Takeaways

- Postal operators are experiencing market trends including increased competition from the digital world, globalization, deregulation, evolving customer behaviors and changeable mail volumes
- To address the growth of a global society, advanced OCR technologies allow for mail sorting and delivery based on country-specific address formats and languages
- New generation software incorporates the latest innovations in artificial intelligence, capture and recognition

Summary

Despite lower mail volumes, OCR technology continues to progress. Newer advancements enable automation of new mail formats, improved address recognition, and indicia validation. These technology improvements result in increased efficiency of postal services and reduced costs.

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History
For centuries speed and accuracy have been the primary goals of postal service operations around the world. As economies, businesses, styles and technology have changed, so have customer demands and expectations regarding what is considered “fast” and “accurate.”

At the turn of the 20th century, mail volume grew dramatically and mail handling became an extremely labor-intensive and time-consuming process. Postal service efforts for speed and accuracy were targeted at improving mail delivery regarding communications and mail transportation. Opportunities for innovation shifted to mail handling and sorting.

Leading edge mechanization offered the first improvements in the efficiency of handling and sorting. Sorting machines were first tested in the 1920s, but the Great Depression and World War II delayed widespread development of mechanization until the mid-1950s. During the 1960s and 70s, mechanization became the backbone of letter-sorting operations and increased productivity. By the mid-1970s, however, it was obvious that cheaper, more efficient methods and equipment would be necessary in order for the postal services to counteract rising costs related to ever growing mail volume.

In an effort to make mail piece handling more efficient, the United States Postal Service (USPS) began to develop an expanded ZIP Code in 1978 that required new equipment in order to read them. In 1982 the first computer-driven, single-line optical character reader, or “OCR”, was installed in Los Angeles. The ZIP Code on a letter was read at the originating office by the OCR, which printed a barcode on the envelope. At the destination office, a less expensive barcode reader sorted the mail by barcode. The introduction of computers quickly revolutionized the postal industry and the pace of change has increased dramatically, most notably in the ability to automatically read addresses.

In the 1980s the first OCRs were confined to reading ZIP codes. In the early 1990s OCR’s expanded their capabilities to include reading the entire address, and in 1996 the Remote Computer Reader (RCR) for the USPS was recognizing about 35% of machine printed and 2% of handwritten letter mail pieces. During the next ten years, there were unparalleled breakthroughs in both throughput and OCR reading quality. Modern OCR systems recognize 99.5% of machine printed and about 98% of handwritten letter mail. Due to these types of improvements in recognition technology, the cost of processing the mail dropped from an estimated $55 per 1,000 letters manually in the mid 1990’s to less than $5 per 1,000 letters with automated sorting a decade later. Subsequent advances in technology enabled the automation of magazines and parcels that were previously difficult or impossible to automate.

A decade of focused investment in automated sorting technology based on OCR resulted in high recognition rates of machine printed and handwritten addresses delivered by state-of-the-art systems. Analysis of the entire mail stream and the understanding of the current state of the technology and its potential, provide more insight into the future of mail processing.
Postal Industry Market Trends

Despite earlier forecasts that mail would be substituted with e-mail, recent research show that print mail continues to be a highly effective medium for business communications and revenue. Online advertising did not replace mail. Instead advertisers added access to online information to their traditional catalogues sent by mail.

Growth in e-commerce has resulted in increased international and domestic postal parcel traffic and raised subsequent interest in automatic parcel sorting.

Challenges

Despite these positive trends, the postal industry today faces a number of serious challenges. Modern world market trends – globalization, liberalization, deregulation – all require the postal industry to adapt to increased competition, changing customer behaviors and uncertain mail volumes. This situation raises the bar in performance and efficiency standards at all stages of mail processing, from mail sorting to the quality and variety of services. Technological innovation has played an important role in the battle for efficiency. Although image processing and address recognition technology were used to speed up mail sorting and reduce manual data entry costs for more than a decade, present day realities require the revision of many approaches and priorities.

In the past, posts that had high volume sorting operations intensively and efficiently applied automated postal systems. For example, USPS was one of the market leaders in terms of its use of technology and high-speed automated systems. Today with the high read rates already achieved by the industry, the volume of residual items that has to be processed automatically is comparatively low. To further automate the sorting of these leftover mail pieces would provide lower additional savings, when compared to the savings achieved in the past.

Postal operators in countries with lower mail volumes face a similar problem. Even though their current level of automation may not be high, further automation would be too costly for the low mail input. This is why post offices all over the world are looking for an efficient and scalable solution that would provide manual labor savings in high as well as low mail volume environments.

Improvements for Mail Sorting

There are several major areas for improvement to make mail sorting automation efficient in the low volume environment. The primary driver for investing in technology innovations is the necessity to meet the customers’ expectations of timely and accurate delivery.

