



PARCEL LOGISTICS IMPROVEMENT IN A NATIONAL POSTAL COMPANY

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Abstract

Traditional postal service is currently facing significant challenges to remain in business. Nowadays, technical development and especially the Internet have affected almost all industries, the postal industry is no exception. This study aims to come up with proposals/recommendations to help improve the Oman Post Company external logistical distribution network and enhance the internal operational performance. The study is looking into the company's business processes, their characteristics, and if the processes implemented are in line with international standards. The study identifies factors that contribute to improving or impairing operations. Literature was reviewed to investigate and understand the logistics, postal logistics and postal services industry. As well as analyzing and finding areas of improvement for the external distribution network and analyzing internal performance. Several visits were carried out to the company's operations offices and several interviews were conducted with employees. The results indicate that the Oman Post Company have implemented global standards in their operations; however, there are few gaps in logistical postal network and internal performance. On this basis, it's recommended that that company needs to revise its distribution network and modify/adjust some of the routes such as the route from Khasab to Muscat and from Masira Island to Jalan Bani BuAli Also, the company is asked to resolve the issues it carries within its departments, which hinder internal performance. This should start by replacing frustrating working culture and building a stronger team structure as well as introducing transparent and powerful performance indicators.

Keywords: Logistics, Postal system, Distribution Network, Internal Performance



INTRODUCTION

Sultanate of Oman is a country located on the southeastern coast of the Arabian Peninsula in Western Asia. Oman Post' history goes back to the 19th century when the Sultanate of Muscat and Oman was a British protectorate. The first post office to open in the region was at Muscat on 1 May 1864. Nowadays, the Oman Post Company offers a variety of freight services, last-mile delivery, express mail, enhanced traditional postal services and e-commerce. Its network includes 83 branches throughout Oman with the ability to reach 100+ countries. For this research, discussion will focus only on the traditional postal services. The company's postal service is classified into 4 main categories, namely: Normal/Ordinary Post, Registered Post, Parcel Post and the EMS (Express Mail Service). The first issue of postal stamps inscribed Muscat and Oman was issued in 1966, while the inscription Sultanate of Oman was first issued in January 1971. Oman joined the Universal Postal Union (UPU) in 17th August, 1971.



Figure 1 Map of Oman – (Google Maps, 2019)

Research Objectives

This research will cover the aspects of analyzing the Oman post company profile, its business process and its external distribution network.

1. Explore and understand the literature on logistics, postal logistics and postal services industry. Literature will also be reviewed towards areas of improvement for external distribution network and analyzing internal performance.
2. To look into, identify and understand the business processes implemented in the Oman Post Company. Determine the current state and characteristics of the external distribution network and internal performance.
3. To make recommendations/proposals to improve business processes.

LITERATURE REVIEW

External Distribution Network

Introduction

The distribution network of any business could be the reason for its success or failure (O'Byrne, 2019). It can be considered as the backbone of the business in today's competitive market (Tyagi, 2018). Therefore, it is essential to maintain an efficient distribution network that operates, transfers, and accomplishes successful deliveries (Pedersen, 2018).

The starting point to create an overall view of thesis topic is to look into literature on parcel logistics improvement. The literature review helps to form the correct questions to be asked; starting as wide as the research question and ending up with technical detailed questions within the search topic. This chapter will define the distribution networks and parcel logistics. It will also attempt to address and study the relationships between them and how to make use of literature viewpoints in this study.

Logistics

Logistics is the science/art that deals with material flow management. It includes but not limited to planning and control of material flow and its related information in organisations (Deng, 2013). The mission of logistics is to deliver correct material to the desired location within the given time frame (Rushton, Croucher and Baker, 2017).

Logistics refers to the processes of planning, execution, and control of the movement of goods or people, and its related supporting activities. All within a system designed to achieve specific objectives (Daneshjo and Štollmann, 2013).

Logistics components

A logistics system consists of the following components: Customer service, Inventory management, Transportation, Storage and materials handling, Packaging, Information processing, Demand forecasting, Production planning, Purchasing, Facility location, and other activities for a specific organisation could include tasks such as after-sales parts and service support, maintenance functions, return goods handling and recycling operations (Anon., 2014).



Figure 2 Logistic System Components - (Anon., 2014).

Figure 2 shows all components related to logistics systems. However, not all of these will be significantly used while dealing with postal logistics, some of the components might be more in focus in other industries. For example, purchasing would be related more to a retailer or a commercial type contractor. Packing would be used more in companies involved in manufacturing or food industries.

Postal Systems

American Heritage® Dictionary of the English Language defines a postal system as: A usually government-run system by which letters, packages, and other materials are transported and delivered to individuals and organizations (postal systems, 2011). In the U.S., Australia and Canada the term "mail" is commonly used for the postal system and for the letters, postcards, and parcels it carries. However, in New Zealand, "post" is more common for the postal system and "mail" for the material delivered. In the UK, "post" prevails in both senses.

The national postal service operator for Oman is called "Oman Post", which is equivalent to "Royal Mail" for the UK and "United States Postal Service (USPS)" for America and "Australia Post" for Australia. Although the Royal Mail is no longer government owned and was fully privatized in 2015, it is still the designated Universal Postal Service Provider and part of the Universal Postal Union, the UN agency that coordinates postal policies with every country's postal service. (Mondonedo, 2018) However, the postal service in Germany was privatized in 1995 and became a fully independent company in 2000. The German mail is carried by Deutsche Post DHL Group.

Postal Logistical Network

Examples of Postal Networks

Different postal networks have different levels of complexity depending on their size, number of post offices and number of agents. Some examples of postal networks around the world are discussed in this section. Seven countries were selected for various reasons.

For example, Saudi Arabia and Argentina were selected because they have the same population density (16 people/km) to Oman. New Zealand and Norway were selected because they have a population close to Oman. The population for the three countries is Norway; 5.21 mil, New Zealand; 4.92 mil and Oman: M 4.49 mil. Poland was selected because it has very close area size of Oman. Poland is 306,230 km² while Oman is 309,500 km². India was added to the group as it has the largest postal network in the world. Bahrain was added because it holds one of the smallest postal networks in the world. Therefore, the selection of all countries aims to show where Oman postal networks stands and how countries with similar population/area/density deal with postal networks.

Table 1 gives a brief idea about postal service usage and density according to country's area and population.

Table 1 Statistical Data of Postal services - (UPU, 2019).

Country	Oman	Saudi Arabia	Argentina	New Zealand	Norway	Poland	India	Bahrain
Items / Year	2015	2017	2015	2014/15	2015	2016	2017	2016
1.1 Area of territory (km²)	309'500	2'149'690	2'780'400	270'534	385'155	306,230	3'287'263	694
1.2 Population (millions)	4,491	32,938	43,417	4,492	5,211	38,224	1'339,180	1,425
2.1 Number of licensed, authorized or declared operators	15	6	91	18	3	291	ND	43
2.3 Domestic letter delivery services - number of items	10'875'593	ND	1'150'381'847	600'000'000	ND	1'330'907'696	ND	16'267'624
2.4 Domestic parcel delivery services - number of items	1'938	ND	48'802'423	11'000'000	ND	24'589'861	ND	7'891
3.1 Total number of staff	521	11'127	16'626	6'751	18'590	77'993	433'417	ND
3.4 Number of posts (in full-time equivalent)	82	13'227	16'579	6'018	18'189	75'657	308'917	310
4.1 Total number of permanent post offices	166	667	3'799	268	1'400	7'490	154'965	3
4.4 Average area covered by a permanent office (km²)	1'864,46	3'222,92	731,88	1'009,46	275,11	43,16	21,21	231,33
4.5 Average number of inhabitants served by a permanent office	27'051,45	49'382,63	11'428,47	16'761,81	3'722,12	5'103,39	8'641,82	475'057,00
8.3 Number of post office boxes	66'215	624'569	81'695	275'086	92'681	129'614	52'210	33'800
9.2 Number of letter-post items, domestic service	10'875'593	35'152'886	452'654'054	648'809'246	759'600'000	1'664'022'545	4'975'610'000	13'403'659
9.3 Number of letter-post items, international service - dispatch	2'025'213	3'259'620	906'897	15'986'130	ND	32'886'100	6'292'919	5'787'832
9.4 Number of letter-post items, international service - receipt	18'240'217	11'803'434	8'379'301	49'764'514	ND	54'314'638	2'310'327	532'542
10.1 Number of express items, domestic service	11'793	1'579'437	24'998'681	34'263'407	ND	100'072'851	463'825'000	78'834
10.2 Number of express items, international service - dispatch	13'168	276'288	27'745	428'672	ND	151'786	2'405'360	26'284
10.3 Number of express items, international service - receipt	49'650	244'024	86'301	677'434	ND	95'775	381'314	31'196
10.4 Number of parcels, domestic service	1'938	782'428	2'572'283	9'445'503	ND	20'806'739	68'160'000	NA
10.5 Number of parcels, international service - dispatch	13'114	160'206	18'106	255'843	ND	987'169	395'435	7'937
10.6 Number of parcels, international service - receipt	15'385	190'482	68'830	2'750'247	ND	261'137	304'366	19'586

Saudi Arabia and Argentina

Saudi Arabia and Argentina share the same population density of Oman, which is 16 ppl/km² (UPU, 2019). However, this number doesn't exactly match on all other elements described in table below. The huge difference in population and area between Saudi Arabia, Argentina and Oman create large differences in postal networks. Saudi Arabia for example, has 33.94 million people with a postal network consisting of roughly 667 post offices, (UPU, 2019). which means the average number of people served by an office is around 49,382 people. The situation in Argentina is slightly different, the postal network consists of 3,799 post offices serving 43.42 million people. (UPU, 2019). I.e. Each post office serves an average of 11,428 people. Oman's postal network consists of 166 post service centers. With a population of 4.49 million people, each center serves an average of 27,054 people (UPU, 2019).

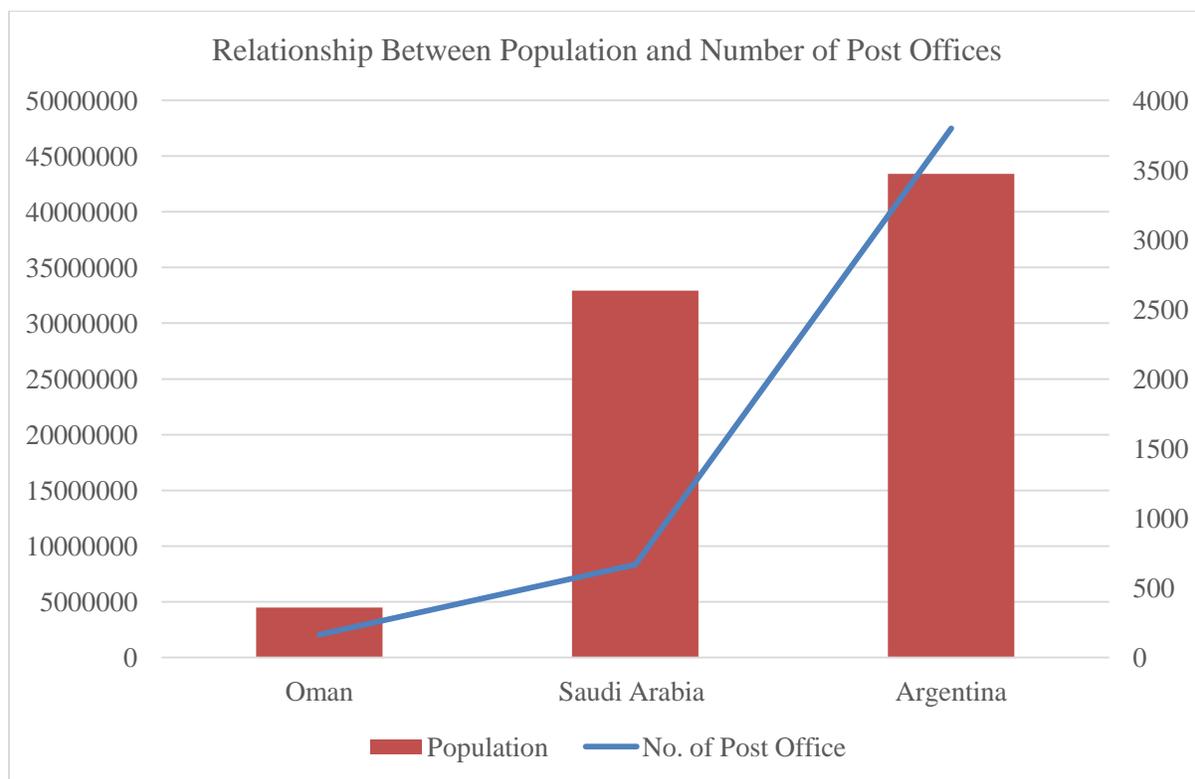


Figure 3 Relationship between Population and Number of Post Offices - (UPU, 2019).

