design, planning and control and improvement of the processes they manage. They make key decisions that can affect the long-term success of an organisation as well as dealing with many short-term problems and issues on a daily basis.

- **The importance of operations**

  Operations practices and decision-making influence costs, revenues and cash flow. If operations are able to develop their own unique capabilities, they can be used to provide a competitive advantage in the marketplace. The best operations can fundamentally change how a market is served through innovative practices.

- **The relevance of operations management**

  Far more people practice operations management than might be first thought. Anyone in an organisation who provides an output or manages resources can be considered to be an operations manager.

If you look at the role of operations in the context of the introduction of big, new ideas, then the function needs to be involved in design and development processes for products, services and the processes that produce them. The resource intensity and complexity of operations can make changing existing practices difficult to implement and there is a risk that operations can hold back this type of development. The operations role in this context often is to implement the strategy of the organisation.