

The postal performance of the South African Post Office: An international and local perspective

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Background: Postal services have been impacted by e-digitisation and e-commerce. The revenue derived by the South Africa Post Office (SAPO) from letter-post has declined contributing to its financial difficulties. This has led to a decline in the mail delivery service and performance. With its country-wide network, SAPO can offer an affordable and indispensable service.

Objectives: The objective is to evaluate the mail delivery performance of SAPO, using both an international and local perspective, with an emphasis on aspects such as logistics, supply chain management (SCM), last mile delivery, etc.

Method: Primary data, by the Universal Postal Union (UPU), on postal performance were used with locally collected primary tracking data of postal delivery from origin to destination of registered postal items. A quantitative data analysis and evaluation was performed using these data to get a sense of the postal development and mail delivery performance of SAPO.

Results: The postal development performance of SAPO as measured by the UPU was compared with actual quantitative tracking data. There seems to be a significant disconnect between the results published by the UPU and what those in South Africa are experiencing.

Conclusion: This quantitative analysis shows that SAPO's postal service is no longer a reliable, predictable and professional service. It will necessitate an enormous effort to turn it around.

Contribution: The article provides a view on the performance of the postal services of SAPO, both from an international and local perspective.

Keywords: postal service; supply chain management; postal development performance; tracking data analysis.

Introduction

The South Africa Post Office (SAPO) is one of many state-owned entities in South Africa including Eskom, South African Airways, Denel, etc. In its traditional form, the postal sector has been driven on the supply side by three main stakeholders: governments, regulators and designated postal operators (SAPO 2017). The first two entities define the basic policies and rules governing postal services, while the third has the legal obligation of ensuring the delivery of basic postal services to all citizens within a given territory – the so-called 'universal service obligation [USO]' (Ambrosini, Boldron & Roy 2006). The designated postal operator in South Africa is SAPO for both domestic and international postal products or goods. In this regard, the delivery of postal items remains one of the core functions of SAPO.

The traditional post office focused on the shipping of parcels and letters as well as the selling of stamps. However, the span of services and activities the modern-day post office provides is much broader and wider. Postal services operate in areas such as logistics, financial services, e-government, health care and other public services.

The impact of modern technology, and specifically digitalisation, has had a major impact on postal services worldwide. Increasing connectivity across the globe has impacted the volumes of domestic letters and parcels. Two significant trends have played a major role in this (Bruno et al. 2021): (1) *e-substitution* – the substitution of traditional postal letters by electronic forms of communication, including social media and (2) *e-commerce* – giving a significant escalation and growth in parcel volumes. The decline in traditional mail volumes is structural and irreversible (eds. Crew & Brennan 2016:v; Dragendorff et al. 2019; Falch & Henten 2018; Matúšková & Madle áková 2017; Nikali 2008;

Wolak 1996). This decline dates to the late 1980s and early 1990s where there was a significant increase in different interpersonal communication modes. Online information services became available, there was a reduction in telephone and fax machine costs while that period signified the advent of the Internet (Wolak 1996). Postal demand would decrease as well as the associated cost for these services. Subsequently, various studies on this topic were conducted.

For example, Matúšková and Madleňáková (2017) considered the impact of decreasing postal volumes on the cost structures of the providers of universal postal services. Falch and Henten (2018) show that in Denmark, the use of letters has declined to levels lower than when the postal service was introduced in Denmark in the 17th century. The main contributing factor is that government communication is almost exclusively done electronically.

Dragendorf et al. (2019) indicate that in 2019, the mail revenue share still accounted for 40% of postal revenues globally. However, the global volume ratio of letters (mail) to parcels declined from 13:1 in 2005 to 4:1 in 2015 and is expected to reach 1:1 by 2025. The concomitant growth in e-commerce will create definite opportunities for postal service providers and capturing a component of these parcel volumes will be crucial for the postal service providers to protect the unique benefits of their mail-parcel operations. Locally consolidated monthly domestic mail volumes comprising of standard mail, non-standard mail, registered mail, Fastmail and parcels, are given for the last three financial years 2019/20, 2020/21 and 2021/22 (SAPO 2022:37). For 2019/20, the volumes were around 5 million items throughout the year declining to 3 million. The volumes for the next 2 years are very similar, hovering around 3 million items throughout the 2 years. In the 2021/22 annual report, it is stated that letter volumes are decreasing further while parcel volumes are increasing.

Crew and Kleindorfer (eds. 2008), Crew and Brennan (eds. 2016) and Parcu, Brennan and Glass (eds. 2022) capture presentations from conferences devoted to the postal sector with a focus on regulatory matters and postal economies. Strategies in the changing digital world are also covered and the importance of increasing and improving postal delivery services emphasised (Jaag, Moyano & Trinkner 2016) as well as eliminating inefficiencies (Cigno, Klingenberg & Pearsall 2016). In this regard, it becomes important to determine what the performance of the current postal delivery service is and how it can be improved. Further changes within the postal services concern the liberalisation of these services. The European Union (EU) opened postal markets to competition in most of its member countries from the beginning of 2011 (eds. Crew & Brennan 2016). Liberalisation goes as far back as the start of the 21st century (eds. Crew & Kleindorfer 2006). If the performance of the postal service provider is not up to standard, competitors will step into the postal market. These are issues that SAPO needs to take note of in their planning for the future. The performance of SAPO's postal delivery service will be a critical determining factor in how its future plays out.

With increasing global connectivity, e-commerce gives customers access to markets all over the world. Goods can be purchased from anywhere across the globe. This has, inter alia, created many opportunities for small entrepreneurs also in South Africa. For small e-commerce businesses in South Africa, SAPO provides the most affordable way to get their goods to international clients (Retief 2023). Purchasing goods is only one aspect of the process of acquiring the goods in a postal service context; however, getting the items delivered implies properly functioning supply chains.

There is a perception in South Africa that postal services, and specifically postal delivery, are at an unacceptable level (Jagbeer 2022). This holds for both domestic and international purchased goods. The focus and objective of this article is to present and, by using a quantitative analysis approach, to evaluate the mail delivery performance of SAPO which includes aspects such as logistics, supply chain management (SCM), last mile delivery, etc. Thus, firstly, SAPO's performance will be compared to similar postal services globally as well as African postal services. Secondly, using locally collected data, a qualitative assessment is performed to measure the performance of SAPO. The focus will be on priority post delivery times, comparing it against the average delivery times of all post types in African countries and the locally set standards. The question, therefore, is whether there is evidence that confirms the perception of an unacceptable postal delivery service.

An outline of the rest of the article is as follows: the section 'Literature review' contains a literature review of the following aspects: general postal outlook, main postal developments, postal service performance and logistics and quantitative approaches to address postal challenges. The 'Research methods and design' is briefly outlined next. The section 'South African Postal Services' gives a brief view on postal services in South Africa. This is followed by the section 'International postal performance'. An international comparison of the local postal service is given in 'South African Post Office postal service performance: An international comparison'. The next section is dedicated to an analysis of the postal service in South Africa over the last few years as it relates to international and local registered post. This is then compared to the performance targets for postal delivery in South Africa. Lastly the conclusions are presented.

Literature review

This literature review is divided into four sections namely the general postal outlook, new postal developments, postal service performance and logistics issues or challenges in the postal environment. All of these have relevance to mail delivery performance.

General postal outlook

Postal services worldwide have been affected by technological developments in the communication, digitisation and e-commerce environments (eds. Crew & Brennan 2016; Falch &

Henten 2018; Hearn 2016; Wolak 1996). This has created many challenges for universal service providers both from a financial and long-term sustainability viewpoint. The most notable change in postal services is the decline in letter-post and the rising trend in parcel-post, a phenomenon that started in the mid-1980s of the previous century with the advent of the Internet (Wolak 1996). The global postal infrastructure and networks are some of the essential apparatuses for sustainable growth and inclusion in global digital economies. Liberation of state-owned postal operators is continuing in many countries with the resultant increase in competition (eds. Crew & Brennan 2016; eds. Crew & Kleindorfer 2006; EU 2022). Postal operators are losing market share in letter-post, parcel-post as well as the express-mail segment (EU 2018, 2022; Universal Postal Union [UPU] 2022).

The UPU publishes an annual Postal Economic Outlook (UPUa 2019, 2020, 2021), and the 2021 report being the latest one. The effect of coronavirus disease 2019 (COVID-19) on the postal industry features strongly in this report as well as the decline in letter-post and growth in parcel-post. There are some interesting statistics presented in this report. For Africa, as a continent, the domestic and international letter-post numbers declined in 2019 and 2020 by 33.2% and 66.2%, respectively, while the percentages for domestic parcel-post increased by 6.1% with a decline of 24.8% for international parcel-post (UPUa 2021). Globally, the same phenomenon was observed during the mentioned period except for domestic parcel-post where the growth was 17.7%. From a global point of view, mail traffic decreased the most in Africa. The decline in mail volumes impacted the revenues of postal operators except for those in developed countries.¹ Postal operators responded in different ways to these challenges. Some postal operators now focus entirely on the growing parcel segment, as a strategy; others follow a hybrid model where the focus is on parcel-post without neglecting letter-post, as a second strategy; a third strategy is to diversify the parcel delivery segment and enhance the logistics business; and a fourth strategy is to establish synergies with delivery companies or competitors, something very close to third-party logistics, while improving or optimising all processes (UPUa 2021).

Main postal developments

The EU (27 member countries plus the United Kingdom [UK], Iceland, Liechtenstein, Norway and Switzerland) through the European Commission publishes regular reports on developments in the postal sector (EU 2013, 2018, 2022). The postal sector contributes 0.8% to the gross domestic product (GDP) of the EU totalling EUR 110 billion in 2021. This sector remains a significant contributor to the economies in EU countries. The United States Postal Service (USPS) generated 17.4 billion US dollars in the 2016 fiscal year, a considerable amount (Houck 2018). In the latest report (EU 2022), the main recent developments in the postal sector are presented. The

1. Post and Parcel (2023b) reported that the revenue of Swiss Post, top postal operator globally, decreased by 157 million francs (R 3.125 billion) in 2022 compared to 2021, indicating all postal operators are facing financial challenges.

following are some developments or trends highlighted in this report together with input from other sources:

- Letter mail volumes continued the downward trend, it applies to all member states. The same holds for elsewhere in the world (Houck 2018).
- Price increases and cost reductions are the result of the drop in mail delivery volumes. Royal Mail in the UK increased stamp prices by over 10% as from 03 April 2023 (Post&Parcel 2023a) to ensure sustainability.
- e-commerce usage impacts competition in the courier, express and parcel market.
- There is a drive to a greener postal sector.
- Employment has been affected by the changes in the postal sector.
- The postal sector in the EU has adapted to changes in regulations that affect the sector.
- The basket of services that the member countries are offering vary.
- Changes in the mail mix create opportunities and challenges for stakeholders.
- Several member states provide financial compensation to the universal service providers.
- Different regulatory requirements are needed given the competitive dynamics in letter and parcel delivery.

Performance of SAPO's postal delivery is the focus in this article and many of these trends and developments are directly relevant to SAPO. Decreasing mail volumes impact both costs and revenue. With decreasing income, steps to cut costs both in terms of personnel and running cost become unavoidable. Such actions have a direct impact on postal delivery services. South African Post Office has already increased its basket of services to enhance its revenue and to provide other necessary government services. One of the mandates of SAPO remains providing postal services as part of its USO (see the section 'South African Postal Services'). In this regard, the postal market in South Africa has not been opened to competitors legally but still various players in the private sector are competing in different ways (Uni Global 2018:59).

Postal service performance

The changes experienced by postal operators over the last 20–30 years resulted in increased costs and decreasing income causing cutbacks in workforce, closing of post offices, etc., all affecting postal service efficiency and performance (Tockhov 2015). What is the extent of the performance decline of postal services? There is very little in the literature that addresses this topic, and nothing directly related to postal service delivery. It is this void this article endeavours to address.

In a study to determine the economic and social consequences of postal service liberalisation, the postal service in South Africa is one of the case studies in Uni Global (2018). South African Post Office made a huge loss in 2017. There is also a reluctance from government and trade unions to privatise, nevertheless, new market entrants in the postal service were

able to take a profitable market share in areas where no regulations have been defined. In addition, technologically SAPO has degenerated so far that it is not able to offer a competitive service.