Reduced Costs

Until recently, the cost of a mail sorting automation project was very high as suppliers provided integrated solutions that included both OCR and transport components. This resulted in the tight integration of sorting equipment and OCR module(s), thereby hampering the replacement or updating of one of the components independently.
This is no longer the case with the introduction of the OCR/Video Coding Systems (OCR/VCS) open interface standard by the European Committee for Standardization (CEN Interface). The OCR/VCS standard enables postal operators to work with different suppliers on needed replacements or expansions of the sub-systems without incurring significant engineering costs. In particular it becomes possible to rely on smaller suppliers, who can often come up with less expensive and more efficient solutions compared to larger vendors. Actually, many state-of-the-art solutions offered by large suppliers are based on or include the software provided by their subcontractors.

The opportunity to be more selective and demanding when choosing OCRs allows postal operators to implement universal OCR technology requiring comparatively low expense to customize and which can be more easily applied to country-specific address formats and coding rules. Universal OCR also helps postal operators to unify efforts across different types of mail streams – letters, flats and parcels. In the past, updates or improvements in OCR technology often coincided with the deployment of a newer generation of sorting equipment. For example, deployment of new flats sorting machines also provided an opportunity to raise the bar in OCR performance. Now with a lower reject mail volume, it may not make sense for a supplier to invest money in OCR improvement solely based on the reject volume of flats. However, if OCR improvements are considered separately from the upgrade of sorting equipment, it then becomes possible to provide address recognition improvements for several mail stream types simultaneously. The cost savings, received from the application of technology to a combined mail volume, justifies the initial investment in the OCR improvement project.

The right choice of an OCR product based on a thorough analysis of specific factors in each particular case of OCR implementation may also enable both postal operators and suppliers to make an attractive business case. For example, when choosing an OCR engine to automate a reject mail stream, it is important to take into consideration that the reject mail stream will have a different ratio of handwritten and machine-print addresses compared to the full mail stream. A full mail stream usually has somewhere between 70% and 90% of machine-print addresses. Most OCR engines have much higher performance levels on machine-printed addresses than on handwritten addresses. After these systems have been used to automate mail sorting, the portion of handwritten addresses in the reject mail stream grows by up to 50%. Therefore, relying on an OCR engine that has a high performance level on both machine-printed and handwritten addresses will make automation investments more viable.

OCR Improvements

Another opportunity to raise the efficiency of mail sorting and to make it feasible in a low volume environment is to improve the OCR’s performance. In particular, its ability to recognize mail pieces that could not be read automatically and had to be sent to manual processing. This has been the case with, for instance, international mail.

According to the USPS website, “the Postal Service is the world leader in optical character recognition technology with machines reading nearly 98 percent of all hand-addressed letter mail and 99.5 percent of machine printed mail.” There are additional advancement in recognition technology that contributes to these high read rates.
New Formats

Formats that were not previously automated are now sorted by machine including magazines, parcels, and larger items. Recognition technology locates and reads destination addresses on parcels capturing all address information including city, state, zip code, P.O. Box, street number and apartment number.

Improved Address Validation

Advanced image processing with highly tuned region-of-interest location finds and differentiates address blocks and labels and detects missing addresses. Software cross-validates addresses with postal address databases for the highest possible recognition rates and mail delivery. It includes learning modules to meet application and country-specific requirements and reduce resources and timeframes required for customization.

Indicia Validation

While OCR technology revolutionized mail sorting operations, integration of such technology with image processing and pattern recognition into a single product may provide a solution to other challenging problems, such as postage revenue losses.

All pieces of mail delivered by a post office must have stamps or “postal indicia” indicating that the proper postage and/or a postal permit exist to allow the items to enter the domestic mail delivery network. In addition to providing payment for delivery, indicia are used by the postal service to verify that postage was paid and at the correct rate. Without this proof of payment, the postal service returns the mailed item to the sender. Mainly automatic indicia detection systems locate indicia to determine the orientation of the mail piece and to properly face the mail for subsequent processing, while postage validity and value detection rely on error-prone manual processes. An inability to detect insufficient postage or counterfeit indicia can result in multi-million dollar annual losses for the postal service.

Recent developments in pattern recognition technologies offer a streamlined approach to automatic indicia location and detection on envelope images including stamps, meter marks and other types of indicia. The systems can also determine the types of indicia on the mail piece and reliably read the postage amount, thus enabling postage revenue protection. Another area of application is indicia fraud detection. The software compares each stamp located on an envelope against a database of stamps. If a stamp does not match the database it is flagged as a counterfeit suspect.

