

Digital transformation in rail freight transport

Bringing all the information together

Compared to the digitally networked fleets of trucks on the road, freight by rail is hardly at the forefront of technology. Still applauding itself for a basic upgrade to quieter breaks, the industry is a long way from introducing automatic brake tests, vehicle sensors and “smart” freight wagons. Rail boundaries are often synonymous with system boundaries.

That said, railway operating companies do in fact employ many modern IT solutions. Electronic signal boxes allow safe driving with low personnel requirements. Freight trains are weighed as they pass over dynamic weighbridges, which also accurately record flat spots on wheels. Workshops equip vehicles and vehicle components with RFID tags for identification in inventory management. RFID readers confirm whether wagons are in the correct order as the train passes by. Video-supported systems monitor train arrivals and

departures. Software packages for integrated rail transport management, such as zedas®cargo and zedas®asset, combine shunting and long-haul traffic logistics with rail infrastructure and vehicle fleet maintenance. Many train drivers now carry tablets for electronic order handling and time and fault reporting. But does all this really amount to a digital transformation?

In all these examples, the solutions are just add-ons, implemented as stand-alone projects within a department,

division or company, with the primary goal being the quickest return on investment (RoI). Every isolated solution, however, generates a wealth of additional data that, in most cases, go unused.

Collecting the right data

Examples: Once the route is set and the signal is green, safe passage is assured. All data accrued up to then, such as train number, platform stepping, shipping information and time stamps, lose all meaning for the operative task of “safe driving”.

Wagenzug K60

DatumRF	FahrzeugID	FzgTyp	Reihung	PosZB	Status
13.04.2016 19:53:19	1232	04	0	0	OK
13.04.2016 19:53:23	5714	84	1	4	Reihung in Zugbildung fehlerhaft!
13.04.2016 19:53:26	5261	84	2	3	Reihung in Zugbildung fehlerhaft!
13.04.2016 19:53:30	5437	84	3	2	Reihung in Zugbildung fehlerhaft!
13.04.2016 19:53:33	5704	84	4	1	Reihung in Zugbildung fehlerhaft!
13.04.2016 19:53:37	5475	84	5	5	OK
13.04.2016 19:53:40	5280	84	6	6	OK
13.04.2016 19:53:43	5289	84	7	7	OK
13.04.2016 19:53:47	5296	84	8	8	OK
13.04.2016 19:53:50	5703	84	9	9	OK
13.04.2016 19:53:54	5413	84	10	10	OK
13.04.2016 19:53:57	5357	84	11	11	OK, aber Fehler RFID-Ausrüstungsstatus!
13.04.2016 19:54:00	5686	84	12	12	OK
13.04.2016 19:54:04	5687	84	13	13	OK
13.04.2016 19:54:07	5709	84	14	14	OK, aber Fehler RFID-Ausrüstungsstatus!
13.04.2016 19:54:10	5391	84	15	15	OK, aber Fehler RFID-Ausrüstungsstatus!
13.04.2016 19:54:14	5293	84	16	16	OK

Automatic monitoring of wagon order using RFID technology (marked area shows “Wrong order in train formation”)

At best, they land in the depths of log files, from which they are sporadically dug out again during troubleshooting. To determine tare and gross weights, for example, a dynamic weighbridge needs parameters to compare with, to know what goods and what type of wagon are being weighed. An electronic signal box can automatically prime a weighbridge with this shipping information.

After weighing, not only is the shipping weight of each individual wagon known, but also the number of axles, the respective wagon number, the position of the locomotive and, if equipped to measure them, the flat spots on every single wheel. For phasing out damaged wagons, an isolated piece of information such as "flat spot on 12th axle on right in direction of travel" is simply inadequate for functional

operation. Only with correct knowledge of the wagon order can one identify the wagon number of, say, the third four-axle wagon in a pushed train, on which the right wheel on the last axle is non-round. Manual recording of wagon order, which is still common practice these days, is an inexhaustible source of error.