Shim, Kumar and Hakami (2014) considered the performance of the Australian postal service against Internet usage trends. The objective was to determine the trends related to mail volumes, revenue, pre-tax profit, return on revenue and productivity within the postal services. In all cases, there was a decline in numbers, with increasing competition from private parcel delivery companies. Their study did not consider performance around mail delivery times. Changes, if any, to the efficiency of the postal services in Central and Eastern Europe, because of liberalisation and the Internet, are reported in Tockhov (2015). The main conclusions from this study were: (1) an increase in pressure on postal services to improve their efficiency and (2) competitors were able to claim a significant component of the more profitable parcel delivery and express mail market. Falch and Henten (2018) in their study in Denmark came to similar conclusions. The postal policy in Denmark has since 1995 focused on ensuring the availability of universal postal services, promoting liberalisation of the postal market and privatisation. With the major focus on liberalisation, mail delivery performance was not one of the objectives of any of these studies.

Logistics and quantitative approaches to address postal challenges

A supply chain may be defined as a system of organisations, people, activities, information and resources involved in fulfilling a customer request (Chopra & Meindl 2016; Hugos 2018). In the case of postal services, a supply chain encapsulates all activities involved to deliver goods, postal items, to the consumer. This can also include, but is not limited to, new product development, marketing, distribution and customer service. The supply chain of postal service consists of many of these activities, more specifically, collecting postal items, sorting these items and delivering the postal items to customers (Bruno et al. 2021; ERGP 2020). 'Optimising' these activities, or achieving the best possible solution for an activity, is essential for top performance and efficiency.

One of the main performance measures of SAPO is 'delivery speed', a performance indicator which SAPO monitors to ensure it meets delivery standards (Rossouw & Calitz 1999). Delivery speed, a standard set by the Independent Communications Authority of South Africa (ICASA), is a measurement to determine the percentage of mail delivered within the set standards (see the section 'Performance target for mail service delivery' and ICASA 2012).

Possibly one of the first attempts to solve, or optimise, mail delivery using mathematics is the famous Chinese Postman Problem (Van Ee & Sitters 2019). The Chinese mathematician (Kwan 1960) worked as a temporary postman and his objective using quantitative methods was to solve the following:

A postman has to deliver letters to a given neighbourhood. He needs to walk through all the streets in the neighbourhood and back to the post-office. How can he design his route so that he walks the shortest distance? The optimisation of the routing system for collection and transport of letters and parcels remains an important component of the postal delivery system. One way of solving these problems is by formulating this distribution problem as a capacitated vehicle routing problem (CVRP). The optimisation model, formulated to solve the CVRP problem, is designed with a set of routes that start and terminate at a mail centre using homogeneous vehicles to deliver postal items to several vertices, or demand points, such as post offices. Sbai, Krichen and Limam (2022), as an example, formulated this model and outlined a metaheuristic approach using the Tunisian Post Office as a real case study.

South African Post Office implemented a hub-and-spoke distribution system (CSCMP 2013) many years ago (Rossouw & Calitz 1999). Such a distribution model offers the benefits of faster transit times while offsetting costs. From a logistics perspective, the postal operator hub-and-spoke system is used to coordinate receiving of postal items (collection process) and delivery from a single large distribution centre (mail centre) to and from multiple delivery locations which in the postal environment is all the post offices. Various models have been developed for locating hubs in an optimal way, see, for example, Aykin (1988), Klinecicz (1991) and Çetiner, Sepil and Süral (2010).

Numerous postal operators are investing in research and development with the aim of implementing innovative solutions to improve their operations (USPS 2021). The USPS office focuses its research on mail innovations, data analytics, autonomous technologies and intelligent infrastructure (USPS 2021). Significant research with a focus on postal delivery to improve efficiency and delivery performance, using quantitative methods is described by Madlenakova, Turska and Madlenak (2019). These innovations impact transport fleets, mail hubs and logistic centres, automation of sorting, optimising the postal network, the introducing of and using new tracking devices for consignments, etc. (Vaculik, Kolarovszki & Tengler 2012; Vaculik, Michalek & Kolarovszki 2009). Optimising last mile delivery is a continuous priority for postal operators while there are now also efforts to improving the first mile in collecting postal items (Koncováa, Kremeňováa & Fabuša 2021; Turska et al. 2019; Vaculik & Tengler 2012).

Mail delivery is in essence a logistics operation (see the section 'South African Postal Service'). Most postal operators, SAPO included, use a form of the hub-and-spoke distribution approach where mail items are dispersed to a multitude of post offices from large mail centres (Bowen 2012; Rossouw & Calitz 1999). Two approaches, namely, static route planning or dynamic route planning, can be followed to determine the routes for the actual delivery of mail (FarEye 2022). With static routing planning, mail deliveries are sent through pre-configured, fixed routes with no deviations allowed. This approach has restrictions and limitations; for example, if

there is bad weather or an accident on a road, the route cannot be changed. In 2013, USPS implemented dynamic route planning, or optimisation (USPS 2015, 2020), where the approach allowed for dynamic (in-time) adjustments to the route plan based on traffic-related or weather issues.

A study performed in the Lublin province of Poland considered optimising the location of the local distribution centre with the aim of improving the mail delivery service (Drożdźiel et al. 2017). The problem was formulated as a p -median facility location model to minimise travel distances, and thus total costs, for the entire regional postal logistics network. A similar type of study for Joint Stock Company (JSC) 'Russia Post' is described in Rudneva (2022) outlining the placement of a new logistics postal centre in Khabarovsk. Mail is delivered from this centre to Moscow and other main cities in the country using the operators' own planes.

The decrease in postal volumes initiated a study for the Italian postal service provider in the city of Bologna (Bruno et al. 2021). The collection of postal items became very inefficient as many collection points had no mail, and the collection needed to be reorganised to avoid visiting the empty mailboxes and to reduce costs. Formulating the problem as a mathematical programming model which identifies post boxes to be closed, Bruno et al. (2021) were able to evaluate the impact of the reorganisation of the collection process on management costs.

A phenomenon, logistics sprawl, which has been observed in many large cities and metropolitan areas worldwide, needs to be taken note of by the postal sector. *Logistics sprawl* is defined as 'the spatial deconcentration of logistics facilities and distribution centers in metropolitan areas' (Dablanc & Rakotonarivo 2010). This implies that as cities grow logistics facilities and distribution centres move further and further away from city centres. This is mainly caused by population growth, urbanisation and the resultant city expansion. Robichet and Nierat (2021) analysed the effect of logistics sprawl on a parcel service carrier in the metropolitan area of Paris, France. Their conclusion is that there is an increase in distance travelled and in CO₂ emissions.

Limited published research, on postal and mail delivery services in South Africa, can be found in the literature. As far back as the early 1970s, mail sorting constituted one of the major costly operations of the postal services, and it required thousands of man-hours per annum (Rudolph 1971). Rudolph addressed the problem resulting in improvements in sorting procedures, labour cost saving and a reduction in postal delays. Rudolph formulated the problem as a dynamic programming model to optimise sorting. Secondary research conducted from a South African perspective from 2006, 2016 and 2022 reveals several disconnected studies with no or little implementation of the results. From a performance point of view, two of the studies endeavoured to improve operational performance but both were at a very local level. Tabeni (2006) investigated the impact of inbound logistics' activities on the

operational performance of SAPO branches in the Eastern Cape province. The conclusion of this study was that improvements with respect to inbound logistics will enhance performance by increasing revenue cost effectively. As far back as 2015, SAPO already suffered huge losses caused by, inter alia, a lack of a reliable and predictable postal delivery service leading to poor quality of service with many customer complaints (Batista 2016). To address this, Batista (2016) focused on route optimisation, focusing on the eMalahleni mail centre, with the aim to minimise transportation costs, improve the quality of service as well as customer service. A significant reduction in travel distances was obtained with associated cost savings. The excessive computational time to solve the metaheuristic approach used was not acceptable for SAPO in this case. Jagbeer (2022) endeavoured to determine what SAPO's competitive advantage is within the market it serves. In his study, he showed the extensive postal network, the services and products SAPO offers with its competitive pricing structure placed SAPO in a very advantageous position. In addition, a belief emanating from this study was that modernising SAPO will improve its relevance. As this study was conducted in 2022, it is not clear whether any of the findings from the study was implemented.

Research methods and design

This study intends to determine the performance of the postal service in South Africa based on quantitative data. Internationally, the UPU has published the performance of some 170 postal operators (also referred to as designated operators [DOs]) for each of the 6 years, from 2016 to 2021. The performance is given as an Integrated Index for Postal Development (2IPD), determined by means of a methodology developed by the UPU. Using this index, postal operators are ranked from high to low. From this, it is possible to determine how well the postal operators, in the various countries, perform and their performance can be compared to each other. The performance data of SAPO was then compared to locally gathered tracking data of registered postal items, also called priority mail. From the latter, one can determine the delivery, or transition, times recorded of postal items from their origin to their destination. A quantitative evaluation and analysis, using these two sets of data, namely the UPU data and the locally gathered data, was performed to get a sense of the performance of SAPO from a logistical perspective. In the 'South African Postal Services' section a high-level view of SAPO and the extent of its postal delivery task is presented.

South African Postal Services

In South Africa, the first signs of a postal service goes back some 500 years, 07 July 1501 to be precise, when the captain of a Portuguese ship placed a letter in the ancient 'Post Office Tree' in Mossel Bay (Rosenthal & Blum 1969). The captain reported damage and loss of some of his fleet during a storm off the southern Cape coast. The first post office in South Africa was opened formally on 02 March 1792 by the acting governor of the Cape, Johan Isaac Rhenius (SAPO 2021). This was the start of

what became the SAPO, a state-owned entity. On 01 October 1991, the then Department of Posts and Telecommunications was split into three separate entities, namely TELKOM, SAPO and a smaller government entity (Williams 2021). Since then, SAPO has operated in its current form.

One of the two main mandates of SAPO (2020) as it relates to postal services is:

The SA Post Office is mandated to provide postal services according to the Postal Services Act of 1998 and the exclusive mandate of 1998. This Act provides for the regulation of postal services and the operational functions of the company, including its Universal Service Obligations (USOs). (p. 13).

South African Postal Services is thus the mandated service provider of the services outlined in the *Postal Act 44 of 1958* and *Postal Services Act 124 of 1998*. Along with these services, SAPO also offers courier and freight, financial services, electronic bill payments and a variety of government services. A full list of services and products offered by SAPO for the domestic and the international markets is provided on the SAPO website.²

The Postal Service Directive (PSD) of the EU defines postal services as 'services involving the *clearance, sorting, transport and distribution* of postal items' (ERGP 2020). Postal services enable any person to send a letter, packet or parcel to any addressee, in the same country or abroad, and assume it is handled, sorted and transported according to regularity, speed and security. Each of these 'postal operations' represent the postal delivery supply chain, as depicted in Figure 1 (Bruno et al. 2021). Mail, or post, must be cleared or collected from various points, it needs to be sorted and as SAPO uses a hub-and-spoke approach, the mail is transported to a mail sorting centre, then the sorted mail is transported to the distribution points from where it is ultimately delivered to the recipients. In the latter case, this happens by putting the postal item into a post box or a postman delivering it to a physical address.

The South African Post Office has an extensive network of points of presence across the entire country, see Figure 2 (Jagbeer 2023a). These comprise of traditional post offices as well as postal retail agencies. As part of SAPO's USO,³ remote rural areas should have access to the postal services. South Africa is a large country and as can be seen from Figure 2, there is a concentration of postal outlets within the metropolitan areas while in less populated rural areas, the outlets are widely scattered with long distances between them and the potential users of these services. The South African Post Office divides the country for operational purposes into six regions, namely the Western, Central, Northern, Gauteng, KwaZulu-Natal and Eastern regions.

Figure 3 shows one of these regions comprising of the Western Cape and Northern Cape provinces (Jagbeer 2023a). As can be seen clearly, the Western Cape, which is more

2.SAPO website: www.postoffice.co.za.

3.'Universal service is a set of measures aiming to grant permanently all users in all points of a territory a sufficient level of service' as defined in Ambrosini et al. (2006).

populated, has more postal outlets which are concentrated around the high-density populated areas while the Northern Cape, a large geographical area with a low and widely scattered population has much fewer postal outlets sprinkled across the province. Servicing this area implies long distances, high costs and possibly weekly or bi-weekly deliveries with higher delivery times.

The operations footprint of SAPO as reported in the 2021/22 annual report is shown in Figure 4. This Figure shows the six regions, mentioned earlier, SAPO use for operational purposes. In Table 1, the numbers from the footprint are compared to the 2020 and 2021 numbers.

The formal SAPO definition of some of the operational entities are (Jagbeer 2023a):

- *Retail outlets* – are post offices offering the full suite of SAPO products and services.
- *Retail agencies* – are community-based entrepreneurs who contract with SAPO to resell SAPO's products and services which these agents select themselves to resell.
- *Mail centres* – are the main processing centres located in major cities nationally.
- *Delivery depots* – these act as receiving centres whereby processed mail is distributed for final delivery to customers via street delivery, post boxes and collection at post offices.