International Mail

In our fast-paced global society, integration and international communication are playing increasingly important roles. The European Union enhanced the political and economic integration of its 27 countries. EU citizens can invest, live, travel, and work in other member countries. This integration leads to a significant share of international mail in the mail stream of each country. In some European countries, 15% of the mail goes to foreign destinations. Simultaneously, the United States of America (about 830 million
mail pieces going to foreign destinations per year) and Great Britain (almost 450 million mail pieces going to foreign destinations annually) are among the largest exporters of letter-post items. In addition to international letter mail, the volume of international parcels grew as a result of greater e-commerce activity. This international mail must be processed as quickly and as accurately as domestic items, so that the processing of these items is not deferred and the OCR produces valid mailing addresses.

In most countries, postal sorting machines primarily read and sort mail by country name, which may be written in English or in the language of the destination country. For example, a letter addressed to Germany may have the country name written as “Germany” or “Deutschland”, a letter addressed to Ivory Coast may have “Côte d’Ivoire” or “Ivory Coast”. It is important that a postal sorting machine that sorts by the country name be able to correctly interpret any variation in the country name. In the United States, the USPS only reads the country name and assigns an appropriate international ZIP code to a mail piece. All mail sent from the USA to a given country goes to a single location in that country for sorting and separation. The exception is Canada, where province name and city name also have to be read in order to sort the mail piece. In the latter case, OCR is dealing with addresses that may be written in English, French or even a combination of the two languages. Reading addresses written in different languages is a challenge for most OCRs. It is important for postal centers that sort international mail to rely on universal OCR technology.

The problem of processing addresses written in different languages in one stream is not restricted to sorting by country name. While the United States ignores the destination city in international mail (except in mail to Canada and the UK), other countries do not. For example, mail from England to Los Angeles is sent directly to Los Angeles, whereas a letter to New York goes on a flight to New York. The journey of a letter from Nome (Alaska, U.S.) to Provideniya (Siberia, Russia), if sent westward rather than eastward, could be 23,000 miles shorter if the USPS processed the city line. Even in the domestic mail stream there is a certain percentage of mail that comes from abroad and may not comply with the addressing guidelines and formats of that particular country, or may have addresses written in foreign languages, or use names that differ from local names. Examples include: The Hague for Den Haag in the Netherlands, Copenhagen for København in Denmark, Cologne for Köln in Germany, or Prague for Praha in the Czech Republic. Therefore, in many countries even domestic mail sorting requires OCR capability to read addresses written in different languages. For example in Russia, postal sorting systems are required to read addresses written in both Russian and English. Countries like Canada or Switzerland, which have two, three or even more official languages, can have automatic mail sorting systems running efficiently only if they use universal OCRs able to read different languages.

Modern Video Coding

Modern video coding systems allow postal services to better utilize the performance of the operators aligning it with the performance of automated stages. These systems are robust, easy to use and can be readily configurable to meet specific application requirements. As with the OCR component, it is important for the video coding system to be compliant with OCR/VCS Open Interface Standard. This makes video coding
Looking Beyond the Envelope

system supplier independent and allows postal operators to work with different suppliers to replace or expand video coding component without incurring engineering costs.

Change of Address
Postal organization efforts to update address databases, which businesses use for their commercial mailing, can reduce the cost of forwarding incorrectly addressed mail. Advanced forms processing systems based on universal OCR technology can automatically read Change of Address forms to update records in the Move Order database. Address validation systems that allow commercial users to revise their mailing lists, and verify them against an updated USPS database, are also available.

Conclusion
The postal industry seeks technologies to solve certain problems and increase the efficiency of operations and services. In others, technical innovations may offer new opportunities for business.

There are many technologies available on the market that deserve a closer look: advances in OCR, ability to process more larger mail formats, sophisticated address recognition for more effective mail sorting, redirection and error identification; format and layout verification to detect items that require specific processing (like foreign mail), and indicia recognition for fraud protection.

Postal services will remain an integral part of the economic infrastructure. To sustain the role of mail as one of the most efficient means of business communication, postal services have to continuously improve their organizational and technological infrastructure for mail processing and delivery, ensuring that mail is timely, relevant, and non-intrusive. New technology advances are one of the driving forces that enable postal operators to make necessary innovative changes.

About Parascript
Parascript is a leading developer of intelligent document recognition (IDR) solutions. Drawing from a long history of cursive and handprint recognition, Parascript’s high-value solutions are powered by software that is always learning — constantly maximizing the user’s return on investment. Parascript enables business automation in forms processing, postal and financial automation, and fraud prevention, and supports cancer screening in medical imaging. Fortune 500 companies, postal operators (including the U.S. Postal Service), major government and financial institutions rely on Parascript software, which is distributed through its OEM and value added reseller networks, including partners such as: IBM, EMC, Bell and Howell, Fiserv, Selex Elsag, Lockheed Martin, NCR, Siemens, and Burroughs. Visit Parascript online at http://www.parascript.com.