

# Digitalization of Intra-Company Road Freight Transport

## Digitalizace vnitropodnikové silniční nákladní dopravy

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### Abstract

*In 2023, the subsidiary transport company Doprava TŽ, s.r.o. was merged with the parent steel company TŘINECKÉ ŽELEZÁRNY, a.s. The digitalization of the transport process was integral part of the merger. Before the merger, there was a low level of digitalisation and a high administrative burden in subsidiary company. Data was written by hand in a paper, then repeatedly re-typed into a computer and several times checked. A SQL-based program called EDL (electronic delivery list) was developed by TŽ programmers. Transportation begins with an electronic reservation created by the client, which has a unique ID. Then the dispatcher assigns the reservation to the driver. During the shift, driver fulfils the assigned reservations, which he selects, starts and ends using a hand reader. The progress of the transport is recorded using barcodes and QR codes.*

*All data of the entire transport process from the moment of the reservation to the end of the transport are shared online in program EDL on PC or hand reader. Benefits of implementing the EDL program are reduction of administrative burden for all process participants, significant acceleration of the entire process, continuous control over the entire process, reducing the error rate, increase in productivity, data unification and on-line overview of the entire process. All paper documents were abolished.*

**Key words:** digitalization; road freight transport; SQL; hand reader; productivity; process improvement

### Abstrakt

*V roce 2023 byla dceřiná dopravní společnost Doprava TŽ, s.r.o. sloučena s mateřskou hutní společností TŘINECKÉ ŽELEZÁRNY, a.s. Digitalizace dopravního procesu byla nedílnou součástí tohoto sloučení. Před sloučením byla ve společnosti nízká úroveň digitalizace a vysoká administrativní zátěž. Data se zapisovala ručně na papír, následně se opakovaně přepisovala do počítače a několikrát kontrolovala. Programátoři TŽ vyvinuli SQL-based program EDL (elektronický dodací list). Doprava začíná elektronickou rezervací vytvořenou zákazníkem, která má své unikátní ID. Dispečer následně přiřadí rezervaci řidiči. Během směny řidič plní přidělené rezervace, které si pomocí ručního terminálu vybírá, zahajuje a ukončuje. Průběh přepravy je zaznamenáván pomocí čárových a QR kódů.*

*Všechna data o celém dopravním procesu od okamžiku vytvoření rezervace až po ukončení přepravy jsou online sdílena v programu EDL na počítači nebo ručním terminálu. Přínosy implementace programu EDL jsou snížení administrativní zátěže pro všechny účastníky procesu, výrazné zrychlení celého procesu, nepřetržitá kontrola nad jeho průběhem, snížení chybovosti, zvýšení produktivity, sjednocení dat a online přehled o celém procesu. Papírové dokumenty byly zrušeny.*

**Klíčová slova:** digitalizace; silniční nákladní doprava; SQL; ruční čtečka; produktivita; zlepšení procesu

## 1. Introduction

Automatic identification systems enable the shortening of activity cycles, the replacement of human labor, error-free operation and, ultimately, the growth of competitiveness [1, 2]. The most used technology in automatic identification is the barcode or QR code [3].

Barcodes have advantages over manual data entry into computer systems, such as speed, accuracy, higher productivity, savings in material movement, and quick return on investment [4]. The bar code makes it possible to track in real time the movement between the individual parts of the logistics chain [5, 6].

In 2022, it was decided to merge the subsidiary transport company Doprava TŽ, s.r.o. with the parent steel company TŘINECKÉ ŽELEZÁRNY, a.s. The merger also included the digitalization of the entire transport process, including the implementation of automatic identification using QR codes.

Thanks to digitalization, some of non-productive administrative activities have been canceled or significantly accelerated and the entire process is now more efficient. Information about the progress of the transport is shared online, so that all participants in the process have access to all necessary information about the transport.

This conference paper aims to analyse the implementation and impacts of automatic identification systems, specifically focusing on the use of QR codes, in the context of the merger and digitalization process at TŘINECKÉ ŽELEZÁRNY, a.s.

The paper will explore how the integration of QR codes has enhanced operational efficiency, reduced administrative overhead, and improved information sharing within the logistics chain. By presenting a detailed case study of TŘINECKÉ ŽELEZÁRNY, a.s., this paper intends to demonstrate the practical benefits of adopting automatic identification technologies in the steel industry, providing valuable insights for other organizations considering similar digital transformations.