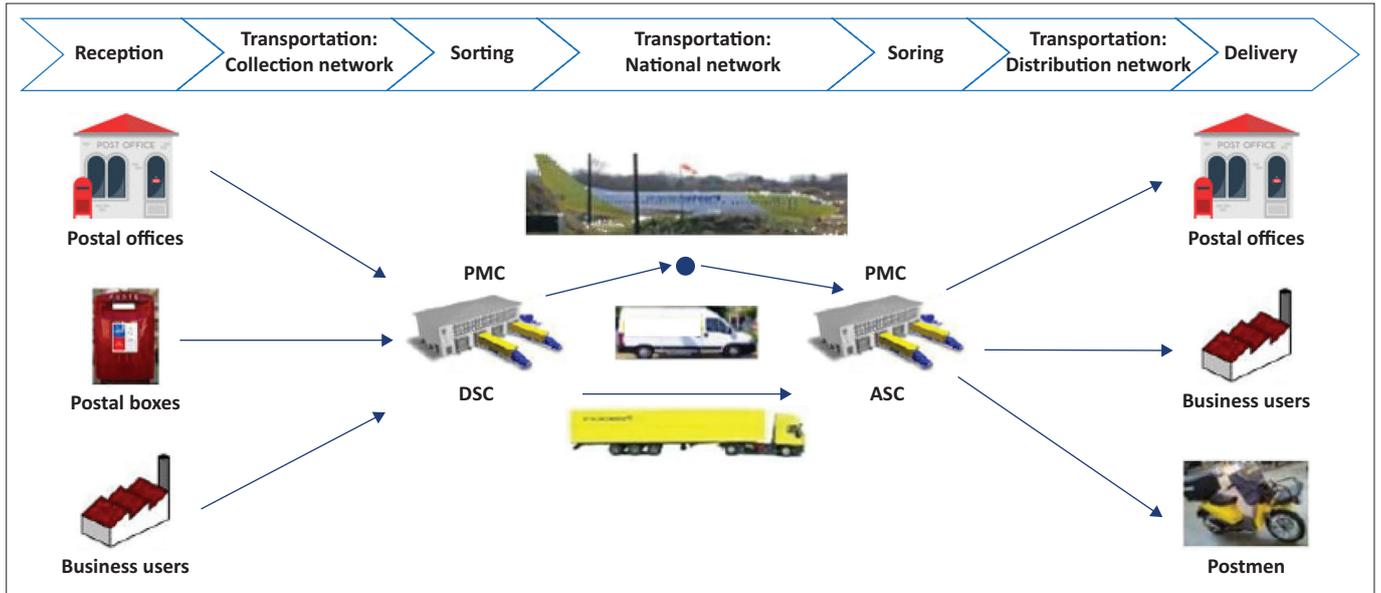
What is very noticeable from Table 1 is the reduction of both retail outlets and retail agencies as well as the fleet size. Over a period of 1 year, 134 post offices were closed. In addition, the fleet size was reduced from 1238 vehicles to just 366 vehicles, a reduction of almost 75% (SAPO 2021, 2022). Both have a negative impact on mail delivery across the postal network. As of January 2023, the number of post offices have reduced further to 1132 active post offices with the total active points of presence country-wide being 1882 (Jagbeer 2023b).

Financial difficulties and challenges have faced SAPO since the 2012/13 financial year when SAPO recorded its first net loss, R 206 million (SAPO 2013), and every subsequent financial year up to 2021/22, when the net loss was reported to be R 2181 million (SAPO 2022).⁴ One of the reasons for the poor financial performance has been the reduction in mail volumes (see e.g. SAPO 2015), a worldwide phenomenon, necessitating continuous cost cutting and this has been the main reason for the closure of post offices and the reduction of the vehicle fleet (SAPO 2021, 2022). According to Areff (2023), SAPO is planning to retrench 6000 workers, and at the stage of reporting, no final decision on a date has been made. The impact of this reduction in personnel will further exacerbate the challenges faced by SAPO around mail service delivery.

International postal performance

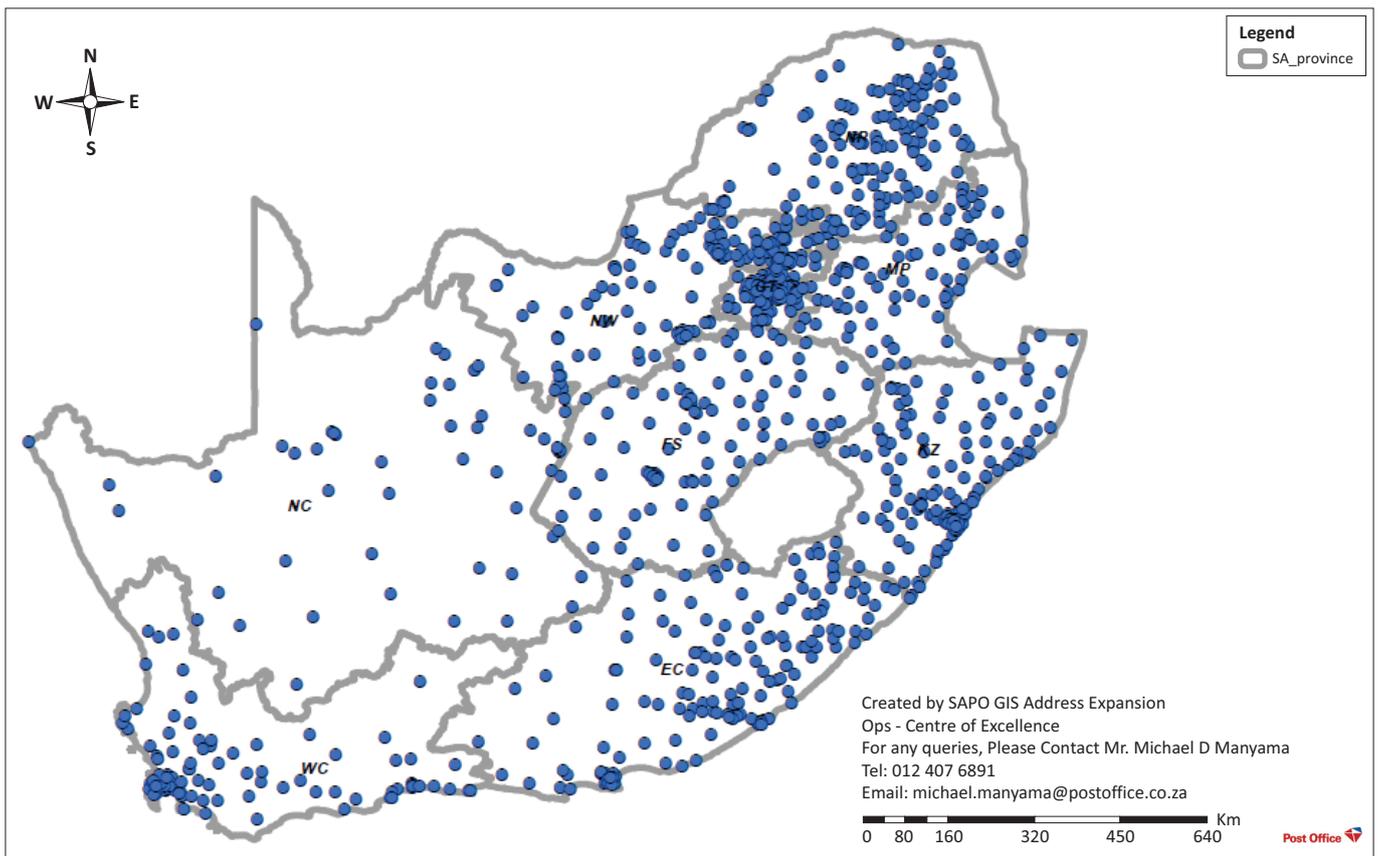
The UPU, established in 1874, is an international body with its headquarters in Berne, Switzerland, making it the second-

4.The 2021/2022 Annual Report is the latest available published report.



Source: Bruno, G., Cavola, M., Diglio, A., Laporte, G. & Piccolo, C., 2021, 'Reorganizing postal collection operations in urban areas as a result of declining mail volumes – A case study in Bologna', *Journal of the Operational Research Society* 72(7), 1591–1606. <https://doi.org/10.1080/01605682.2020.1736446>
 PMC, postal mail center; DSC, departure sorting center; ASC, arrival sorting center.

FIGURE 1. Representation of a postal logistics network.

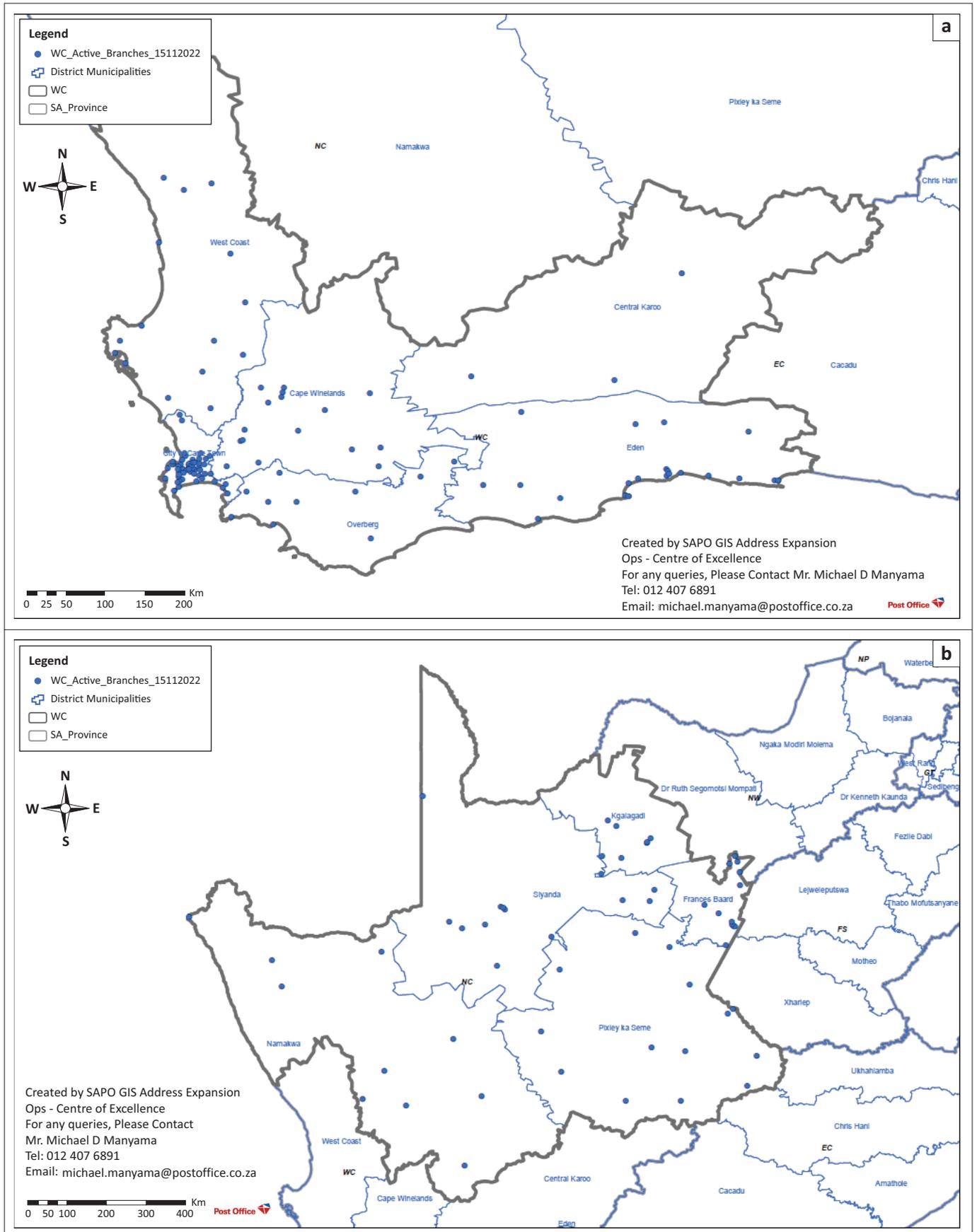


Source: Jagbeer, J., 2023a, 'E-mail to Hans Ittmann on 06 January 2023', Maps of postal outlets

FIGURE 2: Postal outlets scattered across South Africa.

