

# Editorial

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The future is digital. As governments and companies around the world are realising that massive improvements, in terms of efficiency and effectiveness, are possible with digitalisation, so are infrastructure asset managers.

The optimal exploitation of digitalisation in infrastructure management, of course, regardless of type of infrastructure network being managed, requires substantial progress on three fronts: (i) clarification of the business processes used, including how asset decisions are made; (ii) clarification of the data required; and (iii) determination of how digitalisation can help.

The first of these requires an in-depth understanding of how the infrastructure management organisation works and what it is trying to achieve. The second requires an understanding of the amount and type of data to be collected and stored, as well as an understanding of the required accuracy and frequency with which it needs to be collected. The third requires an understanding of not only the state-of-the-art technologies but also how the business processes can be best modified to use these technologies. This is particularly complex as all business processes within the organisation have potential to be improved, and state-of-the-art technologies span an enormous spectrum. The latter includes sensors to be used to collect data, information technologies, such as building information modelling and geographical information systems to collate and distribute information, and software to automate tasks that are either too complex or too mundane for humans.

At the base of these three fronts, there has to be clarity as to why the infrastructure assets exist and why they are maintained – that is, what service is being provided; what happens to the service as the infrastructure itself deteriorates over time; and how the service is affected during maintenance and development interventions. This themed issue gives a view into some of the work being done in this direction (i.e. the definition, quantification, measuring and modelling of service) by researchers around the world. Although the work principally uses railway infrastructure assets as examples, the messages conveyed are transferable to the management of the assets in all types of infrastructure networks.

In the first two of the five articles, Papathanasiou and colleagues (Papathanasiou and Adey, 2020; Papathanasiou *et al.*, 2020) argue that the quantification of service should be done per stakeholder per unit time and that this improves the ability of infrastructure managers to determine optimal intervention strategies and programs, and to discuss these with stakeholders. Their proposal points to a possible future for all infrastructure asset managers, where solid agreement on definitions of service and its systematic quantification would lay

the foundation for consistent, transparent and digitally supported decision making.

In the third article, Lin *et al.* (2020) demonstrate how, in the absence of a quantification of service at a unit level, performance measures can be used to determine the optimal times to intervene on sidewalks. They offer a methodology for systematic decision making that could form the basis of a digitalised sidewalk asset management system.

In the fourth article, Fecarotti and Andrews (2020) demonstrate how advanced simulation techniques can be used to assess the effects of maintenance on the performance of railway networks. The use of their techniques enables improved understanding of the interactions between management, infrastructure and service. It is easy to see how the embedding of these techniques into a digitalised infrastructure management organisation would help to ensure asset management decisions that maximise the net benefit of all stakeholders.

In the fifth and final article, Meesit and Andrews (2020) offer a way to minimise the impact on railway users due to maintenance by optimising replacement bus services during infrastructure possessions, an area that is often given inadequate attention, but is nonetheless essential to understand making the best possible asset management decisions. It is only through giving adequate attention to how stakeholders are affected due to infrastructure interventions that asset managers can minimise the negative impacts for stakeholders while the interventions are being executed.

In summary, the work presented in these five articles, as well as that to be presented in the second part of this themed issue in December 2020, are helping to define, quantify, measure and model infrastructure service, and are, therefore, paving the way for the optimal exploitation of digitalisation in infrastructure management.

Happy reading.

## REFERENCES

- Fecarotti C and Andrews J (2020) A Petri net approach to assess the effects of railway maintenance on track availability. *Infrastructure Asset Management* 7(3): 201–220, <https://doi.org/10.1680/jinam.18.00046>.
- Lin P, Yuan XX, Li K and Fang H (2020) Development of performance measures for pedestrian sidewalk asset management. *Infrastructure Asset Management* 7(3): 190–200, <https://doi.org/10.1680/jinam.19.00066>.
- Meesit R and Andrews J (2020) Optimising rail-replacement bus services during infrastructure possessions. *Infrastructure Asset Management* 7(3): 221–238, <https://doi.org/10.1680/jinam.18.00042>.

Papathanasiou N and Adey BT (2020) Usefulness of quantifying effects on rail service when comparing intervention strategies. *Infrastructure Asset Management* **7(3)**: 167–189, <https://doi.org/10.1680/jinam.19.00071>.

Papathanasiou N, Adey BT and Burkhalter M (2020) Defining and quantifying railway service to plan infrastructure interventions. *Infrastructure Asset Management* **7(3)**: 146–166, <https://doi.org/10.1680/jinam.18.00044>.