## 2. Original state before digitalization

Before the merger, the level of digitalization at Doprava TŽ, s.r.o. was very low. Most of the records were in handwritten form. The data was not shared, and all the information had to be repeatedly retyped into computer programs. The administrative activities were time consuming and delayed not only the transport itself, but also other activities.

The reservation of transport was arranged by telephone call with the dispatcher. The dispatcher wrote down all the information manually in a notebook and passed the requests to the drivers via radio transmitter.

At the start of transport, the driver arrived to the loading point, where he received a handwritten delivery note after loading. During weighing, the weighbridge lady manually typed all the data into a weight software and printed the weighing and radiation lists. When passing through the gate, the security guard confirmed the passage on the delivery note. The delivery note was also confirmed by the employees during unloading.

At the end of the transport, the driver returned the delivery notes to the sender and filled in and had the driving report confirmed. Handwritten data were also used to record other activities, such as attendance of drivers, assigning cars to drivers, daily book of car or evidence of breakdowns.

A diagram of the entire process of the original state (old process) is shown in **fig. 1**.

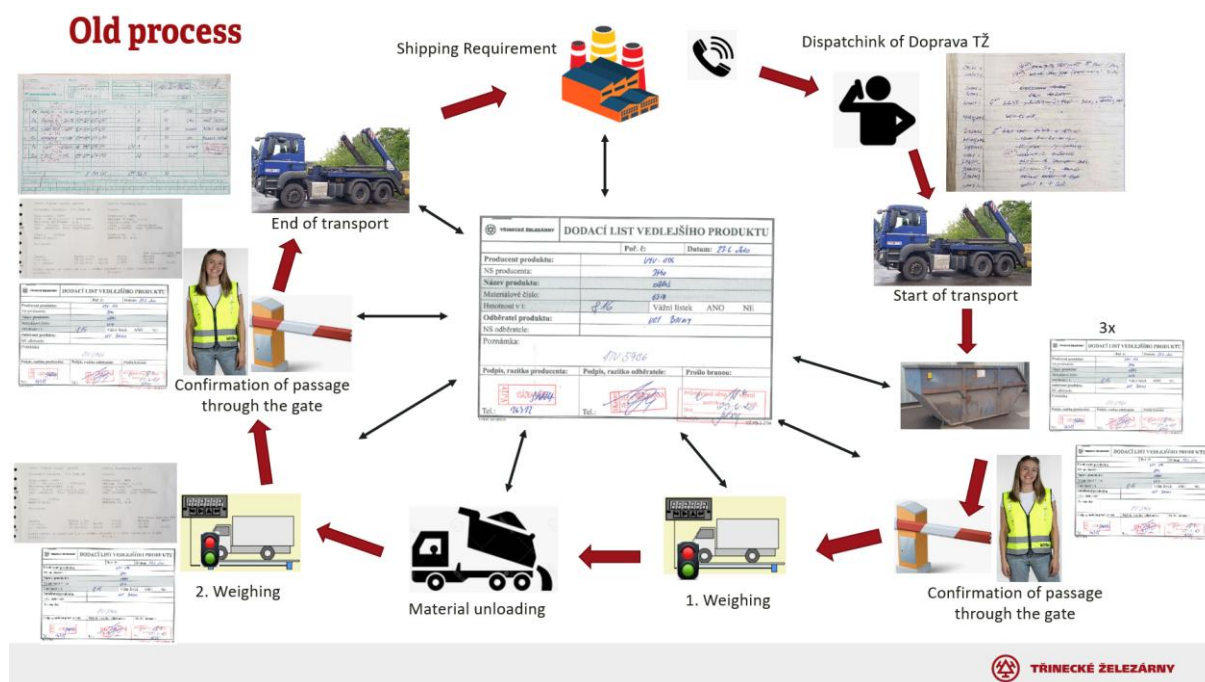


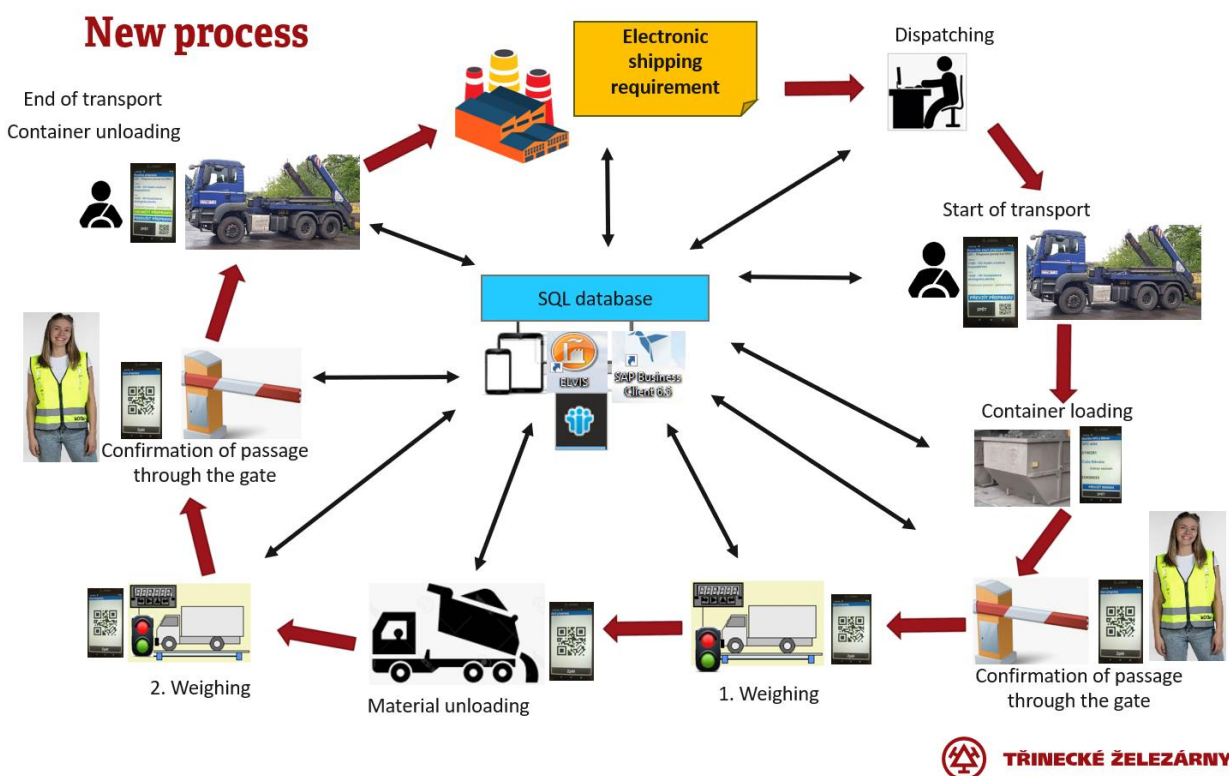
Fig. 1 Scheme of old process  
Obr. 1 Schéma pôvodného procesu