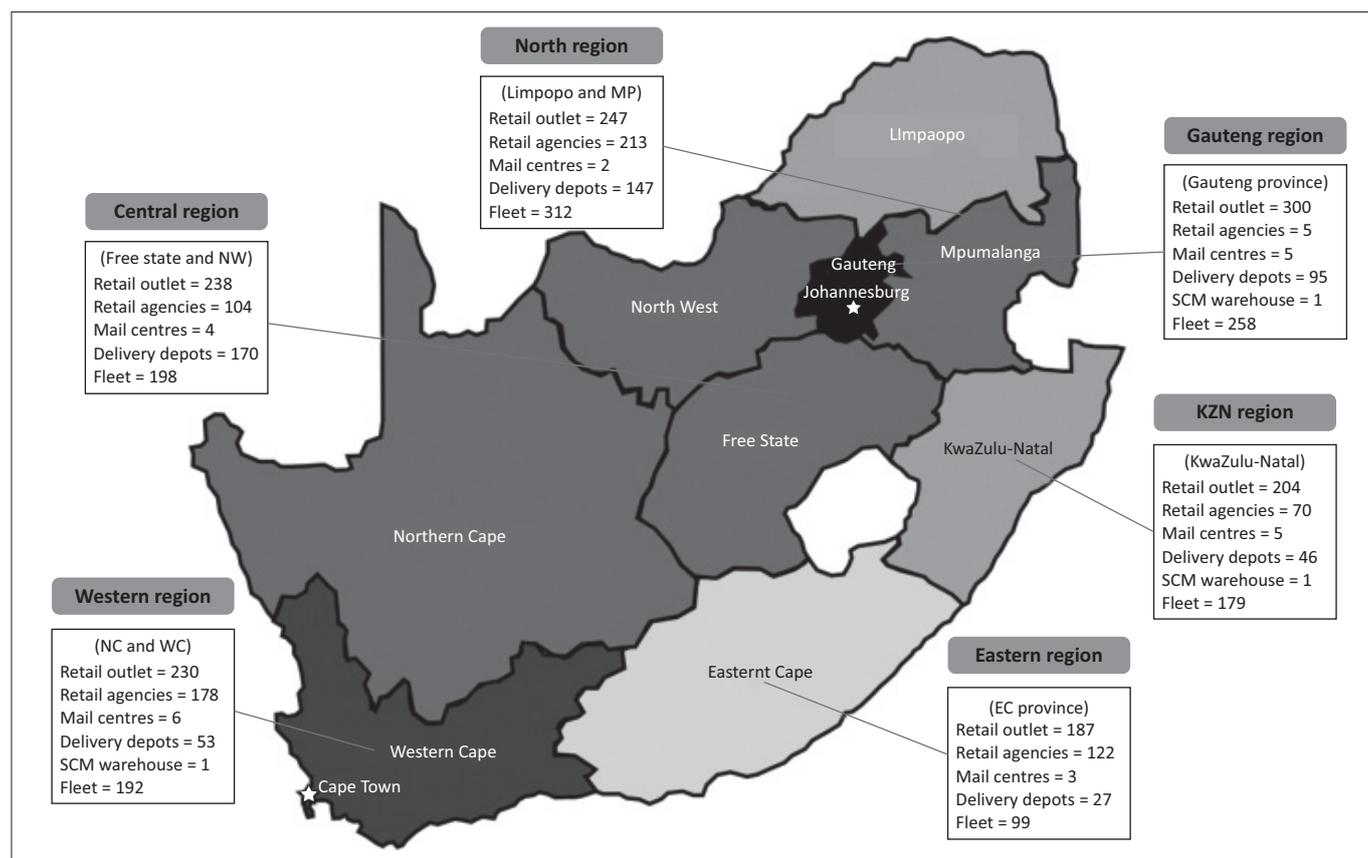
oldest international organisation worldwide (UPU 2023). With its current 172 member countries, the UPU provides a universal network of cooperation, ensuring common rules for international mail exchanges and assisting growth within the sector.

To compare postal development between the different member countries, UPU published the ZIPD for the first time in 2016 (UPU 2017). This index has now been published for five subsequent years and the ZIPD for 2021 provides the most comprehensive view of current postal development across the



Source: Jagbeer, J., 2023a, 'E-mail to Hans Ittmann on 06 January 2023', Maps of postal outlets

FIGURE 3: Postal outlets in the Western Region of South Africa Post Office which encompass the (a) Western Cape and (b) Northern Cape provinces.



Source: SAPO, 2022, *Annual report 2022*, South African Post Office Soc Ltd, Pretoria, viewed 01 February 2023, from <https://www.postoffice.co.za/about/annualreport.html>
SCM, supply chain management; WC, Western Cape; NC, Northern Cape; EC, Eastern Cape; NW, North West; MP, Mpumalanga.

FIGURE 4: The South African Post Office operations footprint.

TABLE 1: Comparison of the South Africa Post Office operations footprint for 2020/21 and 2021/22.

Points of presence	Year – 2020/21	Year – 2021/22
Retail outlets	1406	1272
Retail agencies	692	689
Mail centres	25	26
Delivery depots	538	417
SCM warehouse	3	3
Fleet	1238	366

Source: SAPO, 2021, *Annual report 2021*, South African Post Office Soc Ltd, Pretoria, viewed 05 November 2022, from <https://www.postoffice.co.za/about/annualreport.html>; SAPO, 2022, *Annual report 2022*, South African Post Office Soc Ltd, Pretoria, viewed 01 February 2023, from <https://www.postoffice.co.za/about/annualreport.html>
SCM, supply chain management.

globe (UPU 2022). In the 2022 report, the 2IPD methodology and its value are defined as follows: *it enables the creation of a composite index that comprises critical factors for successful postal development – irrespective of the structural differences in postal policies and economic models between countries.* In essence, the 2IPD is very similar to the Logistics Performance Index (LPI) that the World Bank published over the period 2004–2018 (Arvis et al. 2018). The LPI focuses on trade logistics performance for countries in the world, not all countries, while the 2IPD is aimed at the global state of postal development.

The data used to calculate the 2IPD is a combination of UPU postal ‘big data’, official statistics and initial surveys. The big data included 3 billion tracking records in 2016 and increased substantially every year. The data integrity needs to be

thoroughly checked to ensure the data are complete, accurate, consistent and that it is maintained in a secure manner (Bigelow 2022). The UPU relies on member countries to provide large portions of the data annually (UPU 2017). The Union is largely responsible for ensuring the data integrity which includes aspects such as data correctness, validating the data, does the data make sense, is the digital data uncorrupted, etc. (Bigelow 2022). Having performed this process, the ‘big data’ analysis (Sathi 2012; Waller & Fawcett 2013) can commence. Over the years, the 2IDP has been refined and it is better understood. Clearly, countries are not similar, and the same holds for postal development in the different UPU member countries. Furthermore, postal development is difficult to measure and presents many challenges. The UPU identified seven challenges, or difficulties, in determining the 2IDP and concludes that it will never be an exact calculation. Nevertheless, it remains most useful and is required for data-driven decision-making and policy formulation (UPU 2022).

Using a quantitative approach, that incorporates the masses of data, the index is computed. The following four vital postal development components are used to determine the 2IPD index, and each is defined as follows (UPU 2022):

- *Reliability:* Assesses the development of quality of service from a speed and predictability perspective.
- *Reach:* Evaluates the level of postal connectivity of the country with the rest of the world from an outbound perspective.

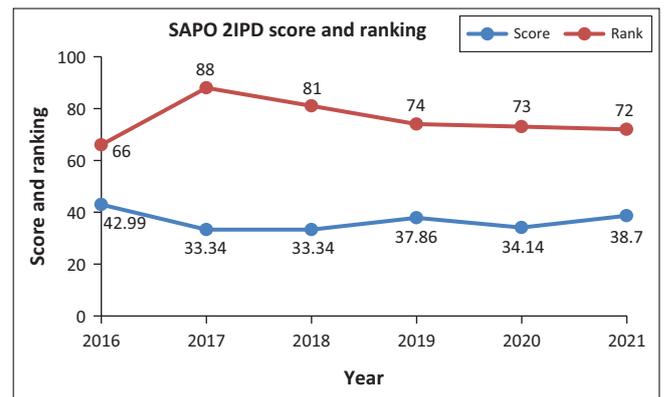
- *Relevance*: Measures the relative success of different postal business models and activities from a demand perspective.
- *Resilience*: Estimates the postal capacity to overcome economic, social, technology and environmental shocks in a sustainable way.

Reliability therefore measures operational efficiency, reach captures the level of internationalisation, relevance evaluates the competitiveness in all key segments as well as the potential to generate higher postal volumes while resilience assesses the ability to withstand external shocks through adjusting and adapting business models. All four components thus epitomise what the postal sector is facing worldwide because of digitalisation as well as the growth in e-commerce. Mail delivery, both nationally and internationally, relies heavily on and is achieved through 'postal logistics' and thus supply chain management functions or processes. The strength, efficiency and effectiveness of postal supply chains impact all four factors either negatively or positively.

The result of the analysis by the UPU is the 2IPD index which is a benchmark performance score (0–100). The index is then used as a standard against which the performance of all DOs in the various member countries is measured. An extensive outline of the methodology used to calculate the 2IPD index is provided in Appendix 2 of the UPU (2019:24–29). Section 1 of this Appendix gives a general outline of the methodology used. Each one of the four components used to determine the 2IPD is then described and the methodology to determine the specific score for that component is given. The variables and sub-variables for each are presented as well as the final formula for each component. The latter is determined as a vector and each component of the vector represents the value for a different country. Finally, a country index is computed as the sum of the four component scores and then rescaling it according to a formula given in Section 1 of Appendix 2 of UPU (2019).

South African Post Office postal service performance: An international comparison

As indicated in the section 'International postal performance', the 2IPD index is aimed at presenting the global state of postal development in all the member DOs of the UPU. The best developed, or performing, DO is given an index of 100 and all the other DOs index scores are scaled accordingly. These indexes can now be used to compare the development, or performance, of individual DOs (countries) with each other. In this way, DOs can be grouped together to show the best performing designated postal operators, those not performing as well and the ones performing the worst or where the postal development is the worst. Using these, high-level decisions around global postal development can be made, strategies can be developed and action plans put in place. In addition, individual DOs or countries, can monitor their own performance and act based on these 2IPD performance



Note: Please see the full reference list of the article, Ittmann, H.W., 2023, 'The postal performance of the South African Post Office: An international and local perspective', *Journal of Transport and Supply Chain Management* 17(0), a948. <https://doi.org/10.4102/jtscm.v17i0.948>, for more information.

SAPO, South African Post Office.

FIGURE 5: The South African Post Office postal development index from 2016 to 2021.

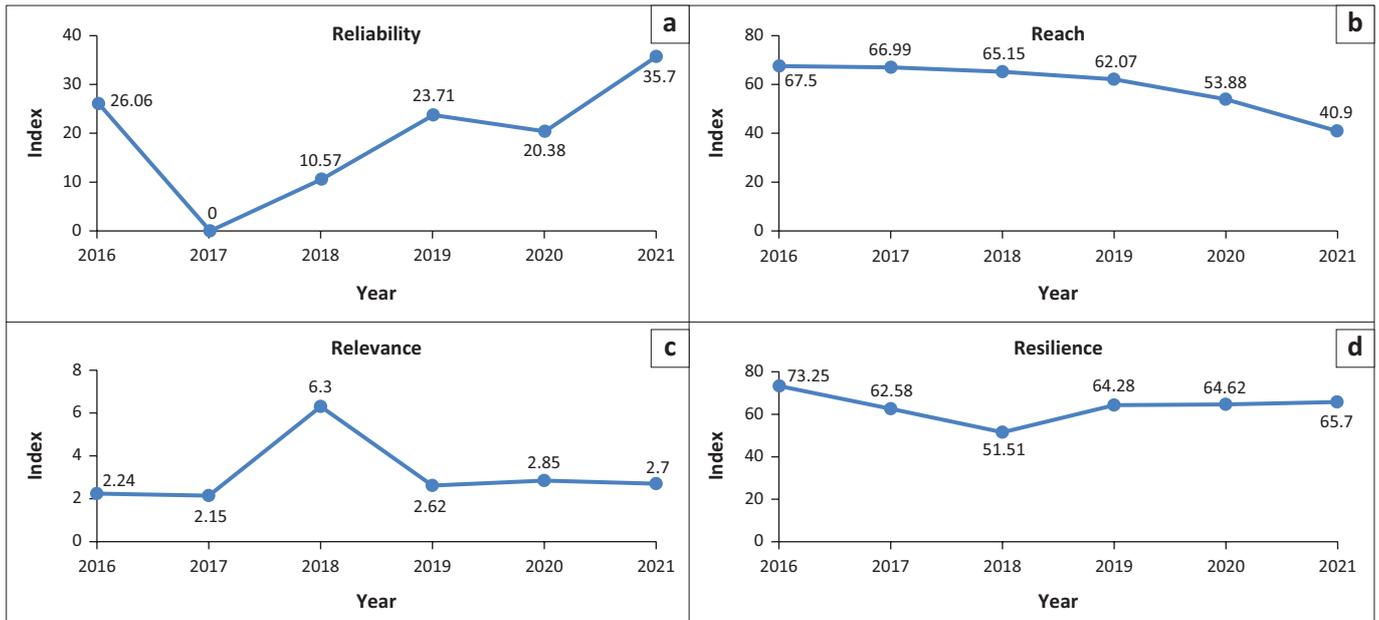
indicators. Logistics and supply chain management play a critical role in the performance of postal service delivery. Proper analysis of the data and comparisons with similar data can provide valuable insights directly related to postal service delivery performance.