Figure 3 shows that there is no direct relationship between the population and the number of post offices. In other words, the number of post offices may increase by population growth, but this increase is not directly proportional.

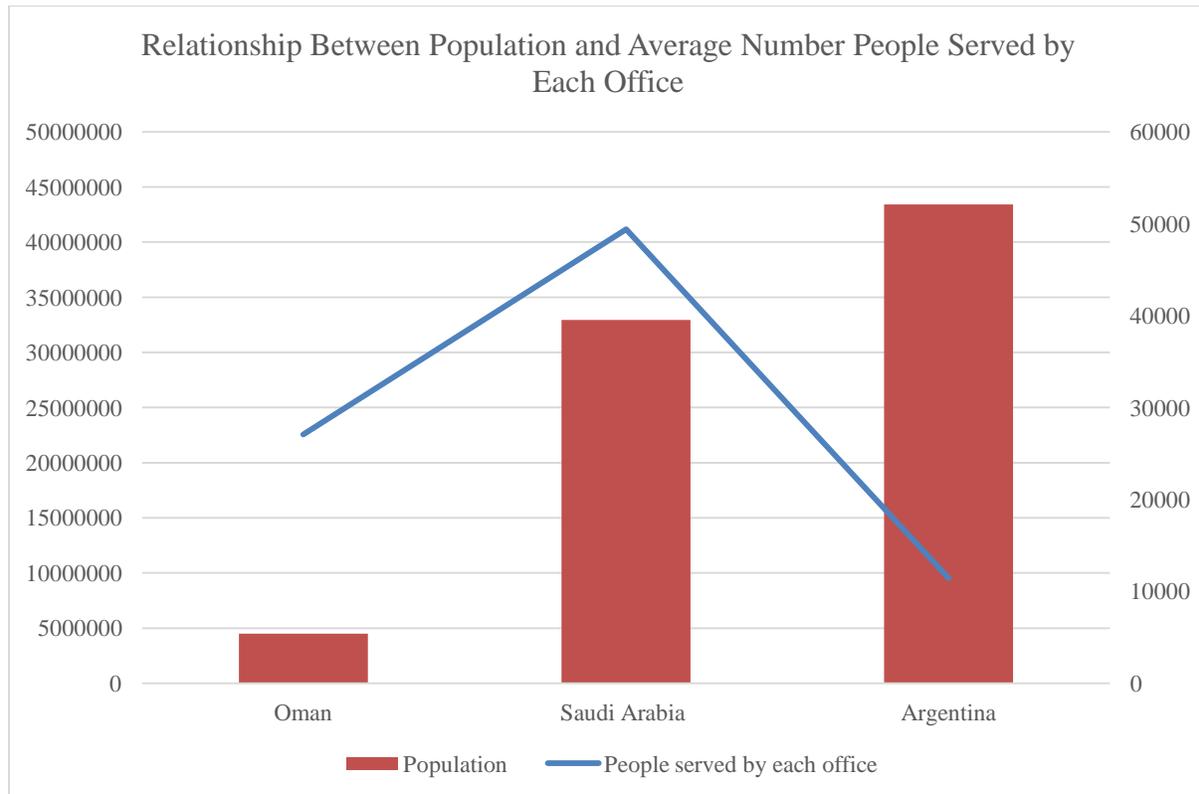


Figure 4 Relationship between Population and Average Number People Served by Each Office - (UPU, 2019).

Comparison between figures 3 and 4 confirms that although growth in population may increase the number of post offices in the country, it doesn't necessarily reflect on the average number of people served by each office.

New Zealand and Norway

New Zealand and Norway have populations of 4.49 million and 5.21 million people respectively. Oman's population fits in very closely to a population of 4.91 million people (UPU, 2019). Although the number of people living in the three countries is similar, the postal activities shows huge differences. In 2015, the number of letter-post items, (domestic service) was around 760 million articles in Norway and about 648 million in New Zealand. (UPU, 2019). However, numbers went far down to around 10.8 million articles only in Oman. (UPU, 2019). This clearly indicates that population is not the only factor contributing to postal activity.

Poland

Poland spans a total area of 306,230 km², while Oman is 309,500 km². (UPU, 2019). The population, however, is 7 times more than Oman (approx.38 mil. Ppl). (UPU, 2019). The postal network in Poland is differs greatly to Oman's. in 2016 there were 291 licensed/authorised postal service operators in Poland. The postal network consists of roughly 7490 post offices, which means the average number of people served by an office is around 5103 people only. In 2016, Poland's postal network successfully delivered more than 1.66 billion posts (domestic only), along with over 32 million in international service of post-dispatches and over 54 million received post (UPU, 2019). Comparing the number of post offices in Oman and Poland shows clearly that the number of post offices doesn't relate to the area size of the region/country.

Bahrain

The Kingdom of Bahrain is an island in the Arabian Gulf, with an area of 765 km² and a population of 1,234,571 people. The postal network of Bahrain operated by Bahrain Post consists of 17 branches (Bahrain Post, 2019) and approximately 33,800 post office boxes (UPU, 2019) distributed around Bahrain. In the year 2016 Bahrain Post handled approximately 16,275,515 articles.

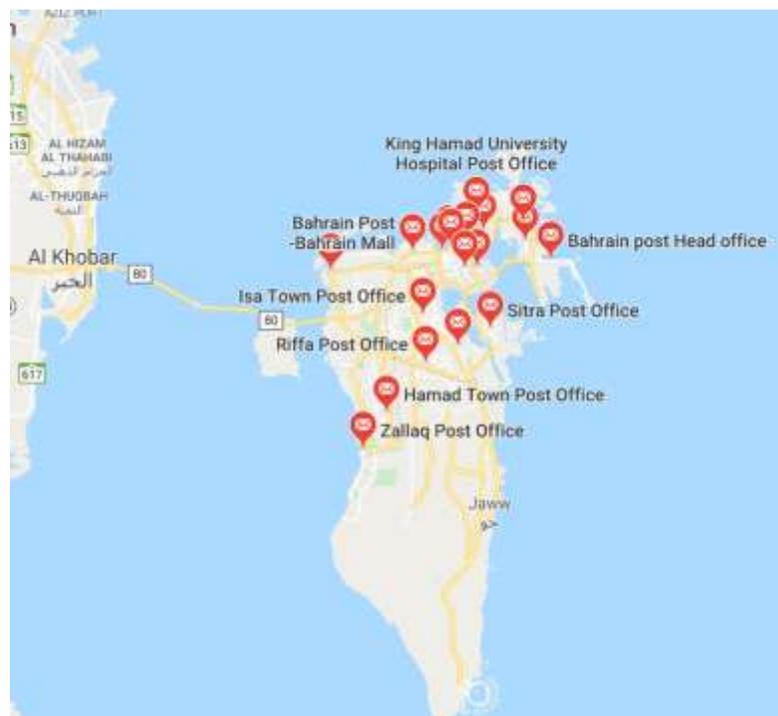


Figure 5 Postal Network in Bahrain – (Google Maps, 2019)

India has the largest postal network in the world with 154,866 post offices as on March 31, 2011, of which 139,040 (89.78%) are in rural areas. The Indian department of Post handled 177.9 million registered letters, 6157.6 million unregistered mail traffic and 281 million Premium Products (speed post and express parcel post) during the year 2010-2011. (Prabhakar, 2012)

India is a very big country in both area and population, therefore it's very challenging for the postal service to find every location in crowded cities or rural villages. To solve this issue the Indian Postal service introduced a 6-digit Postal Index Number (PIN) Code on 15 August 1972. The structure of the PIN code is as follows. The first digit designates the overall geographical region, and the first 2 digits designate the postal circle or sub-region. The third digit designates the sorting district. Thus, the first 3 digits collectively designate the postal district, while the last 3 digits indicate the specific post office within the district. (Postal Codes of India, 2011)

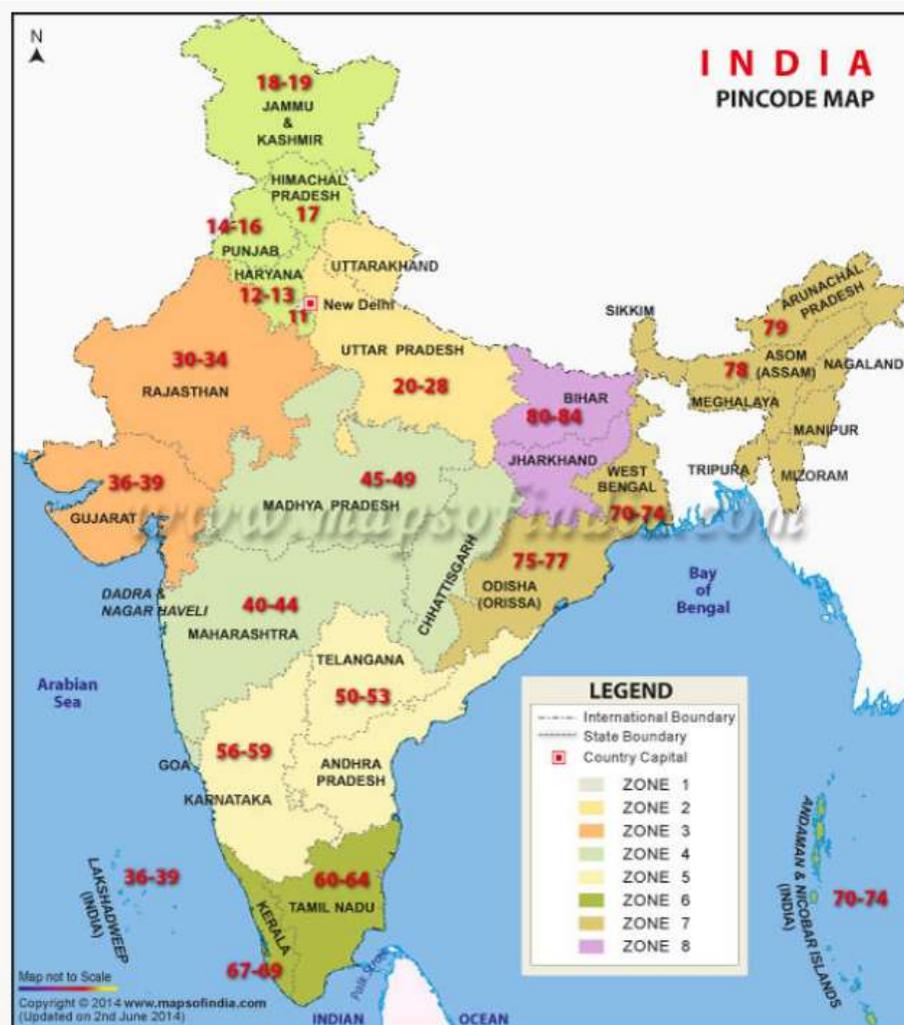


Figure 6 Zones and Distributions of First 2 digits of PIN - (Postal Codes of India, 2011)

Components of Postal logistics

Postal logistics are the parts of logistics (defined earlier in 2.1.2) related to the postal network. In other words, it is not different from other logistics, but it's often used more often in postal networks. The following can be considered components of postal logistics:

Transportation / Fleet management

Fleet management is the management of commercial vehicles such as cars, vans, trucks and any other vehicles used in company's fleet. Fleet management includes a wide range of activities and functions under its umbrella. Starting with the initial stage of leasing or financing of the vehicle before its arrival to the fleet. The fleet management department is also responsible for vehicle maintenance, following up registrations, licensing and insurance policies renewal.

In Oman post, fleet management functions are the responsibility of what is called the transport department. In addition to the points mentioned above, the transport department is responsible for creating delivery routes for parcel deliveries to all post office branches across Oman. Route follow-ups and reliability checks are also transportation department's responsibility, as well as its improvement and resilience to problems occurring. The transport department is also responsible for vehicle telematics (tracking and diagnostics), driver management, speed management, fuel management, health and safety issues related to transportation.

Distribution Centers

The central operational office of Oman post in Muscat is vital for the postal services in Oman, as it acts as the heart to the human body. The busiest and the heaviest operations happen there. Muscat office can be considered as the country's main distribution centre for postal items. Manikas and Terry (2010), define a distribution centre as "a building with two main functions: warehousing and distribution". The warehousing part is used for storing received goods, whereas the distribution part is used a receiving, forwarding and dispatching hub. Although this definition may not exactly match with what Muscat office operations do, especially concerning the goods storing part, but the idea can be passed if it's considered as an immediate distributing centre because most of the items received are dispatched in less than 24 hours.