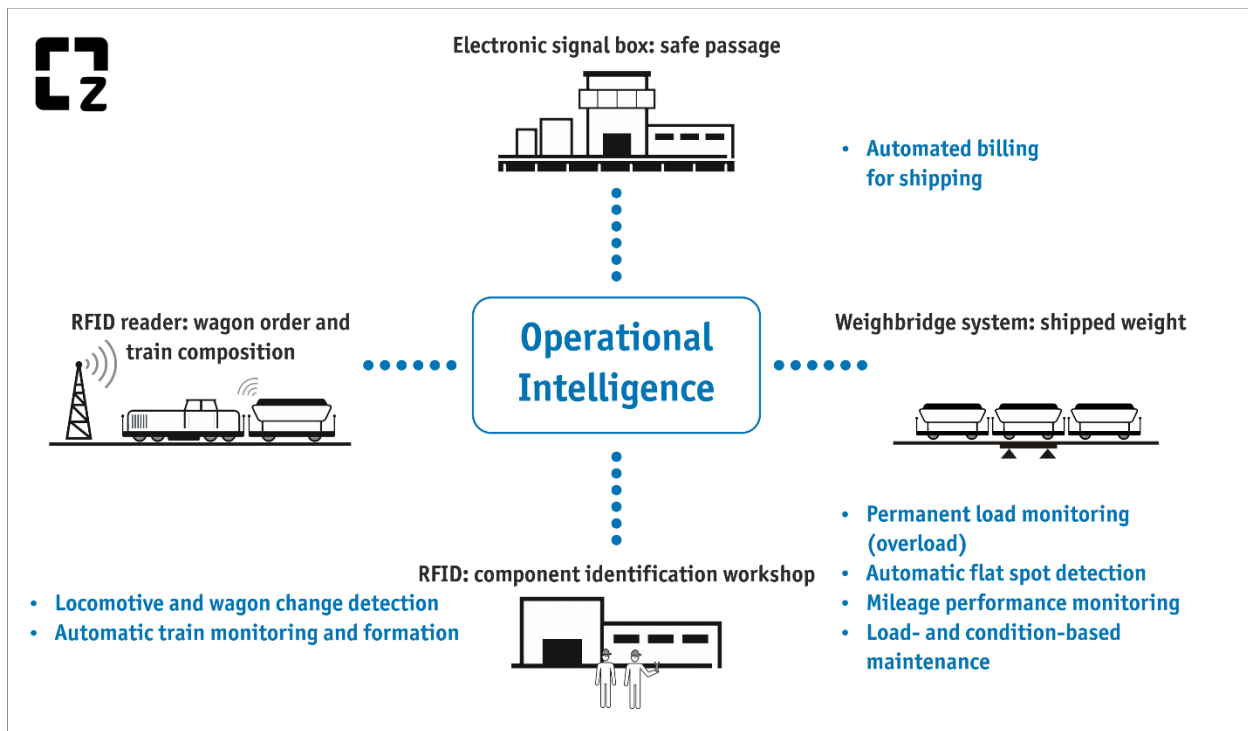
When the damaged wagon is phased out according to its wagon number, the workshop begins the search for which of the eight wheels is un-round. Workshops like to equip goods wagons with RFID tags on both sides of the body and uniquely identify the tag ID. It would make good sense, therefore, to link all the information regarding the detected flat spot, the wagon order and the ID together. This is easily and reliably achieved if an RFID reader on the

weighbridge captures the composition of the train as it passes over.

Information from different sources can be compared against each other, and thereby validated, for example by comparing the electronically preannounced number of wagons with the number of wagons detected by the weighbridge system, and with the RFID train composition.

When information is networked

All of these examples show how isolated solutions each generate information that will sooner or later be of interest to other stakeholders. Networking these separate projects and amalgamating the resulting data creates synergies. Operational intelligence increases for all parties involved: the rail transport company, infrastructure



Operational intelligence arises from linking information.

operator, workshop and shipper. With full information regarding train stepping from the electronic signal box, shipped weights from weighbridges, RFID-captured train compositions and order management in the logistics software, even billing can be automated for shipping orders. Locomotive and wagon changes are automatically recorded during shunting operations. Train formation is reliably detected electronically, while automatic wagon order monitoring facilitates train operation. Combining flat point detection at the weighbridge with RFID wagon ordering makes sure workshops receive unambiguous fault messages. This allows for condition-based maintenance. Train stepping and composition information can be combined together for performance monitoring of locomotives and wagons. The load on the track infrastructure can also be quantified, in turn allowing for load-dependent maintenance.

Data transformation adds value

Rail transport companies these days don't just make money from shipping goods. Generating and exchanging data, and linking them to create meaningful information for more efficient processes, is a lucrative practice for a railway company at the interface between customers, loading points, suppliers, vehicle manufacturers, rental services and maintenance companies. Carmakers have long embraced digitisation, and it's time for the rail companies to get on the bandwagon. The market is ready; the merchandise is high quality data. It is a business with a profitable future.

The first step on the path to digital transformation is not to treat operative, electronic data as "garbage" after its primary use. The second step is to prepare, formalise and amalgamate the data, and the third is to link the data together to create information.

This is the prerequisite for improving business processes, decisions and work efficiency. It takes a digital vision of one's own business and a culture of change to do this. A flexible organisation that can see "the big picture" will generate digital added value by rapid response to developments and trends. In this sense, digital transformation means unearthing the data treasure in one's company and using this raw material in one's own business processes.