Utilising the UPU data, Figure 5 shows how the SAPO ranking, and the associated index scores, has varied over the 6 years from 2016 to 2021 with Figure 6 capturing the four key components for SAPO. In 2016, SAPO ranked 66th out of 170 country DOs; however, it is important to note that its index was less than half that of the highest rank DO namely Switzerland (Swiss Post) with an index of 100 (UPU 2017). Switzerland has consistently been ranked the highest over the 6 years. After the relatively high ranking of 66th, SAPO dropped to 88th and since then its position has slowly improved in comparison to other DOs. In 2021, the ranking of SAPO, 72, falls just in the top half of all DOs; however, its score of 38.7, and thus performance, is well below 50 indicating low postal development and performance (UPU 2022). More than two-thirds of the country DOs had an index score below 50 in 2016 (UPU 2017). In 2021, 124 country DOs out of 172 had index scores below 50 (UPU 2022). Overall, therefore, most global postal operators are not performing well.

In 2021, the UPU decided to group countries together into 10 postal development levels according to their respective 2IPD scores. With an index score of 38.7 in 2021, SAPO is ranked 1st in postal development level 4. Countries with scores below 38.9, and classified into levels 1–4, are considered countries with low to lower-middle postal development performances (UPU 2022).

The reliability score of SAPO has trebled from a very low base in 2018 of 10.57 to 35.7 in 2021, see Figure 6. Worldwide, the reliability pattern differs widely. With a median⁵ score of 28.4, it remains low (UPU 2022). In Africa, this median

5. Median – represents the middle number, or score, of a set of numbers.



Note: Please see the full reference list of the article, Ittmann, H.W., 2023, 'The postal performance of the South African Post Office: An international and local perspective', *Journal of Transport and Supply Chain Management* 17(0), a948. <https://doi.org/10.4102/jtscm.v17i0.948>, for more information.

FIGURE 6: Key dimensions of postal development: Postal (a) reliability, (b) reach, (c) relevance and (d) resilience – South Africa Post Office performance over period 2016–2021.

score is 6.7, the lowest of all regions, indicating SAPO is performing much better than most countries in Africa. Many postal services (DOs), in response to the increase in online shopping and in particular parcel volumes, invested in additional capacity to increase reliability. Industrial countries (IC) have a median reliability score of 88.5 while Eastern Europe and the 11 Commonwealth Independent States (CIS) have a median score of 76.8.

The global median score for reach is a low 20.5, indicating major challenges in international connectivity between postal service providers (UPU 2022). The low score applies to SAPO as well with a constant declining reach score over the 6 years, although the 2021 score is double that of the global median. The Africa region median score was 4.5 in 2021, SAPO's reach score was almost 10 times higher. The major hurdles affecting international postal reach are changes in international terminal charges (dues), changes in customs regulations and regimes, and shifts in cross-border e-commerce models from business to business (B2B) to business to business to consumer (B2B2C) (UPU 2022).

The relative success of postal business models and activities is represented by relevance. The SAPO graph for this key dimension, Figure 6, is almost a constant over the entire 6-year period apart from 2018 where it was higher (initiatives by the then CEO?). For relevance, there are huge differences among all the 172 participants in the UPU analysis (UPU 2022) with the overall median relevance score being very low at 3.03. Except for the IC countries, all other countries have low values. This is an indication that most countries struggle within the fast and dynamic changing 'postal' environment

with wrong or inappropriate business models and thus not being successful. Even though the SAPO score in 2021 is low, 2.7, it compares reasonable with the African median score of 0.3 (UPU 2022).

The resilience score for SAPO has remained around the mid-sixties over the 6-year period indicating that SAPO is able to adjust and adapt reasonably well to changes in its environment. South African Post Office's resilience score of 65.7 in 2021 is in fact higher than the global median score of 53.9 (UPU 2022). This relatively high global median resilience score is an indication that most countries' postal service providers can absorb shocks to the postal system well.

Within Africa, SAPO is not the best ranked DO as can be seen from Table 2 where the top five ranked countries are shown for 2016 and 2021. South African Post Office was ranked 5th in 2016 and 2021 as well as the four intervening years. The index scores of all the African countries shown in Table 2 have decreased from 2016 to 2021. This is an indication that postal services in Africa are falling behind as far as development is concerned against those in almost all the other continents. The median 2IPD score for Africa is 16.3 while the score for the Latin America and Caribbean region is slightly lower at 16.1. The global median score is 30.0 (UPU 2017, 2022).

In summary, based on the UPU calculations, SAPO falls in the lower half of all the global DOs as far as postal development performance is concerned. It is, however, not the best-performing DO in Africa. As for the four key components of the 2IPD, the one concern is that the reach of SAPO is consistently decreasing, thus affecting the international postal service of SAPO.

TABLE 2: Top five integrated index for postal development-ranked African countries in 2016 and in 2021.

2016			2021		
Rank	Country	Score	Rank	Country	Score
33	Mauritius	60.10	52	Cameroon	47.00
49	Nigeria	52.21	61	Nigeria	43.7
60	Tunisia	45.97	64	Kenya	43.1
61	Morocco	44.88	68	Ethiopia	39.9
66	South Africa	42.99	72	South Africa	38.7

Note: Please see the full reference list of the article, Ittmann, H.W., 2023, 'The postal performance of the South African Post Office: An international and local perspective', *Journal of Transport and Supply Chain Management* 17(0), a948. <https://doi.org/10.4102/jtscm.v17i0.948>, for more information.

Analysis of postal service in South Africa over the past few years

This analysis focuses on postal services and specifically how customers experience postal services within South Africa. The collection and delivery of mail from points of origin to destinations (e.g. post boxes) includes and incorporates all the elements of classical supply chain management – see the section 'South African Postal Service'. Ultimately, the highest priority for customers is a reliable and predictable service with 'on-time' delivery of postal items. Unfortunately, the postal service in South Africa is currently not consistent or reliable, and very slow. A few actual qualitative examples are presented here.

Jagbeer (2022) in a survey of SAPO clients relates the following comments of two different types of clients in response to questions on reliable delivery, lost or stolen goods and parcel delivery to customers as opposed to collecting parcels. It captures what is reported regularly in newspapers, the media and other forums – complaints about a lack of a proper service, and even a total lack of service by the South African Post Office. A business customer:

'Currently mail and courier services are unreliable, and frequently parcels get lost or stolen. It is very inconvenient to have to go and collect a parcel at the post office; door-to-door deliveries should be done more frequently' (Jagbeer 2022:77).

A private customer stated:

SAPO tracking system was turned off and all domestic tracking info missing, local PO did not send out SMSs to notify me of the package. Also, no slip was received ... Sometimes I am happy to wait a little longer for a package for a lower shipping price; however, the item MUST arrive without me losing sleep over the process. Some delays between the item arriving in SA and getting cleared is exceptionally long (Jagbeer, 2022:77).

Viljoen (2018), an avid stamp collector, in a letter to a newspaper, stated the 'South African Postal Services came to a standstill long ago!' In the letter, he reminisces about the efficient postal service when he was a student in Stellenbosch, Western Cape during the 1950s. He would mail a letter to his parents in Graaff Reinet, Eastern Cape on Sunday night, and they will get it on Wednesday. His mother would send a response on the same day and by Friday, he would have her return letter.

In contrast, in 2018, he would send a registered item to Graaff Reinet, registered otherwise it gets lost, and 6 weeks later, it

still has not arrived at its destination. He wrote the letter when postal workers were threatening to strike and to bring the post office to a 'standstill'. Very sarcastically, he indicates that they have already achieved this long ago!

The strike of 2 weeks in July 2018, and the go-slow the week beforehand, led to an accumulated backlog of 38 million parcels and letters which was not cleared by mid-November 2018. By then, the year-end busy period was in full swing and the backlog was still 7.8 million items (Paton 2018). Cohen (2022) reports that given the good leadership within the post office during those times, the strikes stopped, and hundreds of post office workers volunteered one weekend to clear the imported post backlog at the Johannesburg International Mailing Centre (JIMC) at OR Tambo. A clear sign of proud, willing and concerned workers that existed within the post office.

The SAPO strikes have many unintended consequences. For example, Lowman (2021) relates the demise of the SA Turf Directory, a 36-year-old printed publication. The owner was forced to go digital, unwillingly, resulting in job losses of the people who set the publication, the printers, etc.

The precarious and dire financial position of SAPO has led to the closure of over 100 post offices across the country. The Muizenberg, Western Cape, post office was closed in February 2022 with no warning or explanation by SAPO (Bell 2022). The closest neighbouring post office is the Retreat post office with the implication that many post office customers now had to travel up to an additional 7 km.

The residents of the Northern Cape province, the largest and most sparsely populated province in South Africa, are in a worse situation. Opperman (2022) after visiting the province noted that the post office of Loeriesfontein was closed with the nearest post office located in Nieuwoudtville, some 65 km away. People in these remote areas must travel large distances, mostly on bad roads, to get access to postal services. In addition, the closure of post offices impacts negatively on the main competitive advantage of the post office namely its country-wide network.

Eastern Cape residents, living in some of the most vulnerable communities in the country, find themselves in a quandary with threats of post offices closing temporarily or permanently. The post offices in this region also experience many problems and difficulties (Ellis 2022).

There are many similar comments to be found in various media outlets about the service of SAPO. What is, however, required is to have actual data with which these perceptions can be proved and quantified. Is the service really that bad and if it is, what is the extent of this? The sections 'International registered or "priority" post' and 'Domestic registered or "priority" post' present a quantitative analysis of real data and numbers. Collecting data from ordinary post is basically impossible but data can be obtained using registered post and the tracking numbers associated with each such item.

International registered or 'priority' post

For the last 4–5 years, the delivery of postal items shipped from foreign countries to South Africa has deteriorated substantially. Coronavirus disease 2019 had a serious impact on this since February 2020, but the service was bad even before the outbreak of the pandemic. Letters and parcels sent by standard shipping or airmail sometimes took a very long time to reach their destinations or these items just disappeared! It is still the case today.

Ordering goods and having them sent by registered post was one way to ensure the safe delivery of the postal items. In addition, registered post is treated as priority post. From a logistics point of view, knowing that an item, parcel or goods are somewhere in the supply chain is possibly more important than its estimated arrival date, and that is the information that tracking provides to the recipient. Shipping something by registered post via postal services is more expensive than standard shipping costs but considerably cheaper than courier services. For example, the cost of shipping registered post from Denmark to South Africa, using postal service, is 17.5 Euros, exorbitant for an item costing a Euro or two (Andersen 2022)! Using a courier company to ship the item will be much more expensive.

In Table 3, 30 registered items⁶ are listed, each with its tracking number, the country it was sent from, what date it was sent from that country, when it was received (scanned) for the first time in South Africa at the JIMC and at what date it was received at the destination post office. The JIMC is at OR Tambo, Johannesburg while the destination post office is in the east of Pretoria. The period covered in collecting this data is July 2021 to December 2022,⁷ COVID-19 thus had minimal impact. The last two columns in Table 3 indicate two delivery times. The first one is the delivery time from when the registered item left the country of origin till it was received at the post office and the second one gives the delivery time, or transition period, from when it was scanned at JIMC to receiving it at the post office in Pretoria East. The distance from JIMC to the post office is between 50 km and 60 km. As this distance is short, one can consider this delivery as a typical 'last mile delivery'.

Using the tracking number one can track the item along the entire supply chain as it travels from the origin country to the destination. At various points, for example, depots or mailing centres and at the receiving post office, the item is scanned and in this way, the recipient can determine where it is, at what time and date. The tracking information can be found at several websites such as <https://parcelsapp.com/> or <https://www.17track.net/en>⁸ and by using the tracking numbers in Table 3, the data (dates and locations) can be found from these websites.

6. These registered postal items all contained stamps or First Day Covers (FDCs).

7. The National State of Disaster because of COVID-19 was lifted on 05 April 2022. Before that adjusted alert level 1 was in place for the period 01 October 2021 to 04 April 2022 (<https://www.gov.za/coronavirus>).