Facility / Branch location selection

Ertuğrul (2010) identifies facility location selection as the determination of a geographic site on which to locate a firm's operations. The process of selection involves gathering and

evaluating several criteria. The same logic for selecting a location for a commercial company applies to the location selection of post offices. The main difference is the commercial orientation of the company where the post office is service oriented. One major step is to explore the local demographics of the area such as population density, population growth trends, community lifestyle and their occupation and employment mix. Traffic and transportation accessibility are also to be taken into consideration. The location should have an easy and fast access, usually on the main street or close to the main square of the city/town.

Branch network of Oman post

In the 1970s, Oman's post strategy was to be present in every city and big town of Oman. This is what is translated today as 84 branches covering all urban areas of Oman. Oman post is also present in some rural areas in the desert where postal services are needed, such as remote oil fields or chemical plants. The map below shows how Oman post branches are distributed across Oman.



Figure 7 Oman Post Branches locations - (Oman Post | Office Locator, 2019)

Components of Postal Network

The postal network is not much different to any other network. Items move from one pole of the network to the other, passing through several processes in between. Figure 8 shows different components of postal networks.



Figure 8 Postal Network Components - (Chan and Chan, 2006)

Mail articles are:

- 1- Collected from senders through post boxes or collected by hand in post offices. In some countries it may be collected from individual houses by postal workers undertaking delivery. In many countries, mailers or their agents may be able to take mail in bulk to the outward sorting office.
- 2- Prepared (separated between different postal streams - e.g. packets, large flats, standard letters, first/second class machinable/unmachinable etc., faced, post- marked etc.). Once prepared, there will be an initial outward-sort, each article will be put in a designated place, ready to be transported to its destination. Sortation is usually done manually in small- low dense postal offices. Whereas with high volume post, automation is also used to help with sortation.
- 3- Transferred to the post office associated with the destination mentioned on the post. Transport is done via different means such as cars, vans, trains or even airplanes in the cases where the destination is very far from the origin.
- 4- Received at post office of destination where it will be consolidated and sorted again for final inward-sort.
- 5- Delivered to the receiver (customer), either to the house door or put in their P.O. Box. This is done by means of cars, bicycles or on foot.

This network explained above is in its simplest possible form because these stages could be doubled many times, hence the network gets more and more complex. For long distances, usually the consignments pass through several depots / distribution centres and get transferred by different means until they reach their destination.

Figure 9 below shows an expanded postal network with more complexity than the simple process shown in figure 8. As the mail volume increases the postal network gets bigger and more complex. It can be seen how the mail is put in the mailbox, transferred by a truck to the post office, gets sorted and then transferred again by another truck to the distribution centre.

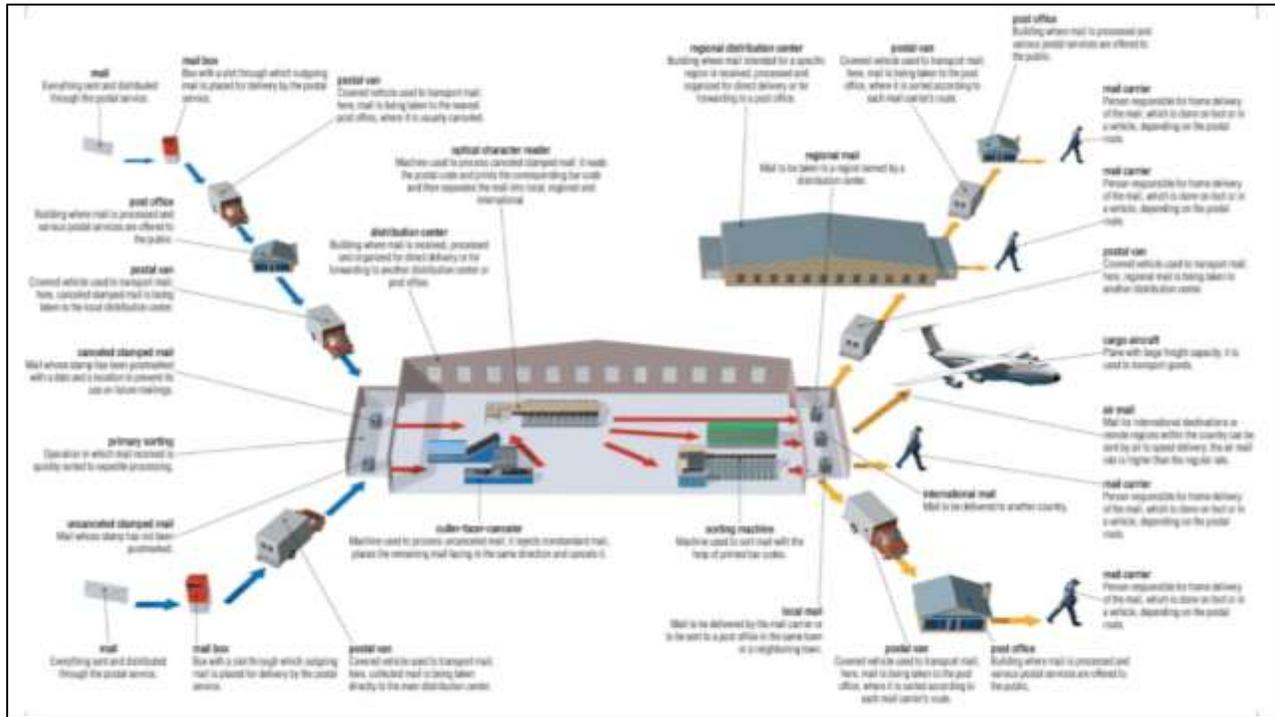


Figure 9 Expanded Postal Network- (Public Postal Network, 2019)

The distribution centre defined earlier in the expanded network is where all sortation processes take place. Depending on how advanced it is, some DCs rely on manual sortation carried out by dedicated employees, whereas others make use of technology and use automatic sorting machines, barcodes etc. The DC also receives and dispatches articles from/to further destinations such as, international mail and regional mail. For this purpose, there is another branch from the DC to airports and/or train stations and vice versa.

Improvement Factors of Distribution Network

According to Jang (2017), logistics network improvement is about determining the number, location and size of warehouses that are optimal for each business by considering a wide range of constraints in the supply chain. In other words, the task is to find the best combination of warehouses necessary to cover the entire supply chain from raw material suppliers to end-users. Improvement of a postal distribution network will result in several

advantages such as cutting cost and time reduction. Currently, postal mail services around the world are facing serious challenges to sustain and remain competitive, especially with the raise of Internet and modern markets. Ordinary postal services are losing their market share to new digital competitors; starting from online communication applications like Facebook and WhatsApp passing through online markets like Amazon and Ebay and ending up with global postal carriers like Fedex and DHL.

Transportation

Transportation is one major aspect to be tackled while improving postal services, mainly because transportation cost is one of the biggest contributors to the total cost of the postal service. Transportation cost depends on several factors that add up together, such as vehicle purchase/lease cost, maintenance and repair cost, insurance and registration costs, fuel costs and driver's salary and overtime (Drozdziel et al., 2017).

Distribution Network

In a supply chain, a distribution network is an interconnected group of storage facilities and transportation systems that receive inventories of goods and then deliver to customers (Hayes, 2019). In a postal industry distribution network this refers to the group of locations at which the postal articles are received/sent to, in addition to the locations of storage and sortation.

Since transportation activities are based on the distribution network, the latter must also be considered as a development target. Improvement of a distribution network will not only influence transport cost reduction, it will also improve delivery times and reduce total distance travelled. Thus, resulting in longer life for delivery vehicles, less overtime payments and lower fuel consumption. Therefore, transportation development is a necessity not a luxury for the postal service.

Internal Performance

Improving the internal process of the postal service is as important as the distribution network, they both complete each other. Therefore, the internal performance must be capable of handling operations of receiving, sortation and dispatch of all consignments moving in the network. This section will discuss different analytical tools used for business analysis which will be used for internal performance improvement, such as:

- SWOT Analysis.
- Fishbone Diagram.
- Pareto Analysis.

SWOT Analysis

The acronym (SWOT) stands for strengths, weakness, opportunities and threats. SWOT Analysis is a simple but powerful tool for sizing up an organisation's resource capabilities, deficiencies, its market opportunities and external threats to its future (Thompson et al., 2007). SWOT Analysis is a process that involves four areas in two dimensions. It has four components: strengths, weakness, opportunities and threats. Strengths and weaknesses are internal factors and attributes of the organisation, opportunities and threat are external factors and attributes of the environment. SWOT Analysis is typically drawn out in a four-quadrant box that allows for a summary that is organised according to the four section titles. Figure 10 shows a SWOT Analysis template, with its four elements in a 2x2 matrix.

- Strengths: Characteristics that give advantages over the other industry.
- Weaknesses: Characteristics that give disadvantages relative the other industries.
- Opportunities: External elements in the environment that provide benefits for the company.
- Threats: External elements in the environment that create difficulties for the company.

Strengths	Weaknesses
Opportunities	Threats

Figure 10 SWOT Analysis Matrix

Fishbone diagram

It is also known as Cause-and-Effect diagram or as the Ishikawa diagram. The problem statement placed at the head of the fishbone is used as a starting point to trace the problem's source back to its actionable root cause. The problem statement typically describes the problem as a gap to be closed or as an objective to be achieved. The causes are found by looking at the problem statement and asking "why", until the actionable root cause has been identified or until the reasonable possibilities on each fishbone have been exhausted (Chakraborty, 2018). Figure 11 shows an example of the fishbone diagram.

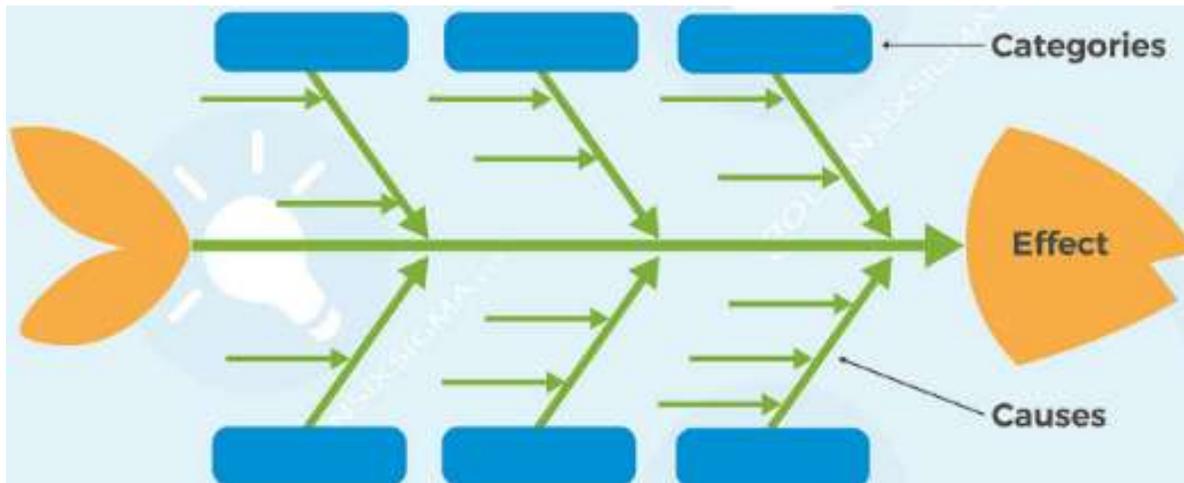


Figure 11 Fishbone Diagram - (Fishbone Diagram, 2012)

Pareto Analysis

Pareto Analysis is a statistical technique in decision-making used for the selection of a limited number of tasks that produce a significant overall effect. It uses the Pareto Principle (also known as the 80/20 rule or ABC analysis) the idea that by doing 20% of the work, you can generate 80% of the benefit of doing the entire job (Haughey, 2019). Pareto or ABC analysis can be used for different scenarios such as, inventory control, sales information system, and many others.

There are no fixed figures for each category of the ABC analysis. Also, different percentages can be applied based on goal and criteria. The ABC analysis is like the Pareto principle where group (A) items represent the largest percentage of the total value but a small percentage of the number of elements. Following are examples of ABC classification

- Group A items – 18% of the items comprise for 60% of the total sales value of the items.
- Group B items – 27% of the items comprise for 30% of the total sales value of the items.
- Group C items – 55% of the items comprise or 10% of the total sales value of the items.

Figure 12 shows an example of Pareto chart where the concept is clearly visible. The chart shows how a few complaints account for 80% of the total number of customer complaints.