### 3. New process after implementation of digitalization

A new software based on an SQL database for mutual data sharing was created by our programmers. All transport requests are now issued electronically and hand readers are used for their handling. QR code readers are used not only by drivers, but also by the weighbridge ladies and security guards when checking in cars at the gate. Evidence of breakdowns have also been digitalized – each breakdown is reported by the driver using a reader. A photo of the breakdown can also be attached to the breakdown information. All information is in electronic form, there is no need to issue paper documents.

The dispatcher's workplace has been digitalized. The dispatcher uses the program to assign cars to drivers and plans transports. In the program, the progress of the transport is continuously monitored. All newly created transport reservations are sent to the dispatcher. The dispatcher then electronically assigns this transport to the driver, who can see it in the hand reader. At the beginning of the shift, the driver logs into the hand reader and pairs the reader with the car he will be driving. He selects the assigned transport in the reader and drives to the loading point. There he scans the QR code on the container and then he loads the container. On the weight, the weighbridge lady reads the information about transport from the driver's reader. Subsequently, the data is transferred to the weighing software and the car is weighed. On fully automated weights, the driver can weigh his car by scanning the weighbridge's QR code.

At the gate of the TŘINECKÉ ŽELEZÁRNY, a.s. premises, the guard scans the QR code from the car door and confirms the passage of the vehicle through the gate. The unloading is confirmed by the staff on the computer at the unloading point. The driver returns the empty container to the loading point and ends the transport in the reader. When the transport is finished, the transport is checked by the clerk responsible for invoicing. The diagram of the new process is shown in **fig. 2**.