8. The data for all these tracking numbers can still be found via these websites.

When an item leaves a country, the assumption, especially for European countries, can be that it should arrive in South Africa the next day. This is not true in all cases as some flights may stop over for a day or two on their way to South Africa. There could also be a delay in scanning the postal item at the JIMC after it arrives in South Africa; in some cases, this can be quite a few days. Postal items are also not always released to the South African authorities immediately after arrival in the country. It is interesting that other countries have their own difficulties and challenges. In the case of the two registered items sent from Chile, both were scanned at the airport of Santiago, Chile on 30 June 2022 and both only left for South Africa a month later!

The average delivery time for the 30 registered items in Table 3 from the country of origin to the destination post office in South Africa is 44.6 days and from JIMC to the post office is 33.73 days. Thus, over a period spanning about 18 months, the average delivery time of a registered postal item, a priority item, from JIMC to the post office in eastern Pretoria is 33.73 days! This is exorbitant, someone walking from JIMC can deliver it faster! If there is a reliable, predictable and efficient postal service, one can expect that priority post should be delivered, at least to a post office and not a physical address, within less than 5 days considering the distance is only 50 km to 60 km.

The delivery times are shown graphically in Figure 7. Over the roughly 18-month period, there is no real or obvious pattern. In addition, the delivery times vary almost randomly and there is no indication of any improvement over the period. The delivery times from JIMC, for the last three registered items, sent from India, Lithuania and Argentina are 13, 14 and 21 days, respectively. Maybe this is the start of an improvement?

In Table 4, similar data as for Table 3 is shown, but in this case, it is for two registered postal items sent from Lithuania and Serbia, respectively, to an address in the Netherlands. The differences from what is experienced in South Africa are glaringly obvious! From when the items were sent, the customer received them within 1 and 3 days, respectively, while the domestic delivery period was 1 day in both cases, delivered by the Netherlands postal operator (PostNL) directly to the physical home address! This demonstrates how top international postal services operate and it also indicates that priority items are indeed handled as such. The supply chains in both cases function excellently. Clearly, making these claims based on a sample of two is problematic but it nevertheless shows what is possible.

Domestic registered or 'priority' post

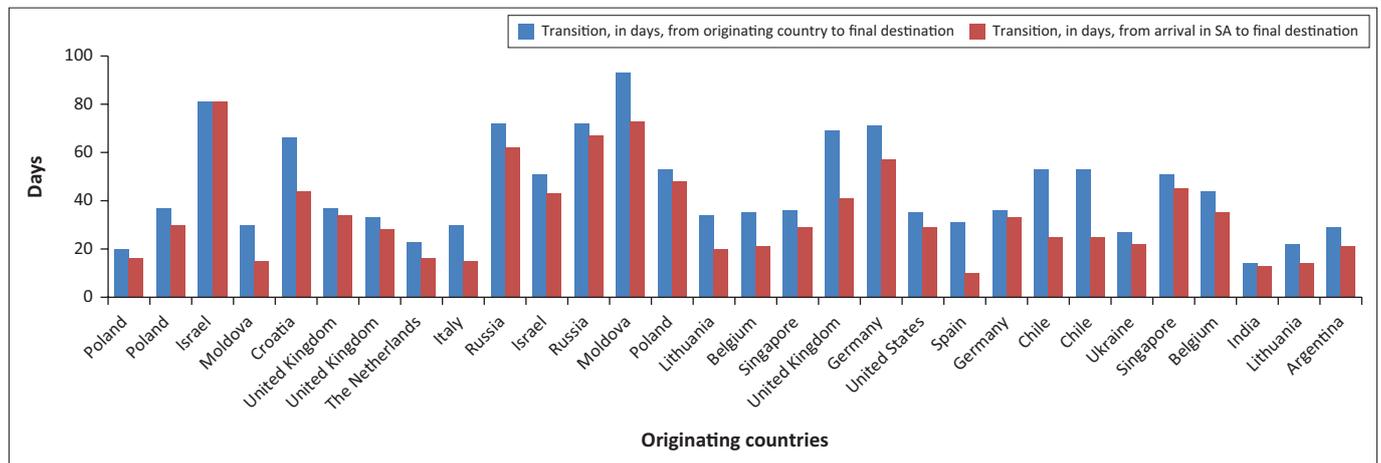
In this section, the delivery time of domestic registered post⁹ is analysed. The sample size, see Table 5, is too small for a proper analysis. Again, using registered post is the only credible way to quantify the delivery time or transition

9. Some of the tracking data are no longer available. Data for some of these can also be found at <http://trackingnew.postoffice.co.za/>.

TABLE 3: Registered international post – Tracking numbers and data.

Tracking number	Country of origin	Left country of origin – Date	Received at JIMC – Date	Arrived at post office in South Africa – Date	Delivery time from origin to SA post office – Days	Delivery time from JIMC to receiving post office in SA – Days
RR952983397PL	Poland	17-Jul-21	21-Jul-21	06-Aug-21	20	16
RR953817643PL	Poland	28-Jul-21	04-Aug-21	02-Sep-21	37	30
RR017381161IL	Israel	26-Jul-21	?	14-Oct-21	81	81
RR320167612MD	Moldova	30-Aug-21	13-Sep-21	28-Sep-21	30	15
RG042797413HR	Croatia	04-Sep-21	27-Sep-21	09-Nov-21	66	44
RZ613214880GB	United Kingdom	12-Sep-21	15-Sep-21	19-Oct-21	37	34
RH060138117GB	United Kingdom	16-Sep-21	21-Sep-21	19-Oct-21	33	28
RI137117075NL	The Netherlands	20-Sep-21	27-Sep-21	13-Oct-21	23	16
RC239189254IT	Italy	27-Sep-21	12-Oct-21	27-Oct-22	30	15
RO308932712RU	Russia	12-Mar-22	22-Mar-22	23-May-22	72	62
RR950656955IL	Israel	22-Mar-22	30-Mar-22	12-May-22	51	43
RB305102574RU	Russia	12-Mar-22	17-Mar-22	23-May-22	72	67
RL330056885MD	Moldova	20-Apr-22	10-May-22	22-Jul-22	93	73
RR971350313PL	Poland	24-Apr-22	29-Apr-22	15-Jun-22	53	48
RS207360587LT	Lithuania	12-May-22	25-May-22	15-Jun-22	34	20
RF098574902BE	Belgium	08-Jun-22	22-Jun-22	14-Jul-22	35	21
RC737656607SG	Singapore	23-May-22	30-May-22	28-Jun-22	36	29
RU665916305GB	United Kingdom	29-Jun-22	28-Jul-22	07-Sep-22	69	41
RR955467565DE	Germany	29-Jun-22	13-Jul-22	09-Sep-22	71	57
UA465003191US	United States	29-Jun-22	05-Jul-22	02-Aug-22	35	29
RF258828873ES	Spain	04-Jul-22	25-Jul-22	05-Aug-22	31	10
RR922808981DE	Germany	27-Jul-22	30-Jun-22	05-Aug-22	36	33
RR557708254CL	Chile	30-Jul-22	26-Aug-22	22-Sep-22	53	25
RR558240480CL	Chile	30-Jul-22	26-Aug-22	22-Sep-22	53	25
RI060188189UA	Ukraine	25-Aug-22	30-Aug-22	22-Sep-22	27	22
RC737697805SG	Singapore	23-Aug-22	29-Aug-22	13-Oct-22	51	45
RF101674576BE	Belgium	07-Sep-22	16-Sep-22	21-Oct-22	44	35
RU495989813IN	India	07-Sep-22	08-Sep-22	21-Sep-22	14	13
RE313086017LT	Lithuania	08-Nov-22	16-Nov-22	30-Nov-22	22	14
RR704465233AR	Argentina	10-Nov-22	18-Nov-22	09-Dec-22	29	21

JIMC, Johannesburg International Mailing Centre.

**FIGURE 7:** Delivery times – Origin country to local post office and Johannesburg International Mailing Centre to local post office.

period. Experiences with long delays of ordinary post forced many postal services customers to ship via registered post or using couriers. In both cases, the costs are higher, with courier costs being much higher, almost double, or more, than SAPOs registered post costs. Courier services, however, are mostly an overnight service.

Two of the examples shown in Table 5 can most probably be considered as outliers with very high delivery times,

one being almost 300 days while the other is more than 1 year! Both of these two items were sent during the COVID-19 lockdown period which could explain the excessive delivery time. In the latter case, the parcel was posted at the WITSPOS post office, located south of Johannesburg. Instead of going directly to Pretoria, the item followed a long, cross-country path – George (Eastern Cape), Oudtshoorn, Capemail (Cape Town), Marshalltown (Johannesburg), Capemail (Cape Town), Glenashley

(Johannesburg), Durmail (Durban) and ultimately a month later it arrived at its destination in Pretoria! Even considering the COVID period as mitigation, such poor service is inconceivable. In contrast, the item sent from Walkerville, which is also located south of Johannesburg, took 11 days to reach its destination and it was also in the middle of the COVID period!

Excluding the two outliers, the average delivery time for the other six items was just under 31 days. It is very similar to the delivery times for registered post from JIMC to the Pretoria post office. According to the UPU, the average delivery times for all types of post in African countries over the years, 2019, 2020 and 2021 were 11.96, 13.39 and 10.63 days, respectively (UPU 2022). In comparison to these numbers, the delivery of registered post in South Africa is way out-of-kilter with the average for African post offices. The local delivery time for priority post, not standard post, being almost three times as high. In 2021, SAPO was rated top in the Development Category 4 by UPU and fifth highest overall in Africa (UPU 2022). Given this, the delivery time for postal items by SAPO must be much better and one thus questions the data used by UPU, see the section 'Performance target for mail service delivery' for a discussion on this. Furthermore, the African delivery average considers all postal categories for all the African countries. This makes the SAPO numbers look even worse. The average delivery time calculated from Table 5 is for registered post, that is priority post. One shudders at what the average delivery time for a standard postal item is in South Africa!

Performance target for mail service delivery

South African Postal Services measures its mail delivery performance annually and it is reported in the SAPO annual report. For the reporting year 2021/2022, the following is stated as one of the SAPO highlights: 'mail delivery performance improvement from 52.95% to 68.36% (SAPO 2022). With the performance measure of 68.36%, there is an associated variance of 23.63%, the implication being the

TABLE 4: International delivery times between countries in Europe.

Tracking no.	Country origin	Date left	Date arrived	Date delivered	Transition time	Delivery time
LP224875724LT	Lithuania	25-Sep-22	27-Sep-22	28-Sep-22	3	1
RR288431635RS	Serbia	21-Jul-22	21-Jul-22	22-Jul-22	1	1

no., number.

TABLE 5: Registered domestic post – Data and delivery times.

Tracking number	Town or city of origin post office	Date it left city of origin	Received at Garsfontein post office	Transition time in days
RC457824875ZA	Witspos	23-Jul-20	06-Aug-21	379
RC457826134ZA	Germiston	28-Jul-20	06-May-21	282
RC457826134ZA	Walkerville	05-Oct-20	15-Oct-20	11
PE800563666ZA	Bethlehem	28-May-21	24-Jun-21	28
RI356721109ZA	Gansbaai	13-Sep-21	16-Oct-21	33
RD421887423ZA	Brackendowns	04-Nov-21	04-Dec-21	31
RC362235287ZA	Riversonderend	15-Nov-21	12-Jan-21	59
RC386228419ZA	Gqeberha	10-Jun-22	02-Jul-22	23

performance data are widely spread around the measure of 68.36%. It is a meaningless number as it is difficult to understand what it really represents.

By legislation, the ICASA determines a mail delivery standard that SAPO must adhere to for a 'basic letter'. A basic letter is defined as a letter, postcard, printed matter, small parcel and other postal articles of the type covered from time to time in Schedule 1 of the Act (ICASA 2012). Table 6 outlines the mail delivery standard with the target that needs to be achieved set at 92%. During COVID-19, this standard was lowered to 90%. A 'basic letter' should thus be delivered, in the worst case, within 5 days after it was posted to the intended delivery point. The SAPO's highlight or improvement from the previous year, of 68.36% is not only substantially below the ICASA regulated standard of 92% but a huge misrepresentation of reality! The actual qualitative data presented in the sections 'International registered or "priority" post' and 'Domestic registered or "priority" post' give a totally different picture. None of the registered items, *priority items*, were delivered within 2, 3, 4 or 5 days after it was posted (*the business day on which an item or mail is posted or handed in at the post office*) or it arrived at JIMC to be sent to its destination. The same holds for the much smaller sample of local registered postal items (see Table 5). This begs the question 'how does SAPO do this performance measurement, what data is used and how is the number derived'? In addition, what SAPO data are used by the UPU?