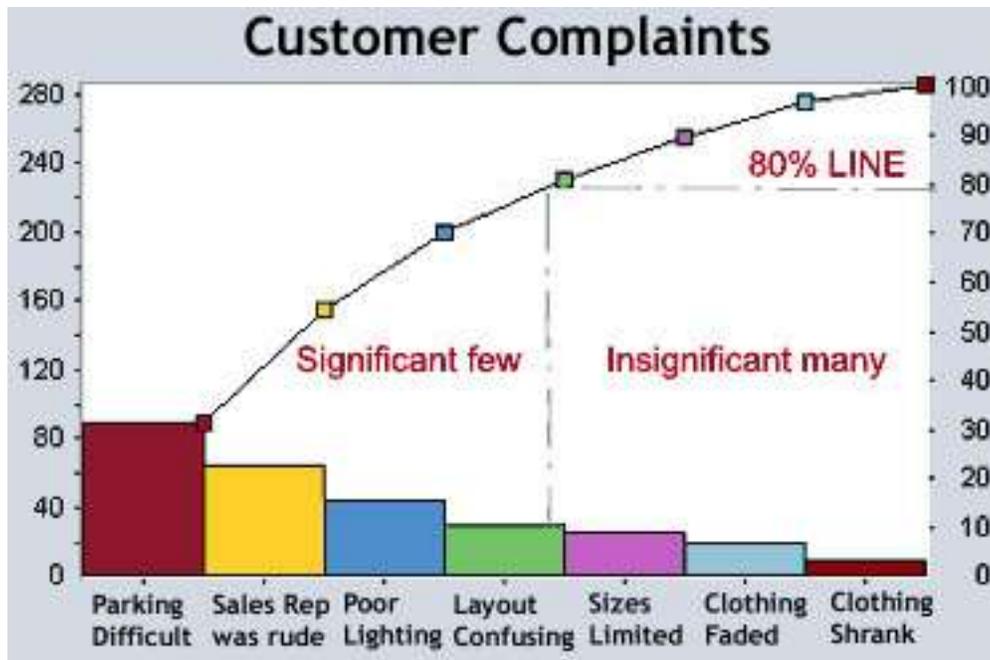


Figure 12 Pareto Chart Example - (Rouse, 2019)

RESEARCH METHOD

Overall approach

This research consists of three stages. The first stage is to obtain an idea of postal service and obtain an insight of the main research areas. This stage was primarily completed through interviews with Oman post employees and secondary data collected through literature review. The second stage aims to understand the business process in the Oman Post Company and was done by conducting site visits to the operations' headquarters. The visits were accompanied with unstructured interviews with employees' in-charge. The final stage of this research study was aimed to make proposals and recommendations to improve the business process. This stage was carried out by linking data gathered from previous stages to evaluate, analyse and define proposals/recommendations that improve the business process.

Data Collection

Primary Data

Interviews: Primary data used for this study was collected through interviews with Oman Post personnel. A purposive sampling approach was adopted for the selection of employees for interviews. The employees selected were holding managerial positions such as department heads or senior managers, this was to ensure they will be able to answer the interview questions and have access and permission to share the information required. The first target

was to obtain an insight into the post process in the operations centre, and related business procedures involved. The second target was to map out the overall process of the post service operation and any affecting factors that may cause disturbance to the process. The last target of interviews focused on finding areas of improvement that can take the researcher towards the overall aim of this dissertation. Note that interviews were conducted with personnel from different departments. Mainly transportation and sortation departments, which are at the operations centre and the statistics department at headquarters.

Total interviews conducted: 6

Visits and observations: Most of the interviews were conducted in the operations centre, which gave the researcher an opportunity to see and observe the operations live. These visits were necessary to understand what occurs every day in the operations centre. The researcher gained an idea about how operations are conducted, starting from receiving consignments until final dispatch. The flow of procedures, material flow, sortation and organisation of precise operations carried out by each employee.

Total visits conducted: 14

Secondary Data

Literature Review: Secondary data of this study were collected by reviewing related literature. The literature was used to compliment the interviews that were conducted to understand the postal service industry. Literature supplies an expanded overview of contributing factors that affect postal services. Starting with logistics and its components and looking at postal services and their procedures and operations around the world. The literature review also gives an insight into both the deliverables of this study, distribution network improvement and improving internal performance. It gives brief ideas about what tools to use, how they can be applied and what possible benefits may result after their application.

Internet and News: The Internet and news feeds were used as secondary data sources in order to achieve a better updated understanding of postal services. The Internet was mainly a source to look into news of different postal services and couriers around the world. Research used both the Internet and newspapers/websites to find and read about postal services in Oman and other countries. The Internet was also used to precisely locate branch locations i.e. Longitude and latitude coordinates of each branch.

Data triangulation

Triangulation was mainly used for the third deliverable of this study, internal performance. Where data was collected using different methods such as interviews, observation and revising previous company data. Triangulation was also used whilst reviewing literature for deliverable one to compare postal networks in different countries.

Data Analysis

Data collected for this study was analysed using Microsoft Excel spreadsheets. Heat Maps used in the analysis were created using DisplayR online service. Process Maps were created using draw.io online service. Geographic Maps were based on Google Maps.

ANALYSIS

Distribution Network Analysis

Oman is divided into 11 administrative provinces/regions. Figure 13 below names the different provinces in Oman according to official administrative divisions.

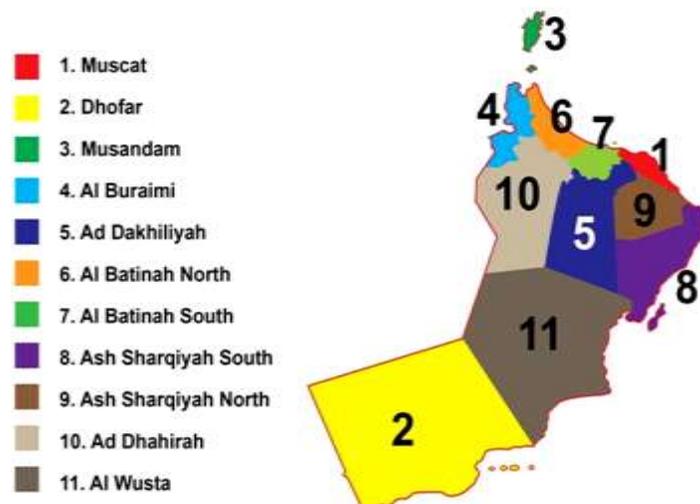


Figure 13 Oman Administrative Divisions- (Ministry of Information, 2014)

Heat Maps

The Oman Post Network has 84 post offices located in different areas of Oman. To make it easier for understanding and comprehension of data, heat maps were created based on the Oman map according to administrative divisions. Heat maps were created for the following:

1. Population
2. Number of post offices
3. Number of post boxes

Population

Muscat, the capital, has a population of around 1.46 million people, which represents 32% of the total population of Oman. Al Batnah North follows Muscat by 754 thousand people and a 16.5 % of total population. The rest of the population data is shown in table 2.

Table 2 Population per Province

Province	Population	% of Total
Muscat	1,459,249	32.0
Dhofar	457,622	10.0
Musandam	44,571	1.0
Al Buraymi	114,334	2.5
Ad Dakhliyah	461,199	10.1
Al Batnah North	754,169	16.5
Al Batnah South	417,847	9.2
Ash Sharqiyah South	312,822	6.9
Ash Sharqiyah North	279,223	6.1
Al Dhahira	213,771	4.7
Al Wusta	45,156	1.0
Total	4,559,963	100.0 %

Heat map 1 in Figure 14 shows how the population of Oman is distributed.

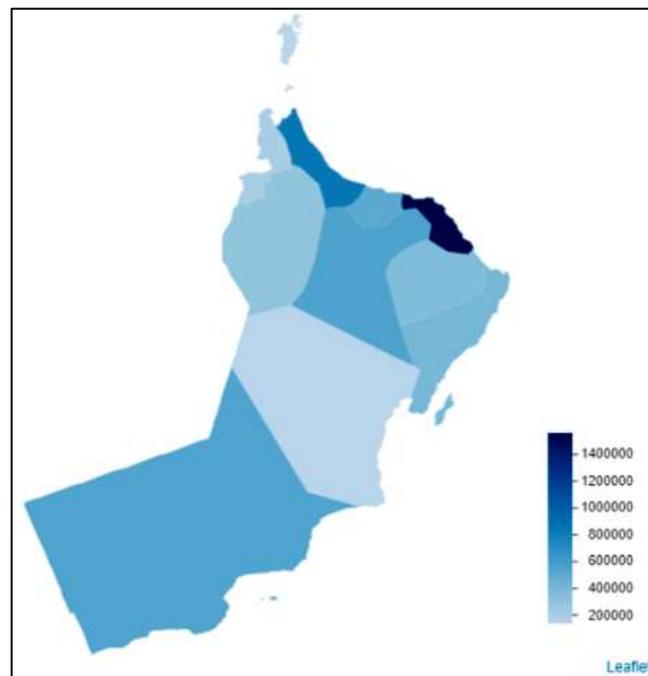


Figure 14 Heat Map 1 - Population in Each Region

Number of post offices (2017)

The Oman Post Company has 84 branches across Oman. 17 of these post offices are in the capital Muscat. Dhofar, the southern province has 12 post offices. The remaining data is found in Table below. A detailed list of branches in each province can be found appendix A.

Table 3 Post Offices in Each Province

Province	NO. Post office
Muscat	17
Dhofar	12
Musandam	4
Al Buraymi	3
Ad Dakhliyah	9
Al Batnah North	9
Al Batnah South	8
Ash Sharqiyah South	6
Ash Sharqiyah North	8
Al Dhahira	5
Al Wusta	3
Total	84

Heat map 2 in figure 15 shows the distribution of post offices in each province.

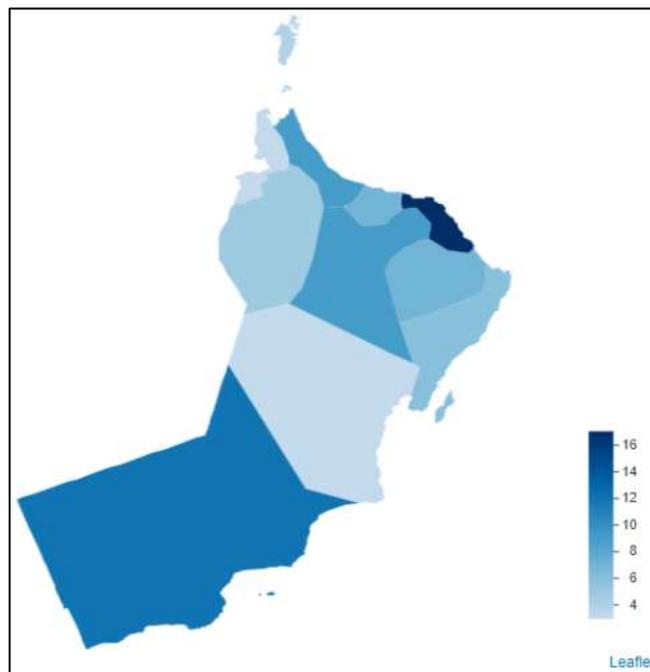


Figure 15 Heat Map 1 Number of Post Offices in Oman

Number of Post Boxes (2017)

There are around 70 thousand post boxes that belong to the Oman Post Company across Oman. More than 45% of these post boxes are in the capital Muscat. The other provinces share the remaining 55%. The remaining data is detailed in table 4.

Table 4 Number of Post Boxes per Province

Province	NO. Post boxes
Muscat	31,570
Dhofar	7,850
Musandam	1,400
Al Buraymi	1,320
Ad Dakhliyah	6,218
Al Batnah North	6,820
Al Batnah South	4,250
Ash Sharqiyah South	3,730
Ash Sharqiyah North	2,850
Al Dhahira	3,048
Al Wusta	450
Total	69,506

Heat map 3 in figure 16 shows the distribution of post boxes in each province.