**Fig. 2** Scheme of new process  
**Obr. 2** Schéma nového procesu

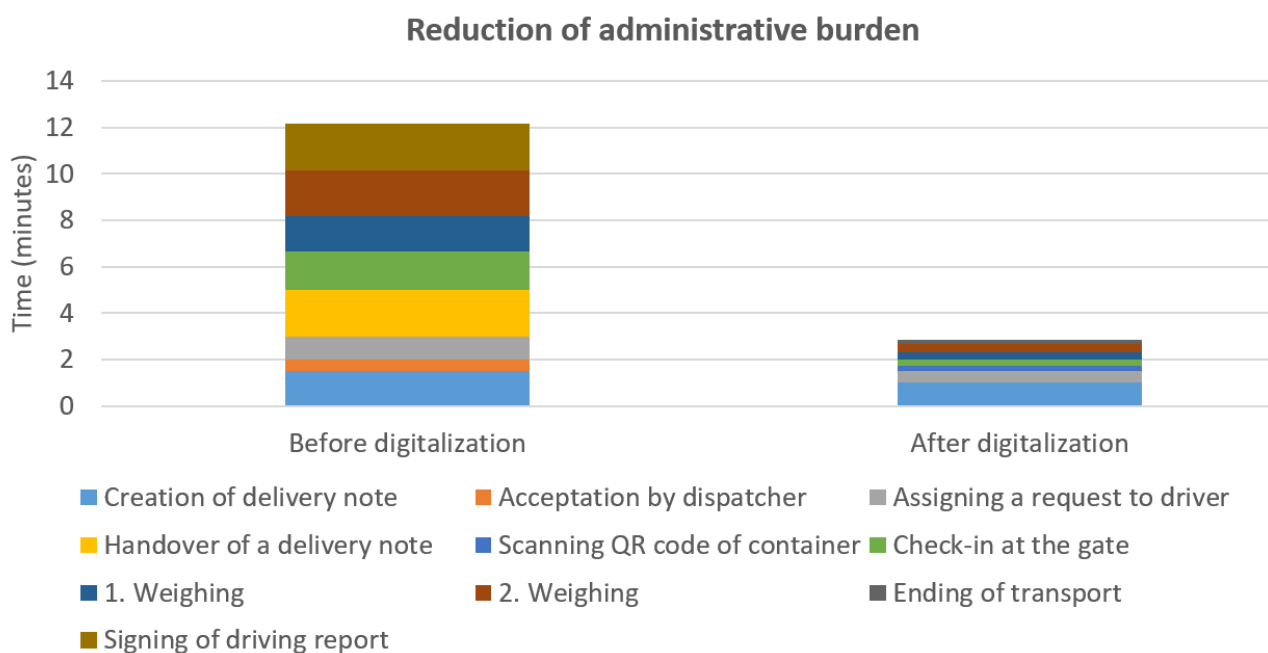
#### 4. Benefits of digitalisation of transport

The main benefits of digitalization of in-house transport are:

- Cost savings – annual savings from digitalization on labour costs amounts to EUR 100,000, another saving of EUR 5,000 is savings from printing and filling in papers.
- Acceleration of the entire transport process – by shortening administrative activities, up to 9 minutes were saved per transport. Drivers are able to make more transports during their shift. The contribution of individual measures to the acceleration of the whole process is shown in **fig. 3**.
- Data uniformity – thanks to data sharing, there is no need to retype data to the computer, that's speeds up the process and eliminates errors.
- Process control – thanks to the availability of data from the entire process, the process can be better controlled and further savings can be sought.

Costs of the digitalization were:

- Purchase of hand readers and computers for EUR 20,000.
- Programmers' work: 200 working days.



**Fig. 3** Saved time in minutes due to digitalization  
**Obr. 3** Úspora času po zavedení digitalizace (v minutách)

## 5. Conclusion

As part of the merger of Doprava TŽ, s.r.o. with the parent steel company TŘINECKÉ ŽELEZÁRNY, a.s., the entire transport process was digitalized and all paper documents were digitalized. All administrative processes have been digitalized. Telephone ordering of transport, filling in documents and rewriting data into a computer have been cancelled. Thanks to digitalization, the entire process has been accelerated and financial costs have been saved.

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*„Originál tohoto článku byl publikován ve sborníku konference METAL 2024 a je zde uveřejněn se souhlasem autora.“*