Conclusion

As a state entity, SAPO provides an indispensable service to many of the South African population. In this article, we have shown how technology has impacted and affected the postal component of SAPO's operations. What SAPO has experienced is not unique as it is a global problem and challenge. South African Post Office still has a unique country-wide footprint which it needs to capitalise on an aggressive way (see Figure 2). This, together with its USOs, puts SAPO in an ideal position to serve customers across the country but then it is essential that the service is consistently reliable and predictable.

The postal development performance of SAPO as measured from an international perspective by the UPU was compared

TABLE 6. South African Post Office's mail delivery standard.

Categories	Standards
Across town – Metropolitan, cities and towns	D + 2
Across town – Remote outlying towns Alternative delivery days (long spokes)	D + 3
Between mail centres – Metropolitan, cities and towns	D + 3 / D + 4
Between mail centres – Remote outlying towns Alternative delivery days (long spokes)	D + 4 / D + 5
Target for all categories	92%

Source: ICASA, 2012, *Amended reserved postal services license for South African Post Office Limited*, ICASA Postal Service Act, 1998 (Act No. 124 of 1998), Government Gazette, Pretoria Note: The equation represents the delivery timeframes from start point to end point. With 'D' in the equation representing the business day on which an item or mail is posted or handed in the post office and the figures '+ numbers' representing the maximum number of business days within which the mail should be delivered at the intended delivery point, that is 'D + 2' means a day plus two business days, etc. (ICASA 2012).

with actual quantitative data of registered, or priority, post. The UPU developed and published the ZIPD index for the first time in 2016 and since then every consecutive year. The type of analysis described here where international data are compared to locally captured data has not been detected in the literature.

From the results obtained, there seems to be a significant disconnect between the results as published by the UPU and what clients of SAPO are experiencing locally on the ground. The performance using actual tracking data indicates the service is even worse than what the UPU results show. The research question was 'Whether there is evidence of the perceived unacceptable level of service by SAPO'. From the quantitative analysis performed in this article, there is conclusive evidence that the service is indeed more than unacceptable. Data from priority mail were used and the delivery times for these are on average far worse than the average delivery times determined by UPU for African countries over three consecutive years, and the latter are for all post types. In addition, the standards set locally by ICASA are not met at all and are almost worse by a factor of 10. Based on these findings, the data SAPO submits to UPU are either out of date or totally wrong while what SAPO reports in its annual reports is also not accurate.

South African Postal Services has degenerated technologically over a long period (Uni Global 2018) and a major effort would be required to reverse the situation. Some suggestions and recommendations for research could include the following:

- Analysis of the population SAPO is serving and their specific needs from a postal perspective. What percentage of the population get mail or letter post? What percentage get parcel post? How would this change over time? This could, inter alia, assist in determining where SAPO should focus its efforts on.
- Is total privatisation an option and what would be the effect of this on SAPO? This is already happening, but it is not totally legitimate.
- What technologies are available to assist in improving performance? Mail sorting machines, other automation equipment to speed-up delivery, etc.
- Developing optimisation models for collecting and delivering mail and parcels, if SAPO is going to remain in this business. Vehicle routing in metropolitan areas is an obvious area for these types of applications.
- Crowd sourcing. Get private sector and private individuals to perform some of the delivery tasks especially in rural areas with long delivery distance.
- Comprehensive study of what global postal operators are doing to improve performance, to enhance their services, etc.

Ten to fifteen years ago, SAPO was a well-functioning, profitable entity providing a reliable, predictable and professional postal service. Today it is the opposite of what it was and to build it up again, if that is possible, will necessitate

enormous effort. What Spiegel (2023) noted is unfortunately true: 'trust in government institutions is nearly impossible to regain once it is lost'.

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Data availability

The authors confirm that the data supporting the findings of this study are available within the article.

Disclaimer

The views and opinions expressed in this article are those of the author and do not necessarily reflect the official policy or position of any affiliated agency of the author.

References

- Ambrosini, X., Boldron, F. & Roy, B., 2006, 'Universal service obligations in the postal sector', in M.A. Crew & P.R. Kleindorfer (eds.), *Progress toward liberalization of the postal and delivery sector. Topics in regulatory economics and policy*, vol. 49, pp. 23–37, Springer, Boston, MA.
- Andersen, D., 2022, 'E-mail to Hans Ittmann on 02 July 2022', Fee for registered post.
- Areff, A., 2023, 'Post Office pushing ahead with plans to retrench 6000 workers, union says', *news24*, 12 February, viewed 13 February 2023, from https://www.news24.com/fin24/companies/post-office-pushes-ahead-with-plans-to-retrench-6-000-workers-union-claims-20230212?utm_source=24.com&utm_medium=email&utm_campaign=3989+28443942+78564&utm_term=https%3A%2F%2Fwww.news24.com%2Ffin24%2Fcompanies%2Fpost-office-pushes-ahead-with-plans-to-retrench-6-000-workers-union-claims-20230212.
- Arvis, J.-F., Ojala, L., Wiederer, C., Shepherd, B., Raj, A., Dairabayeva, K. et al., 2018, *Connecting to compete – Trade logistics in the global economy: The logistics performance index and its indicators*, World Bank, Washington, DC.
- Aykin, T., 1988, 'On the location of hub facilities', *Transportation Science* 22(2), 155–157. <https://doi.org/10.1287/trsc.22.2.155>
- Batista, R., 2016, *The South African Post Office supply chain design and route optimization*, BJP 420 Final Year Report, Dept of Industrial Engineering, University of Pretoria, Pretoria.

- Bell, T., 2022, 'Muizenberg Post Office closure shuts the door on desperate residents – And a piece of history', *Daily Maverick*, 01 March, viewed 02 March 2022, from <https://www.dailymaverick.co.za/article/2022-03-01-muizenberg-post-office-closure-shuts-the-door-on-desperate-residents-and-a-piece-of-history/>.
- Bigelow, S.J., 2022, *Data integrity, TechTarget -DataCenter*, viewed 01 August 2023, from <https://www.techtarget.com/searchdatacenter/definition/integrity>.
- Bowen, J.T., Jr, 2012, 'A spatial analysis of FedEx and UPS: Hubs, spokes, and network structure', *Journal of Transport Geography* 24, 419–431. <https://doi.org/10.1016/j.jtrangeo.2012.04.017>
- Bruno, G., Cavola, M., Diglio, A., Laporte, G. & Piccolo, C., 2021, 'Reorganizing postal collection operations in urban areas as a result of declining mail volumes – A case study in Bologna', *Journal of the Operational Research Society* 72(7), 1591–1606. <https://doi.org/10.1080/01605682.2020.1736446>
- Çetiner, S., Sepil, C. & Süral, H., 2010, 'Hubbing and routing in postal delivery systems', *Annals of Operations Research* 181, 109–124. <https://doi.org/10.1007/s10479-010-0705-2>
- Chopra, S. & Meindl, P., 2016, *Supply chain management: Strategy, planning, and operation*, 6th edn., Pearson, New York, NY.
- Cigno, M.M., Klingenberg, J.P. & Pearsall, E.S., 2016, 'The shape of postal inefficiency', in M.A. Crew & T.J. Brennan (eds.), *The future of the postal sector in a digital world*, pp. 169–190, Springer International Publishing, Cham.
- Cohen, T., 2022, 'Your checks and balances are not in the mail', *Daily Maverick*, After the Bell, 29 September, viewed 23 September 2022, from <https://www.dailymaverick.co.za/article/2022-09-29-your-checks-and-balances-are-not-in-the-mail/>.
- Crew, M.A. & Brennan, T.J. (eds.), 2016, *The future of the postal sector in a digital world*, Springer International Publishing, Cham.
- Crew, M.A. & Kleindorfer, P.R. (eds.), 2006, *Progress toward liberalization of the postal and delivery sector*, Springer Science+Business Media, New York, NY.
- Crew, M.A. & Kleindorfer, P.R. (eds.), 2008, *Competition and regulation in the postal and delivery sector*, Edward Elgar Publishing, Inc., Northampton, MA.
- CSCMP, 2013, *CSCMP supply chain management definitions and glossary*, viewed 04 August 2023, from https://cscmp.org/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms.aspx.
- Dablanc, L. & Rakotonarivo, D., 2010, 'The impacts of logistics sprawl: How does the location of parcel transport terminals affect the energy efficiency of goods' movements in Paris and what can we do about it?', *Sciences* 3(2), 6087–6096. <https://doi.org/10.1016/j.sbspro.2010.04.021>
- Dragendorf, J., Mohr, D., Ecker, T., Neuhaus, F., Briest, P., Beretzky, E. et al., 2019, 'The endgame for postal networks – How to win in the age of e-commerce', in *Travel, transport & logistics*, McKinsley Report, viewed 05 July 2019, from www.mckinsey.com.
- Drożdżiel, P., Wińska, M., Madleňák, R. & Szumski, P., 2017, 'Optimization of the position of the local distribution centre of the regional post logistics network', *Transport Problems* 12(3), 43–50. <https://doi.org/10.20858/tp.2017.12.3.4>
- Ellis, E., 2022, 'Impoverished Karoo communities in jeopardy as post offices run into financial trouble', *Daily Maverick*, 01 March, viewed 03 March 2022, from <https://www.dailymaverick.co.za/article/2022-03-01-impoverished-karoo-communities-in-jeopardy-as-post-offices-run-into-financial-trouble/>.
- ERGP, 2020, *Report on postal definitions*, ERGP PL II (20) 7 Report on postal definitions, European Regulators Group for Postal Services, Brussels.
- EU, 2013, *Main developments in the postal sector (2010–2013)*, Study for the European Commission, Directorate-General for the Internal Market and Services, Dieke, A.K., Bender, C., Campbell, J.J., Jr., Cohen, R.H., Müller, C., Niederprüm, A., De Stree, A., Thiele, S. & Zanker, C., WIK-Consult GmbH, European Commission, Brussels.
- EU, 2018, *Main developments in the postal sector (2013–2016)*, Study for the European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Okholm, H.B., Cerpickis, M., Boivie, A.M., Facino, M., Gårdebrink, J., Almqvist, M., Basalisco, B., Geus, M. & Apon, J., Copenhagen Economics, European Commission, Brussels.
- EU, 2022, *Main developments in the postal sector (2017–2021). Volume 1, main report*, European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Cerpickis, M., Möller Boivie, A., Tizik, S., Spahn, S., Lahann, M., Gallagher, N., Wahl, J., Basalisco, B. & Okholm, H.B., Copenhagen Economics, European Commission, Brussels.
- Falch, M. & Henten, A., 2018, 'Universal service in a digital world: The demise of postal services', *Journal of NBIC* 1, 207–222. <https://doi.org/10.13052/nbjict1902-097X.2018.011>
- FarEye, 2022, 'Dynamic route planning and optimization in logistics: The key to sustainability', *FarEye Blog*, 18 October, viewed 20 October 2022, from <https://fareye.com/resources/blogs/dynamic-route-optimization-and-planning#:~:text=What%20is%20dynamic%20route%20optimization,planning%20is%20scalability%20and%20adaptability>.
- Hearn, J., 2016, 'Implications of recent developments in e-commerce for universal service providers and the USO', in M.A. Crew & T.J. Brennan (eds.), *The future of the postal sector in a digital world*, pp. 43–58, Springer International Publishing, Cham.
- Hugos, M.H., 2018, *Essentials of supply chain management*, 4th edn., John Wiley & Sons, Hoboken, NY.
- Houck, A.C., 2018, 'Life after volume declines: Is there a viable future for the postal sector?', in P.L. Parachu, T. Brennan & V. Glass (eds.), *The contribution of the postal and delivery sector - Between e-commerce and e-substitution*, Springer International Publishing, Cham.
- ICASA, 2012, *Amended reserved postal services license for South African Post Office Limited*, ICASA Postal Service Act, 1998 (Act No. 124 of 1998), Government Gazette, Pretoria.
- Jaag, C., Moyano, J.P. & Trinkner, U., 2016, 'Postal strategies in a digital age', in M.A. Crew & T.J. Brennan (eds.), *The future of the postal sector in a digital world*, Springer International Publishing, Cham.
- Jagbeer, J., 2022, 'Determining the competitive advantage of the South African Post Office', MComm thesis, Cranefield College of Project and Programme Management, Pretoria.
- Jagbeer, J., 2023a, 'E-mail to Hans Ittmann on 06 January 2023', Maps of postal outlets.
- Jagbeer, J., 2023b, 'E-mail to Hans Ittmann on 18 January 2023', SAPO data.
- Klincewicz, J.G., 1991, 'Heuristics for the p-hub location problem', *European Journal of Operational Research* 53(1), 25–37. [https://doi.org/10.1016/0377-2217\(91\)90090-I](https://doi.org/10.1016/0377-2217(91)90090-I)
- Koncová, D., Kremeňová, I. & Fabuš, J., 2021, 'Proposal for a change in the type of devices used for submitting of postal items by using the Saaty's method, a case study for the postal sector', *Transportation Research Procedia* 55, 236–243. <https://doi.org/10.1016/j.trpro.2021.06.027>
- Kwan, M.K., 1960, 'Programming method using odd or even points', *Acta Math Sin* 10, 263–266. (In Chinese).
- Lowman, S., 2021, 'Post Office staff only crippled their employer but stuck many out of business', *Biznews*, 06 October, viewed 07 October 2022, from <https://www.biznews.com/undictated/2021/10/06/sympathy-post-office-staff>.
- Madlenakova, L., Turska, S. & Madlenak, R., 2019, 'The image of the postal company as a key attribute of the customer's purchasing behaviour', *Transportation Research Procedia* 40, 1088–1095. <https://doi.org/10.1016/j.trpro.2019.07.152>
- Matúšková, M. & Madleňáková, L., 2017, 'The impact of the electronic services to the universal postal services', *Procedia Engineering* 178, 258–266. <https://doi.org/10.1016/j.proeng.2017.01.111>
- Nikali, H., 2008, 'Substitution of letter mail for different sender–receiver segments', in M.A. Crew & P.R. Kleindorfer (eds.), *Competition and regulation in the postal and delivery sector*, Edward Elgar Publishing, Northampton, MA.
- Opperman, G., 2022, *Post office closures collapse lives of rural residents*, Media statement, DA, viewed 10 November 2022, from <https://www.polity.org.za/article/post-office-closures-collapse-lives-of-rural-residents-2022-04-22>.
- Parcu, P.L., Brennan, T.J. & Glass, V. (eds.), 2022, *The economics of the postal and delivery sector – Business strategies for an essential service*, Springer Nature, Cham.
- Paton, C., 2018, 'Post Office again fails to clear mail backlog', *Businesslive*, 13 November, viewed 13 November 2018, from <https://www.businesslive.co.za/bd/national/2018-11-13-post-office-again-fails-to-clear-mail-backlog/>.
- Post&Parcel, 2023a, 'Royal Mail: We have to carefully balance our pricing against a continued decline in letter volumes', *Post&Parcel*, 03 March, viewed 03 March 2023, from <https://postandparcel.info/152119/news/e-commerce/royal-mail-we-have-to-carefully-balance-our-pricing-against-a-continued-decline-in-letter-volumes/>.
- Post&Parcel, 2023b, 'Swiss Post group profit for 2022 down 157 million francs compared to 2021', *Post&Parcel*, 10 March, viewed 15 March 2023, from <https://postandparcel.info/152193/news/e-commerce/swiss-post-group-profit-for-2022-down-157-million-francs-compared-to-2021/>.
- Retief, H., 2023, 'It's actually going really well (except for...)' (Dit gaan eintlik heel lekker (behalwe vir...)), *Rapport Weekliks*, 29 January, viewed 29 January 2023, from <https://epublikasies.netwerk24.com/html5/reader/production/default.aspx?pubname=&edid=1c4a1f7e-4836-4f3b-9c12-895316bba7c3>.
- Robichet, A. & Nierat, P., 2021, 'Consequences of logistics sprawl: Order or chaos? – The case of a parcel service company in Paris metropolitan area', *Journal of Transport Geography* 90, 102900. <https://doi.org/10.1016/j.jtrangeo.2020.102900>
- Rosenthal, E. & Blum, E., 1969, *Runner and mailcoach – Postal history and stamps of South Africa*, Purnell & Sons S.A. (Pty) Ltd, Cape Town.
- Rossouw, J. & Calitz, D., 1999, *South African Post Office: Improving customer service*, Public Service Commission Report, viewed 25 July 2023, from <https://www.psc.gov.za/documents/case.asp>.
- Rudneva, Z., 2022, 'Economic, logistics, customs solutions of moving postal mails by online', *Transportation Research Procedia* 61, 70–73. <https://doi.org/10.1016/j.trpro.2022.01.012>
- Rudolph, G.J., 1971, 'Optimal mail sorting policy', *Operations Research Society of South Africa (ORSSA) Newsletter*, June, pp. 29–40.
- SAPO, 2013, *2013 Integrated Report, South African Post Office Soc Ltd, Pretoria, South Africa*, viewed 01 August 2023, from <https://www.postoffice.co.za/about/annualreport.html>.
- SAPO, 2015, *2014/15 Annual report*, South African Post Office Soc Ltd, Pretoria, viewed 27 August 2018, from <https://www.postoffice.co.za/about/annualreport.html>.
- SAPO, 2017, *2016/17 Annual report*, South African Post Office Soc Ltd, Pretoria, viewed 25 August 2018, from <https://www.postoffice.co.za/about/annualreport.html>.
- SAPO, 2020, *Annual report 2019/2020*, South African Post Office Soc Ltd, Pretoria, viewed 15 August 2022, from <https://www.postoffice.co.za/about/annualreport.html>.