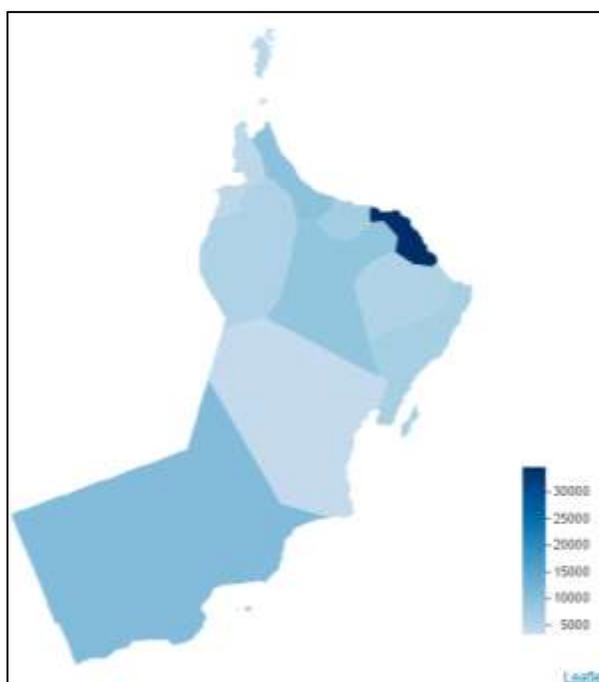


Figure 16: Heat Map 2 - Number of Post Boxes

Mail volume

Table 5 below shows the mail volume in each province. This data is an average of the period from (March 2019 – June 2019). Detailed mail data for each province and its branches can be found in the Appendix C.

Table 5 Mail Volume (Average of March-June 2019)

	Government Mail	Total Mail-in	Total Mail-out
Muscat	772	39,517	5,950
Dhofar	454	6,898	982
Musandam	90	724	515
Al Buraymi	42	1,367	807
Ad Dakhliyah	536	14,349	710
Al Batnah North	527	10,483	1,251
Al Batnah South	670	9,955	487
Ash Sharqiyah South	465	3,371	1,840
Ash Sharqiyah North	553	3,715	1,999
Al Dhahira	337	4,818	282
Al Wusta	10	28	7

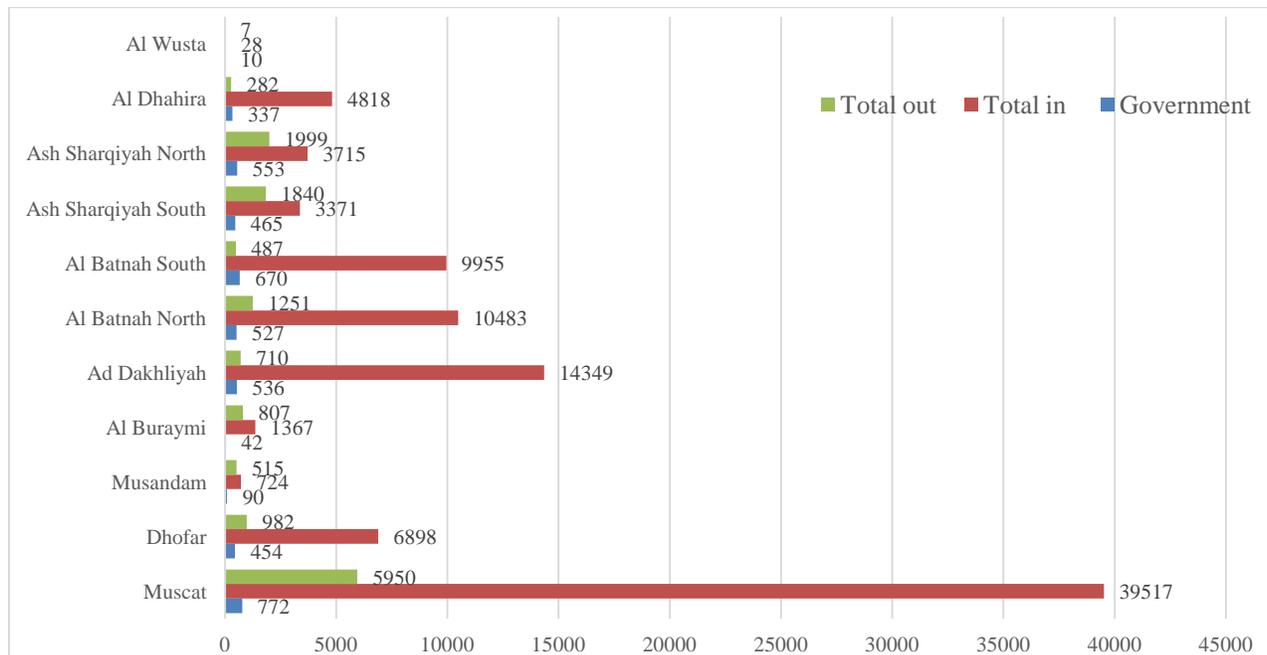


Figure 17 Mail Volume per Province

Business Map

Process mapping tools were used to create the current business map followed in the Oman Post Company. The process starts with a mail article put in the mailbox. It will then be transported to

the post office by a car or a pick-up depending on the location. In the post office, articles will be sorted according to their destination. It will then be stored until the second transporting vehicle comes to the post office. If the articles are sent to a destination within the region, it will be transferred to the destination post office where it will be sorted and transferred to the receiver's post box. Otherwise, if the destination is in another region/province, the article will be transferred to CPO (Central Postal Operations) in Muscat. Mail articles come from all branches in Oman to CPO, along with international mail received at airports and seaports. All these mail articles are sorted at the sortation department. The sortation hall spans an area of 1000 square metres. There are around 50 skilled and un-skilled people working together from 6 am to 7 pm daily to sort all the mail. Everyday sortation department deals with 8000-10000 mail articles; however, this number always fluctuates. Sometimes it can reach up to 20000 mail articles. Once sortation is completed, mail is loaded to different trucks depend on the post office of destination. When the mail finally arrives at the destination post office, it will again be sorted according to the receiver's post box. The final step is to deliver the mail article to that post box. Regarding the EMS and international mail, the CPO has a dedicated truck that delivers mail to the airport daily and is sent directly on the next flight of the destination country. Figure 18 shows the above explained business map followed in Oman post.

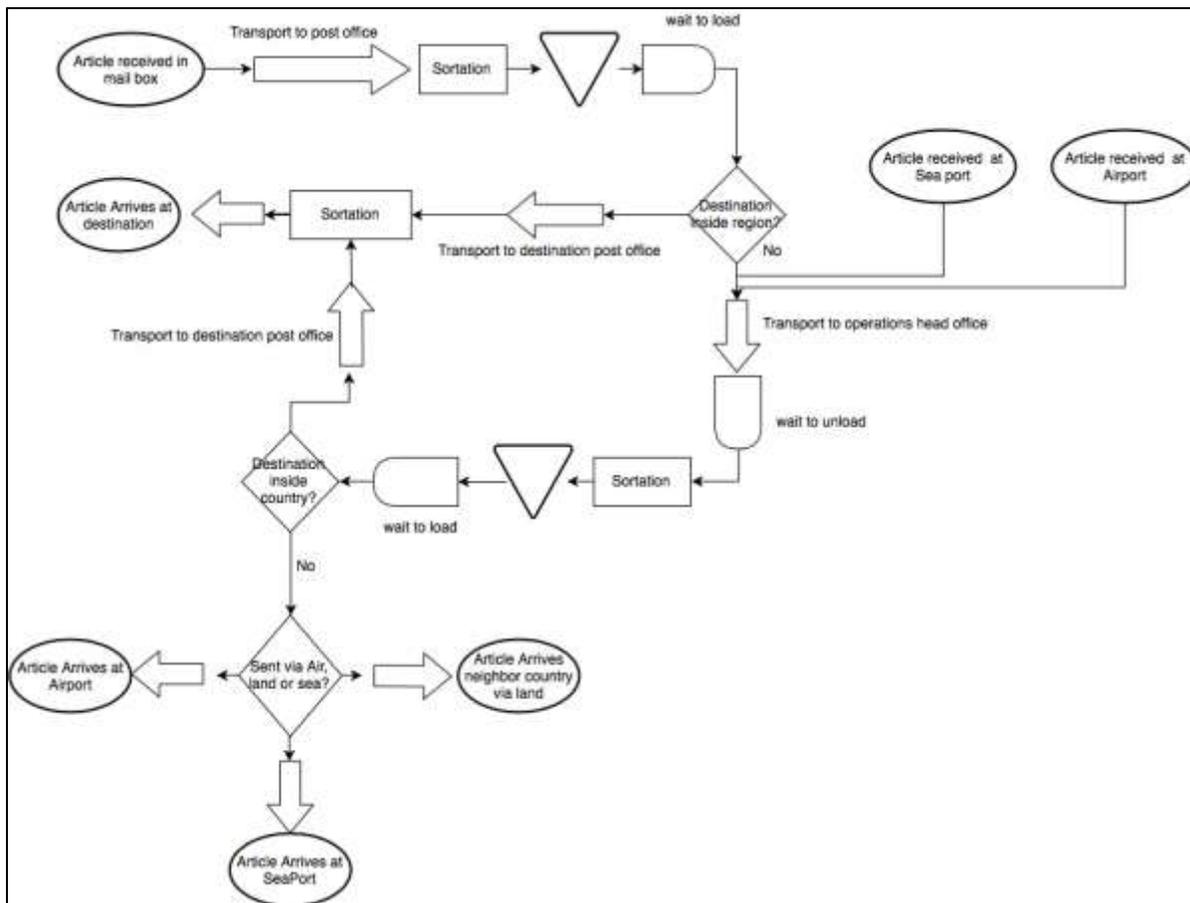


Figure 18 Oman Post Business Map

Distribution Network

The current distribution network consists of 5 daily trips to dedicated postal offices. Namely, Sohar, Rustaq, Nizwa, Ibra and Salalah. However, Salalah city is around 1020 km away from Muscat and the trip takes around 10 hours. Therefore, the Oman Post Company has an agreement with the National Public Transport Company (Mwasalat) to deliver to and receive mail from Salalah. Figure below shows destinations of daily trips going from/to CPO (Central Postal Operations) in Muscat.

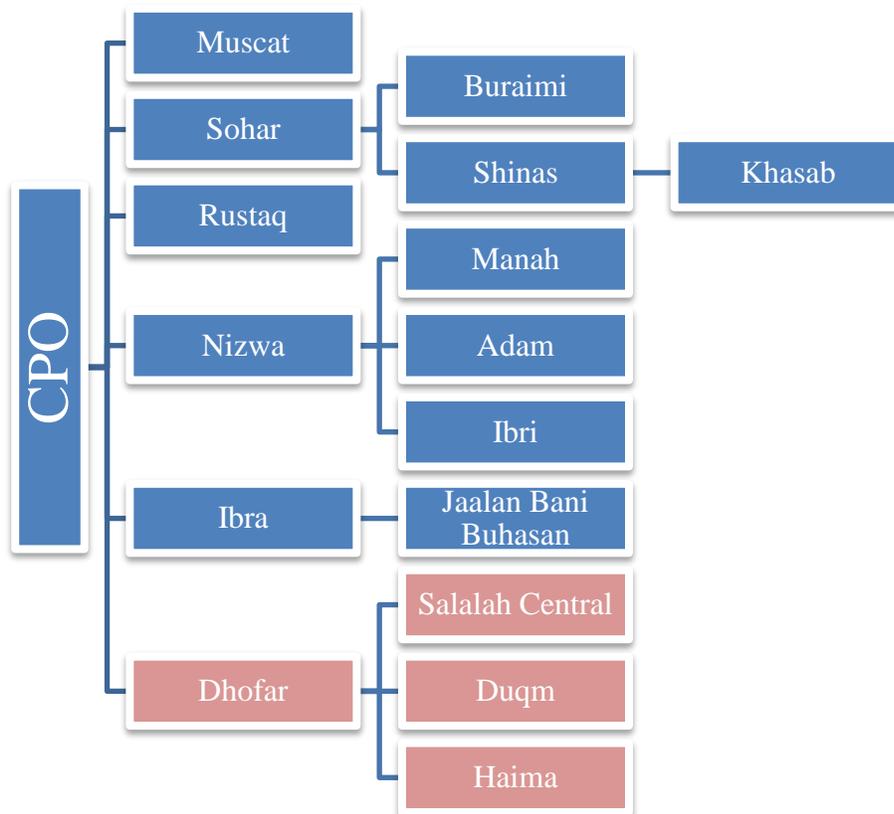


Figure 19 Destinations from CPO

Some branches act as depots or assembly points that gather mail from far areas. For example, Musandam province' mail is first collected in Khasab, then transferred to Shinas then to Sohar. Mail from Mhadha and Sunainah is collected in Buraimi. From there, both Shinas and Burami mail is transferred to Sohar, the final point where it will then be transferred to CPO Muscat. The scenario in Nizwa and Ibra, AL Dhahira mail is collected in Ibri branch then transferred to Nizwa. Mail coming from Masira Island and other far provinces in Sharqiya south is collected in Jaalan Bani Buhasan and then transferred to Ibra.