- SAPO, 2021, *Annual report 2021*, South African Post Office Soc Ltd, Pretoria, viewed 05 November 2022, from <https://www.postoffice.co.za/about/annualreport.html>.
- SAPO, 2022, *Annual report 2022*, South African Post Office Soc Ltd, Pretoria, viewed 01 February 2023, from <https://www.postoffice.co.za/about/annualreport.html>.
- Sathi, A., 2012, *Big data analytics: Disruptive technologies for changing the game*, MC Press Online, LLC, Boise, ID.
- Sbai, I., Krichen, S. & Limam, O., 2022, 'Two meta-heuristics for solving the capacitated vehicle routing problem: The case of the Tunisian Post Office', *Operational Research* 22(1), 507–549. <https://doi.org/10.1007/s12351-019-00543-8>
- Shim, S.J., Kumar, A. & Hakami, H., 2014, 'Internet usage trend and postal service performance in Australia', *Journal of Internet Banking and Commerce* 19(1), 1–10.
- Spiegel, P., 2023, 'American resistance by David Rothkopf – Managing the Trump horror show', *Book Review, Financial Times*, 07 February, viewed 21 March 2023, from <https://www.ft.com/content/4e009f85-a5ed-4c3b-aa90-0a18173c5ed6>.
- Tabeni, M., 2006, 'The impact of inbound logistics activities on the operational performance of the postal services organization in South Africa', MBA thesis, Rhodes University, Grahamstown.
- Tockhov, K., 2015, 'The efficiency of postal services in the age of market liberalization and the internet: Evidence from Central and Eastern Europe', *Utilities Policy* 36, 35–42. <https://doi.org/10.1016/j.jup.2015.09.004>
- Turska, S., Chinoracky, R., Madlenakova, L. & Corejova, T., 2019, 'Optimization of the delivery process in the urban area', in *TRANSORT MEANS 2019 - Sustainability, Research and Solutions, Proceedings of the 23rd International Scientific Conference - Part III, V. Ostasevicius (chair ed. committee)*, Palanga, Lithuania, October 2–4, 2019, pp. 809–813.
- Uni Global, 2018, *The economic and social consequences of postal services liberalization*, Syndex / Uni Global Posts & Logistics Study, Brussels.
- UPU, 2017, *Integrated index for postal development (2IPD) – 2016 Results*, Universal Postal Union, Berne, viewed 15 August 2018, from <https://www.upu.int/en/Universal-Postal-Union/Activities/Research-Publications/Integrated-Index-for-Postal-Development>.
- UPU, 2018, *Postal development report 2018 – Benchmarking a critical infrastructure for sustainable development*, Universal Postal Union, Berne, viewed 22 May 2022, from <https://www.upu.int/en/Universal-Postal-Union/Activities/Research-Publications/Integrated-Index-for-Postal-Development>.
- UPU, 2019, *Postal Development Report 2019 – Perspective on the performance of postal operations worldwide*, Berne, viewed 19 January 2021, from <https://www.upu.int/en/Universal-Postal-Union/Activities/Research-Publications/Integrated-Index-for-Postal-Development>.
- UPU, 2020, *Postal Development Report 2020 - Achieving higher performance amid a major crisis*, Berne, viewed 19 January 2021, from <https://www.upu.int/en/Universal-Postal-Union/Activities/Research-Publications/Integrated-Index-for-Postal-Development>.
- UPU, 2022, *Postal development report 2022 – Postal journey towards a sustainable future*, Universal Postal Union, Berne, viewed 13 October 2022, from <https://www.upu.int/en/Universal-Postal-Union/Activities/Research-Publications/Integrated-Index-for-Postal-Development>.
- UPU, 2023, *About UPU*, viewed 16 January 2023, from <https://www.upu.int/en/Universal-Postal-Union>.
- UPUa, 2019, *Postal economic outlook 2019 – Latest trends in an evolving sector*, Universal Postal Union, Berne, viewed 20 October 2022, from <https://www.upu.int/en/Publications/Postal-economics/Postal-economic-outlook-2019>.
- UPUa, 2020, *Postal economic outlook 2020 – Navigating accelerated change during an unprecedented crisis*, Universal Postal Union, Berne, viewed 14 November 2022, from <https://www.upu.int/en/Universal-Postal-Union/Activities/Research-Publications/Postal-Economics>.
- UPUa, 2021, *Postal economic outlook 2021 – The difficult road towards profitable growth*, Universal Postal Union, Berne, viewed 14 November 2022, from <https://www.upu.int/en/Universal-Postal-Union/Activities/Research-Publications/Postal-Economics>.
- UPUub, 2019, *Postal development report 2019 – Perspectives on the performance of postal operators worldwide*, Universal Postal Union, Berne, viewed 19 January 2021, from <https://www.upu.int/en/Universal-Postal-Union/Activities/Research-Publications/Integrated-Index-for-Postal-Development>.
- UPUub, 2020, *Postal development report 2020 – Achieving higher performance amid a major crisis*, Universal Postal Union, Berne, viewed 19 January 2021, from <https://www.upu.int/en/Universal-Postal-Union/Activities/Research-Publications/Integrated-Index-for-Postal-Development>.
- UPUub, 2021, *Postal development report 2021 – Taking stock of a new reality*, Universal Postal Union, Berne, viewed 25 October 2021, from <https://www.upu.int/en/Universal-Postal-Union/Activities/Research-Publications/Integrated-Index-for-Postal-Development>.
- USPS, 2015, *Dynamic deliveries – Technique helping USPS grow package business*, LINK, viewed 21 September 2021, from <https://link.usps.com/2015/11/18/dynamic-deliveries/>.
- USPS, 2020, *U.S. Postal Service's processing network optimization and service impacts*, Audit Report, Report Number 19XG013NO000-R20, Office of Inspector General, United States Postal Service, Arlington, VA.
- USPS, 2021, *Step into tomorrow: The U.S. Postal Service and emerging technology*, Report Number RISC-WP-21-007, Office of Inspector General, United States Postal Service, Arlington, VA.
- Vaculik, J., Kolarovszki, P. & Tengler, J., 2012, 'Results of automatic identification of transport units in postal environment', *Transport and Telecommunication Journal* 13(1), 75–87. <https://doi.org/10.2478/v10244-012-0007-7>
- Vaculik, J., Michalek, I. & Kolarovszki, P., 2009, 'Principles of selection, implementation and utilization of RFID in supply chain management', *Promet-Traffic & Transportation* 21(1), 41–48. <https://doi.org/10.7307/ptt.v21i1.911>
- Vaculik, J. & Tengler, J., 2012, 'Potential of new technologies in logistics services', in *Congress Proceedings, CLC 2012, Carpathian Logistics Congress*, Jeseník, Czech Republic, November 7–9, 2012, pp. 242–250.
- Van Ee, M. & Sitters, R., 2019, 'The Chinese deliveryman problem', *4OR-Q* 18(3), 341–356. <https://doi.org/10.1007/s10288-019-00420-2>
- Viljoen, C., 2018, 'For a long time SAPO has done nothing (SA Posdiens staan lankal)', *Beeld Newspaper*, 02 July, viewed 02 July 2018, from <https://www.netwerk24.com/Netwerk24/sa-posdiens-staan-lankal-20180701>.
- Waller, M.A. & Fawcett, S.E., 2013, 'Data science, predictive analytics, and big data: A revolution that will transform supply chain design and management', *Journal of Business Logistics* 34(2), 77–84. <https://doi.org/10.1111/jbl.12010>
- Williams, F., 2021, '30 yrs later- smile and tear for stamp and telephone (30 jr later – glimlag en traan vir posseel en telefoon)', *Beeld Newspaper*, 27 September, viewed 27 September 2021, from <https://www.netwerk24.com/netwerk24/sake/maatskappye/30-jr-later-glimlag-en-traan-vir-posseel-en-telefoon-20210927>.
- Wolak, F.A., 1996, *Changes in the household-level demand for postal delivery services from 1986 to 1994*, Preliminary Draft, Department of Economics, Stanford University, Stanford, CA.