Figure 20 shows daily routes of the distribution network. The thick red line indicates main routes going from/to main postal depots, ie. Sohar, Nizwa, Ibra and Rustaq. Green lines indicate local delivery lines from branches that collect mail from far areas and transfer them to main postal depots such as Ibra to Nizwa or Buraimi to Sohar. Dashed lines indicate the area of which the branch is responsible for collecting the mail. Red stars with the yellow frame indicate the main depots. Green stars with red frame indicate local depots.

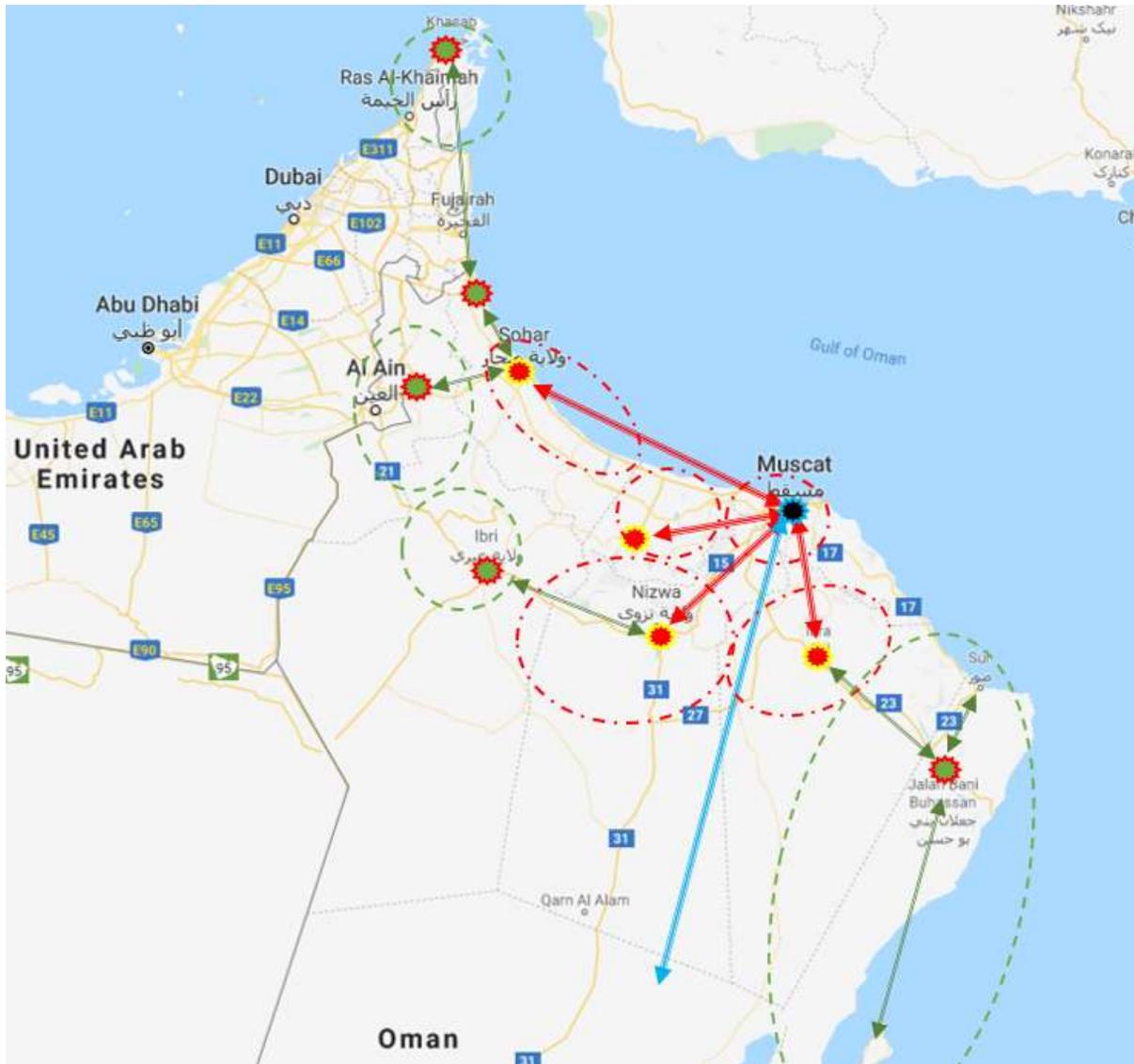


Figure 20 Daily Trips of the Distribution Network

Route Distances

Using the given information and with the aid of Google Maps ® following are estimated distances for each route driven daily by Oman Post Company drivers.

Table 6 Main Routes from Depots to CPO

Route Name	Route stops	Distance in Km
Sohar	Muscat –Al-Suwaiq - Al-Bidaya – Saham - Falaj Al-Qabail - Sohar – Muscat	398
Rustaq	Muscat - Nakhal - Awabi – Rustaq - burg ridda - Muladdah – Barka – Muscat	276
Nizwa	Muscat – BidBid – Samail – Izki – Nizwa - Muscat	299
Ibra	Muscat – Ibra – Muscat	294
Total		1,267 km

Table 7 Collection Distances from Branches to Local Depots

Main Depot	Route stops	Distance in Km
Sohar	Sunaina – Buraimi- Mahdha – Sohar	486
	Khasab – Bukha _ Shinas – Sohar	624
Nizwa	Ibri- Al Khadar -Dhank -Yanqul – Al Araqi – Nizwa	600
	Hamra – Bahla – Nizwa	140
	Al Jabal Al Akhdar	114
	Adam - Nizwa	130
	Manah – Nizwa	38
Ibra	Sinaw – Mudhaibi – Samdulshan – Ibra	198
	Dama Wa Taieen - Ibra	130
	Jalan Bani Buhasan - Jalan Bani BuAli – Alkamel Wal Wafi – Wadi Bani Khaled – Bidiya – Almudhairub - Ibra	384
	Sur – Al Kamel Wal Wafi	114
	Masira Island – Alashkhara – Jaalani Bani Buhassan	554
Muscat	All Muscat Province Branches	258
Total		3,770 km

The following route is handled by the National Public Transport Company (Mwasalat).

Table 8 Route Handled by Mwasalat

Route Name	Route stops	Distance in Km
Dhofar	Muscat – Duqm- Haima – Salalah – Haima – Duqm – Muscat	1,206 km

The same transport company operates several routes across Oman, which the Oman Post Company can benefit from. For example:

Transport Company (Mwasalt) operates:

- 5 daily trips from Muscat to Dubai and vice versa
- Daily trips from Muscat to Masira Island

Therefore:

- *Khasab – Bukha – Shinas – Sohar*

Route can be terminated and postal articles coming from Khasab are to be sent to Dubai. From Dubai, mail articles can be sent via Mwasalt Buses to CPO at Muscat. This will reduce the distance from 624 km to 392 km only.

- *Masira Island – Alashkhara*

Route can be terminated and postal articles coming from Masira Island are to be sent to a nearby harbor called Mahut where the Mwasalat bus stops. The bus will take articles directly to Muscat (2 trips a day). This will reduce around 488 km travelled daily to send and receive mail from Masira Island.

Note that both Khasab and Masira Island have domestic airports with trips to Muscat. This might not be cost effective for traditional mail, but it can certainly be used for EMS and other urgent deliveries.

Also, some areas are closer to branches from other provinces, so it's better to send it to CPO through other province' depot. For Example: Sunainah to buraimi is 116 km, whereas Sunainah to Dhank is 45 km. Also, Sinaw to Ibra is 105 km, whereas Sinaw to Adam is 60 km.

Table 9 summarises the distance currently travelled via the Oman Post Company versus distances after implementing mentioned proposals.

Table 9 Current and Proposed Distances travelled by OPC

	Total Distance form Depots to CPO	Collection Distances from Branches to Local Depots
Current	1,267 km	3,770 km
Proposed	1,267 km	2,850 km

Finally, the Oman Post Company uses trucks to transfer mail articles. However, data showed that there is rarely a need for a truck. Therefore, it is suggested to replace these trucks with lighter cars that consume less fuel.

Internal Performance Analysis

This section illustrates data achieved whilst analyzing the internal performance of the company. It includes data gained through SWOT analysis, fishbone diagram and Pareto analysis.

SWOT Analysis

The results of SWOT analyses of the Oman Post Company are shown in Table 10. One of the key strengths of the Oman Post Company possess is that it's a government entity and the official post operator of the country. This, along with UPU membership give it an advantage whilst competing with other competitors to gain the trust of foreign investors coming to the country. Also, it has a very widespread network across the country with 84 branches serving almost every city. The last point is that the company has started implementing a learning curve (2018) to overcome repeated problems and develop the overall process.

Weaknesses of the company are somehow a reflection of what was its strengths. Although it's a government company the rules, regulations and financial decisions take a long time to be processed. This is due to the long processing chain of government regulations and different priorities of financial approvals for any development plans in other government entities. Also, the company's internal culture is very stable, with no innovation possibilities in the workplace. Employees are not fully satisfied with their carrier plans as they cannot see a clear development path they're going through. Also, the Oman Post Company has a low market share within the country and an even lower existence in the international market. Finally, the company doesn't offer competitive packages to attract new customers, neither has it customer-satisfaction feedback procedure to listen to their voices and develop its services.

OPC has several opportunities which it can take advantage of, especially by making use of its wide network of branches. The company could expand its activities and serve as a 3PL/4PL operator. It can also enter the e-commerce and online parcel delivery with more efficient and competitive packages and services. The opportunities in the domestic market are many, the company can increase its local market share by targeting government /non-government services and private companies, especially small and medium enterprises. OPC branches are usually located in premium locations in each city, where the land itself can be invested directly as a lease or through real estate brokers.

The biggest threat confronting the Oman Post Company is the digital transformation that faces all postal operators worldwide. However, this could be looked at as part of the e-commerce opportunities mentioned earlier. Also, several international and national competitors such as DHL, ARAMEX and MANDO OB (local) represent a real threat that pulls business from the OPC market share. Finally, as a government entity and because all its budget comes from the government, OPC is threatened by oil price fluctuations and world economic uncertainty because any decline in government spending or cost cutting directly affects government entities such as the Oman Post Company.

Table 10 SWOT Analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> • Government entity • Official post operator • Wide network present in all Oman • UPU member • Started using learning curve 	<ul style="list-style-type: none"> • Limited by government rules/finance • Poor usage of technology • Customer Satisfaction? • Small market share • Lack of international Business • Work environment (no innovation) • No competitive schemes • No employee development plans
<ul style="list-style-type: none"> • Opportunities 	<ul style="list-style-type: none"> • Threats
<ul style="list-style-type: none"> • Logistics/Transportation • 3PL / 4PL • E-commerce • Domestic market • Better use of Branches (Investment) • Government and non-government services / target 	<ul style="list-style-type: none"> • Digital Transformation • National and international competitors • DHL, ARAMEX, MANDO OB • National Economy decline

Fishbone Diagram

Fishbone diagram shown in figure 21 below was created using data collected from interviews and observations. From the Fishbone diagram, low performance in the internal operations of Oman Post Company are caused by 6 main reasons. These are:

1. Work Strategy
2. Work Culture
3. People Team Structure
4. Performance Indicators
5. Technology
6. Layout

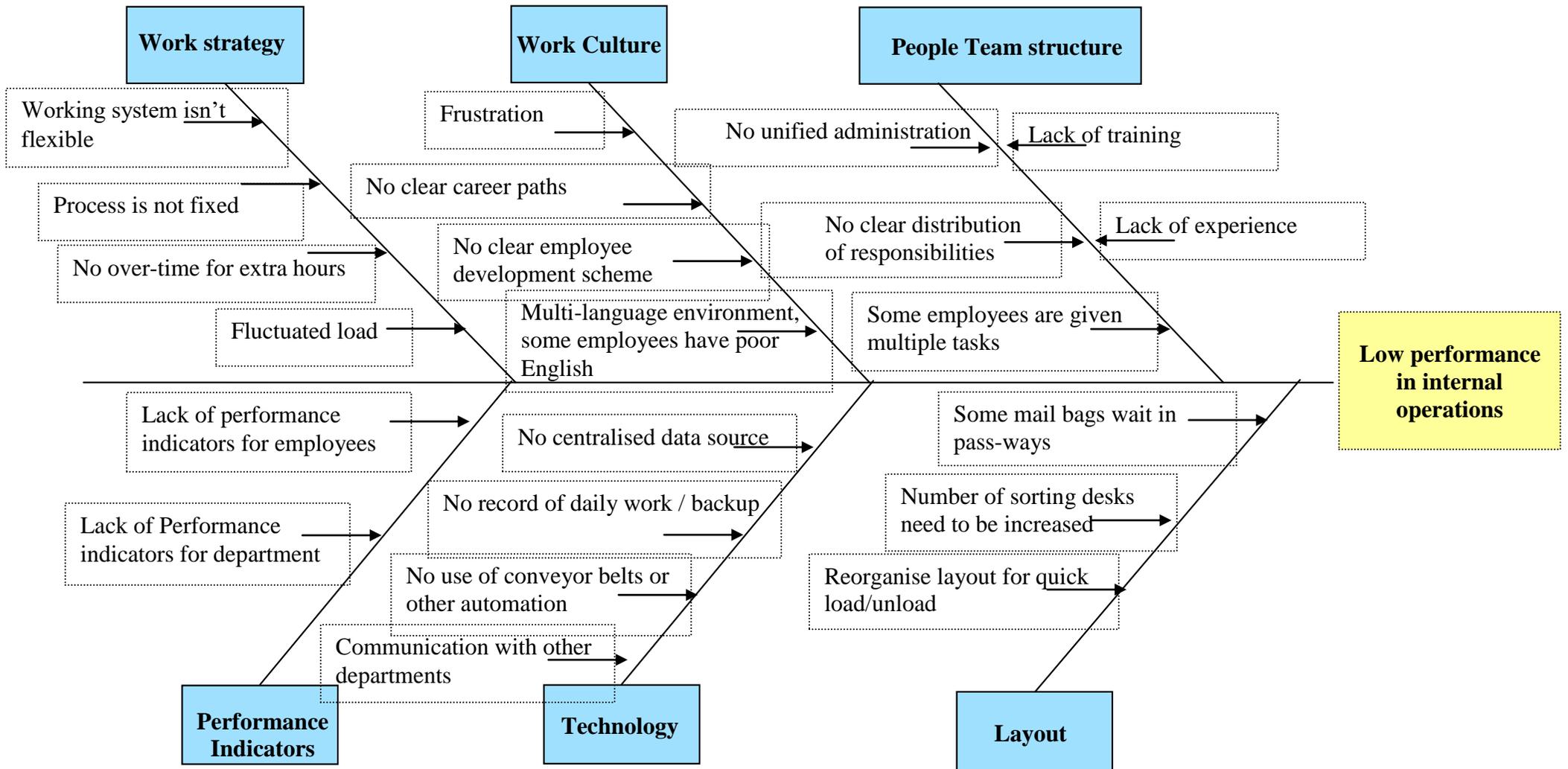


Figure 21 Fishbone Diagram for the Oman Post Company

Pareto Diagram

According to literature it is common to find that few branches comprise the highest mail volume and the other branches share the remaining volume. The sortation department in CPO (Central Postal Operations) is responsible for sorting all mail that comes in/out of the operations headquarters. Mail volume data was collected for all the 84 branches of the company including all mail articles from the following product types:

- Government
- Registered Mail
- EMS
- Parcels
- Post bags

To facilitate analysis, data was sorted according to mail volume handled by each branch. It appears that 8% of the branches account for 33.59% of the total mail handled. 25% of the branches comprised 42.09% of the total mail handled. The remaining 67% of the branches are only accountable for 24.32% of the total mail handled by the company.

Table 11 shows post office classification according to their throughput. Class A refers to branches with the highest throughput. Class B consists of the branches with medium throughput. Class C are the branches with low throughput.

Table 11 ABC Classification

ABC Class	Number of Post Offices	% of Post Offices	Number of Articles Handled	% of Articles Handled
A	7	8 %	37,398	33.59 %
B	21	25 %	46,858	42.09 %
C	56	67 %	27,082	24.32 %
Total	84	100 %	111,338	100 %

Table 12 illustrates a sample list of the branches against their throughput classifications. It also shows the mail throughput with the corresponding percentage of the total. A complete list of all branches can be found in the Appendix C

Table 12 Sample List of Branches with ABC Classification

Branch Name	Mail Throughput	% of Total throughput	ABC CLASS
Salalah Central	6455	5.80 %	A
Airport Heights	6093	5.47 %	A
Al Khuwair	5481	4.92 %	A
Ibri	2386	2.14 %	B

Al-Bidaya	2385	2.14 %	B
Sohar	2376	2.13 %	B
Mableh	2196	1.97 %	B
Ibra	2131	1.91 %	B
Qurayyat	944	0.85 %	C
Yanqul	939	0.84 %	C
Kamel wal Wafi	898	0.81 %	C
Manah	875	0.79 %	C
Bidiya	834	0.75 %	C
Jalan Bani BuAli	829	0.74 %	C

Table 12...

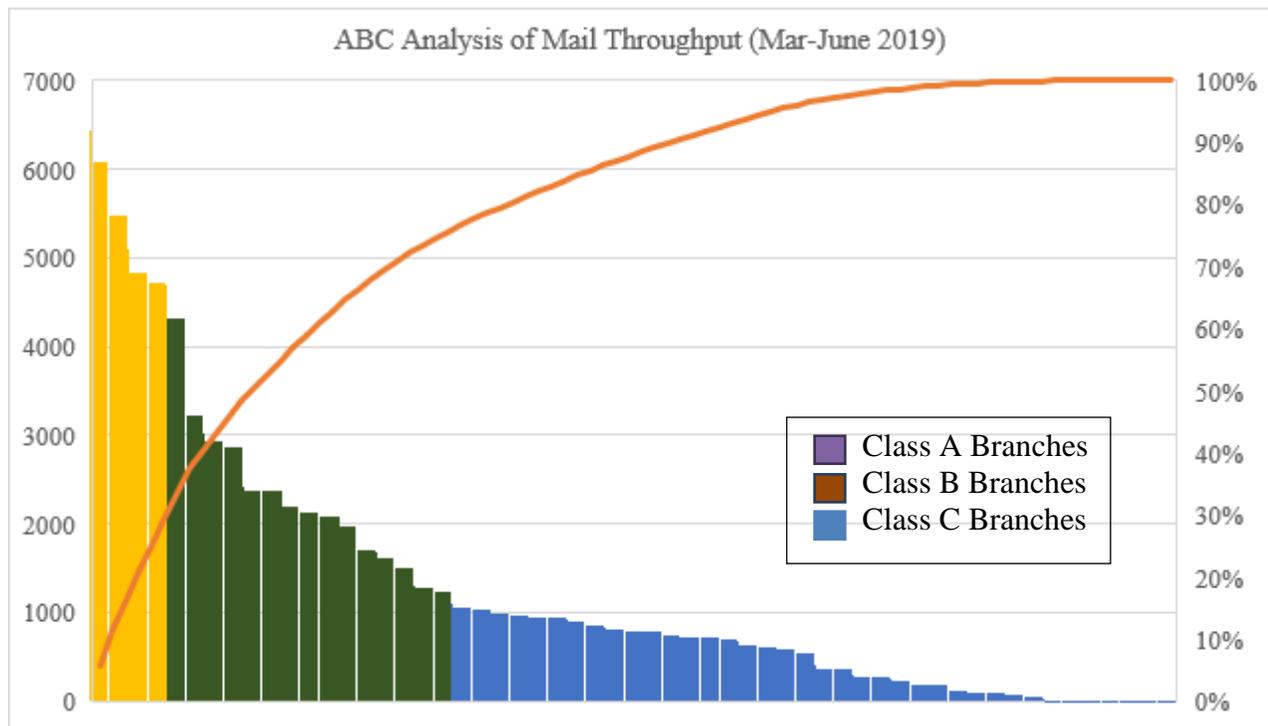


Figure 22 ABC Analysis

FINDINGS AND DISCUSSION

External Distribution Network Analysis

The data analysis confirms a clear correlation between theories of postal network logistics derived from literature review and the business process practiced in the Oman Post Company.

The data on the number of post offices and post boxes illustrated in line with the theory derived in the literature review. There is a clear increase in the number of post offices and post boxes as the population increases in each province. This follows the same relationship with examples stated, where countries with higher population have a greater number of post

offices/boxes as in Poland, which has close area size to Oman, or Argentina, which has a bigger area but the same population density as Oman.

The same situation occurs with mail volume delivered in each province. Where the relationship is more directly proportional to the number of populations. This is in line with examples mention in Table 1 where the amount of mail carried increases with the population, like Norway and Saudi Arabia. However, although some provinces have a higher population, they have less volume than others which is contrary to the hypothesis. This means a further investigation is needed to identify factors contributing to this noncompliant.

The data obtained from the company that helped construct the business map followed by Oman Post, contributes to create a clearer understanding of the components of the postal network, which was explained in the literature review.

In the literature review, the distribution network is defined as an interconnected group of storage facilities and transportation systems that receive inventories of goods and then deliver them to customers. (Hayes, 2019). The results found considering Oman's post distribution networks build on this definition. The data collected for route distances provide a new insight that more co-operation with national transport company will help minimize distances travelled. Although a lack of data, the result of the analysis revealed a possibility to reduce 25% of distance travelled to collect mail from branches to local depots in provinces. This is motivating for deeper analysis to be carried out.

Internal Performance Analysis

The literature review introduced several theories for internal performance such as SWOT analysis. The results obtained from the data collection have proven the statements of Thompson, Strickland and Gamble (2007) about SWOT analysis. It is a powerful tool for sizing up an organisation's resource capabilities and deficiencies, its market opportunities, and the external threats to its future. SWOT analysis revealed significant points that need to be considered by management of the Oman Post Company.

The second tool introduced in the literature review was the Fishbone diagram analysis. The results obtained via the Fishbone diagram confirmed the theory behind its purpose. It helped trace the root cause of the problem, which is in line with Chakraborty (2018) has stated.

The Pareto principle, also known as the 20/80 rule, was explained in the literature review. Results obtained for mail throughput in were in line with this Pareto's principle / ABC analysis. Results showed that 8% of the branches account for 33.59% of the total mail handled. 25% of branches comprised 42.09% and the remaining 67% of the branches are only accountable for 24.32% of the total mail handled by the company.

RECOMMENDATIONS

Based on collected data and analysis, the following are a set of recommendations that could help improve Oman post operations.

- Review the distribution network and extend co-operation with transport companies.
- Record the number of mail articles handled daily in each branch, this will help determine the manpower and other resources required.
- Add Performance level indicators for different stages of the logistical network.
- From data acquired, some branches have very low loads, therefore if a branch is not efficient, merge it or close it.
- Conduct periodic meetings with all branch heads for to review updates and problems.
- Introduce and invest in automation.
- Listen to the voices of employees and invest in teaching and training them.

CONCLUSION

The overall aim of this research is to derive proposals/recommendations that will help Oman Post improve the external logistical distribution network and enhance the internal operational performance. This was attained by achieving the 3 set objectives in the beginning. The study identifies factors that contribute to improving or impairing operations. Literature was reviewed to investigate and understand the logistics, postal logistics and postal services industry. It was also reviewed towards analyzing and finding areas of improvement for the external distribution network and analyzing internal performance. Several visits were carried out to the company's operations offices and several interviews were conducted with employees. Analyses of data collected, and interviews conducted showed that there is a strong correlation between the business processes implemented in the Oman Post Company and those with other countries, as with the increase in number of post offices and post boxes relative to increase in population and mail volume density distribution and business map implemented. The analyses also showed the existence of several internal issues the company suffers from, especially those related to frustrated working culture, team structure and heavy dependence on manual work instead of technology. The results indicate that the Oman Post Company have implemented global standards in their operations; however, there are few gaps in logistical postal network and internal performance. On this basis, it's recommended that that company needs to revise its distribution network and modify/adjust some of the routes such as the route from Khasab to Muscat and from Masira Island to Jalan Bani BuAli Also, the company is asked to resolve the issues it carries within its departments, which hinder internal performance. This should start by

replacing frustrating working culture and building a stronger team structure as well as introducing transparent and powerful performance indicators.

LIMITATIONS

There were several limitations faced while conducting this study.

- Limitation of Data - There were no historical data officially recorded by Oman Post Company branches. The data used in this thesis study were collected by the statistics department employees of Oman Post and the National Center for Statistics and Information and Universal Postal Union. The Oman Post Company was too conservative whilst granting access for observations, visits and data collection.
- Data analysis limitation - While analysing data for the distribution network, Excel Spreadsheets were used for numeric data analysis and Google Maps were used to approximate distances between branch locations. Although the two software are powerful, they lack some features that would have brought more accurate and useful results for the analysis.
- Work limitation - My workplace location is located approximately 600 km from the Oman Post Company headquarters. Therefore, I had limited time to conduct visits and observations. E-mails and telephonic calls were a useful alternative; however, they were not as reliable and fruitful as interviews and site visits.

DIRECTIONS FOR FUTURE STUDY

This research can be extended further towards a complete redesign of the whole distribution network of the Oman Post Company. Redesigning the network must consider relocating some branches, additions and elimination of others. Another direction where future research can be extended is towards implementation of 6-sigma and lean concept in Oman Post operations.

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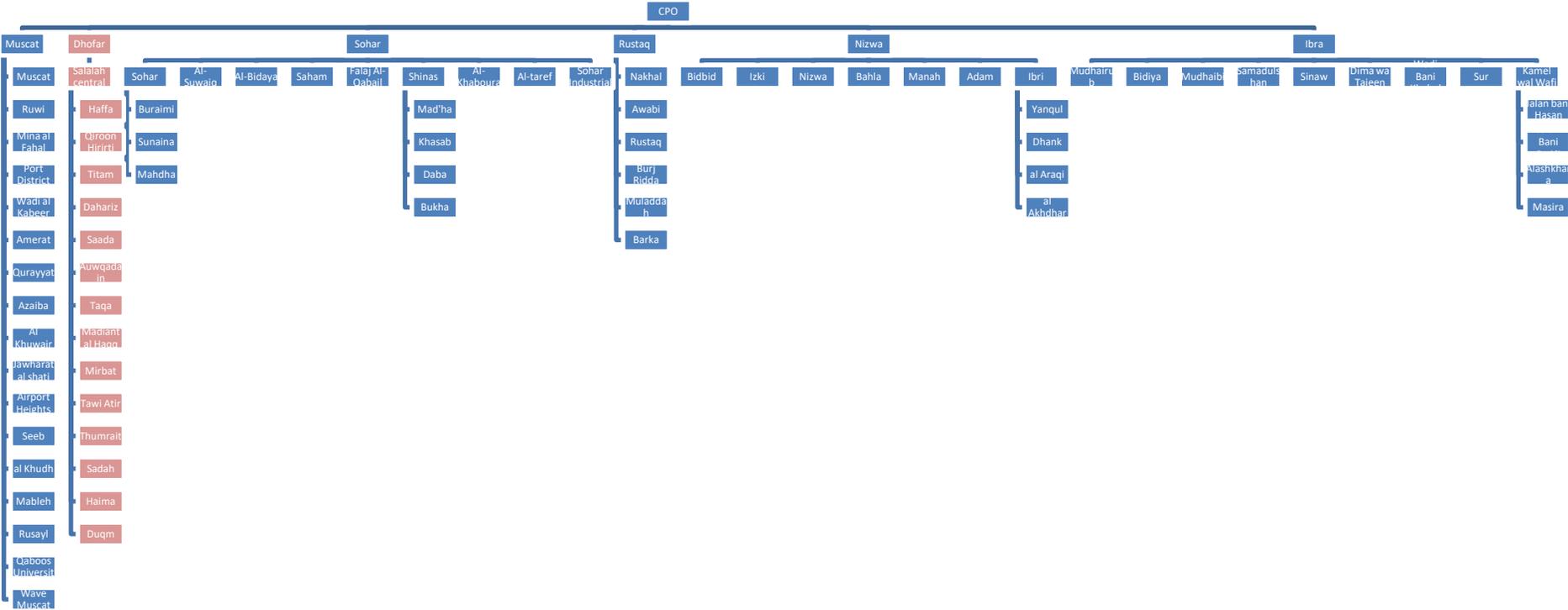
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APPENDICES

Appendix A – Branch List

	MUSCAT		Buraimi		Bathna South
1.	Muscat	35.	Buraimi	63.	Al-Musana'a
2.	Ruwi	36.	Sunaina	64.	Al-Malda
3.	Mina al Fahal	37.	Mahdha	65.	Al-Awabi
4.	Port District			66.	Al-Rustaq
5.	Wadi al Kabeer		Dhahira	67.	Barka
6.	Amerat	38.	Yanqul	68.	Liwa
7.	Qurayyat	39.	Dhank	69.	Nakhal
8.	Azaiba	40.	al Araqi	70.	Burj AR-Rahddah
9.	Al Khuwair	41.	Ibri		
10.	Jawharat al shati	42.	al Akhdhar		North Sharqiya
11.	Airport Heights			71.	Ibra
12.	Seeb		Dakhilyia	72.	Mudhairub
13.	al Khudh	43.	Bahla	73.	Bidiya
14.	Mableh	44.	Nizwa	74.	Mudhaibi
15.	Rusayl	45.	Samail	75.	Samadulshan
16.	Sultan Qaboos University	46.	Bidbid	76.	Sinaw
17.	The Wave Muscat Project	47.	Manah	77.	Dima wa Taiéen
		48.	Adam	78.	Wadi Bani Khaled
	Dhofar	49.	Al Hamra		
18.	Salalah central	50.	Jabal Al Akhdar		South Sharqiya
19.	Haffa	51.	Izki	79.	Sur
20.	Qiroon Hirirti			80.	Kamel wal Wafi
21.	Titam		Wusta	81.	Jalan bani Hasan
22.	Dahariz	52.	Duqm	82.	Jalan Bani BuAli
23.	Saada	53.	Haima	83.	Alashkhara
24.	Auwqadain			84.	Masira
25.	Taqa		Batna North		
26.	Madiant al Haqq	54.	Sohar		
27.	Mirbat	55.	Al-Suwaiq		
28.	Tawi Atir	56.	Al-Bidaya		
29.	Thumrait	57.	Saham		
30.	Sadah	58.	Falaj Al-Qabail		
		59.	Shinas		
	Musandam	60.	Al-Khaboura		
31.	Mad'ha	61.	Al-taref		
32.	Khasab	62.	Sohar Industrial		
33.	Daba				
34.	Bukha				

Appendix B – Distribution Network of Oman Post Company



Appendix C – Mail Throughput and ABC analysis

	Branch Name	Government Mail	Registered Mail In/Out	EMS In/Out	Parcel Out	Parcel In	Post Bag out	Post Bag IN	Branch Total	% of Total Throughput	ABC Class
1	Muscat	10	2676	121	6	45	9	8	2875	2.58	B
2	Ruwi	123	4264	439	95	179	2	4	5106	4.58	A
3	Mina al Fahal	48	2876	171	49	94	0	0	3238	2.91	B
4	Port District	12	1541	94	13	38	0	0	1698	1.53	B
5	Wadi al Kabeer	44	861	60	18	23	0	0	1006	0.90	C
6	Amerat	30	1806	83	96	69	0	0	2084	1.87	B
7	Qurayyat	42	833	21	22	26	1	1	946	0.85	C
8	Azaiba	115	3596	211	145	129	58	66	4320	3.88	B
9	Al Khuwair	107	4590	353	135	161	67	68	5481	4.92	A
10	Jawharat al shati	7	654	70	16	39	0	0	786	0.71	C
11	Airport Heights	81	4888	620	258	247	0	0	6094	5.47	A
12	Seeb	82	2584	141	66	70	0	0	2943	2.64	B
13	al Khudh	0	4339	228	146	117	0	0	4830	4.34	A
14	Mableh	69	1580	265	99	183	0	0	2196	1.97	B
15	Rusayl	0	885	41	12	14	0	0	952	0.85	C
16	Sultan Qaboos University	3	1197	61	21	40	0	0	1322	1.19	B
17	The Wave Muscat Project	1	308	41	5	25	0	0	380	0.34	C
18	Ibra	223	1253	503	42	84	16	13	2134	1.91	B

19	Mudhairub	27	175	19	1	10	0	0	232	0.21	C
20	Bidiya	54	653	55	34	38	0	1	835	0.75	C
21	Mudhaibi	127	525	26	21	39	0	0	738	0.66	C
22	Samadulshan	47	697	26	16	15	0	1	802	0.72	C
23	Sinaw	44	881	65	29	41	0	1	1061	0.95	C
24	Dima wa Taieen	28	316	4	6	19	0	0	373	0.33	C
25	Wadi Bani Khaled	4	88	2	1	2	0	0	97	0.09	C
26	Sur	202	2033	430	144	154	31	27	3021	2.71	B
27	Kamel wal Wafi	54	504	255	31	55	0	0	899	0.81	C
28	Jalan bani Hasan	44	425	43	31	53	0	1	597	0.54	C
29	Jalan Bani BuAli	142	460	84	45	99	0	0	830	0.74	C
30	Alashkhara	0	44	2	1	3	0	0	50	0.04	C
31	Masira	23	112	45	4	94	3	2	283	0.25	C
32	Sohar	171	2016	49	61	80	0	0	2377	2.13	B
33	Al-Suwaiq	39	1156	42	33	20	0	0	1290	1.16	B
34	Al-Bidaya	40	2118	56	122	50	0	0	2386	2.14	B
35	Saham	2	829	49	50	27	5	4	966	0.87	C
36	Falaj Al-Qabail	30	340	37	101	46	0	0	554	0.50	C
37	Shinas	72	433	62	45	38	0	0	650	0.58	C
38	Al-Khaboura	0	617	17	0	7	14	20	675	0.61	C
39	Al-taref	0	174	19	7	3	0	0	203	0.18	C
40	Sohar Industrial	NA	0	0	NA	NA	NA	NA	0	0.00	C
41	Al-Musana'a	42	625	29	11	26	0	0	733	0.66	C
42	Al-Malda	167	1357	50	27	27	1	1	1630	1.46	B
43	Al-Awabi	71	530	8	9	7	0	0	625	0.56	C
44	Al-Rustaq	42	1581	28	9	61	0	1	1722	1.54	B
45	Barka	109	1971	215	53	77	6	6	2437	2.19	B
46	Liwa	36	865	33	72	27	0	0	1033	0.93	C
47	Nakhal	43	873	17	5	23	2	6	969	0.87	C

48	Burj AR-Rahddah	161	1703	27	18	28	15	20	1972	1.77	B
49	Salalah central	309	4668	948	276	207	24	22	6454	5.80	A
50	Haffa	0	0	0	0	0	0	0	0	0.00	C
51	Qiroon Hirirti	0	2	1	0	0	0	0	3	0.00	C
52	Titam	1	0	0	0	0	0	0	1	0.00	C
53	Dahariz	11	236	12	17	6	0	0	282	0.25	C
54	Saada	47	647	36	20	12	0	0	762	0.68	C
55	Auwqadain	43	340	25	8	11	0	0	427	0.38	C
56	Taqa	16	160	7	1	2	0	0	186	0.17	C
57	Madiant al Haqq	1	12	0	0	0	0	0	13	0.01	C
58	Mirbat	11	50	6	3	3	0	0	73	0.06	C
59	Tawi Atir	2	17	1	0	1	0	0	21	0.02	C
60	Thumrait	12	50	6	24	3	0	0	95	0.08	C
61	Sadah	2	20	1	0	1	0	0	24	0.02	C
62	Bahla	124	4457	57	28	51	5	4	4726	4.24	A
63	Nizwa	213	3970	313	114	70	17	16	4713	4.23	A
64	Samail	0	667	16	15	26	0	0	724	0.65	C
65	Bidbid	43	1147	21	12	15	0	0	1238	1.11	B
66	Manah	21	806	15	15	19	0	0	876	0.79	C
67	Adam	27	562	10	4	18	0	0	621	0.56	C
68	Al Hamra	26	991	13	6	19	0	0	1055	0.95	C
69	Jabal Al Akhdar	24	97	2	3	2	0	0	128	0.11	C
70	Izki	57	1365	27	44	27	0	0	1520	1.37	B
71	Duqm	10	26	4	1	3	0	0	44	0.04	C
72	Haima	0	0	0	0	0	0	0	0	0.00	C
73	Mad'ha	6	17	17	220	7	0	0	267	0.24	C
74	Khasab	46	371	203	43	90	18	21	792	0.71	C
75	Daba	20	78	52	8	14	9	9	190	0.17	C
76	Bukha	18	39	10	3	9	3	3	85	0.08	C
77	Yanqul	61	827	18	6	27	0	0	939	0.84	C

78	Dhank	29	227	11	7	30	0	0	304	0.27	C
79	al Araqi	20	1058	15	8	8	0	0	1109	1.00	C
80	Ibri	219	1849	66	61	133	25	35	2388	2.14	B
81	al Akhdhar	9	613	23	20	7	17	12	701	0.63	C
82	Buraimi	40	1035	549	298	134	15	18	2089	1.87	B
83	Sunaina	0	6	0	0	1	0	0	7	0.01	C
84	Mahdha	2	116	3	0	1	0	0	122	0.11	C

Note: Data shown is average of period March – June 2019