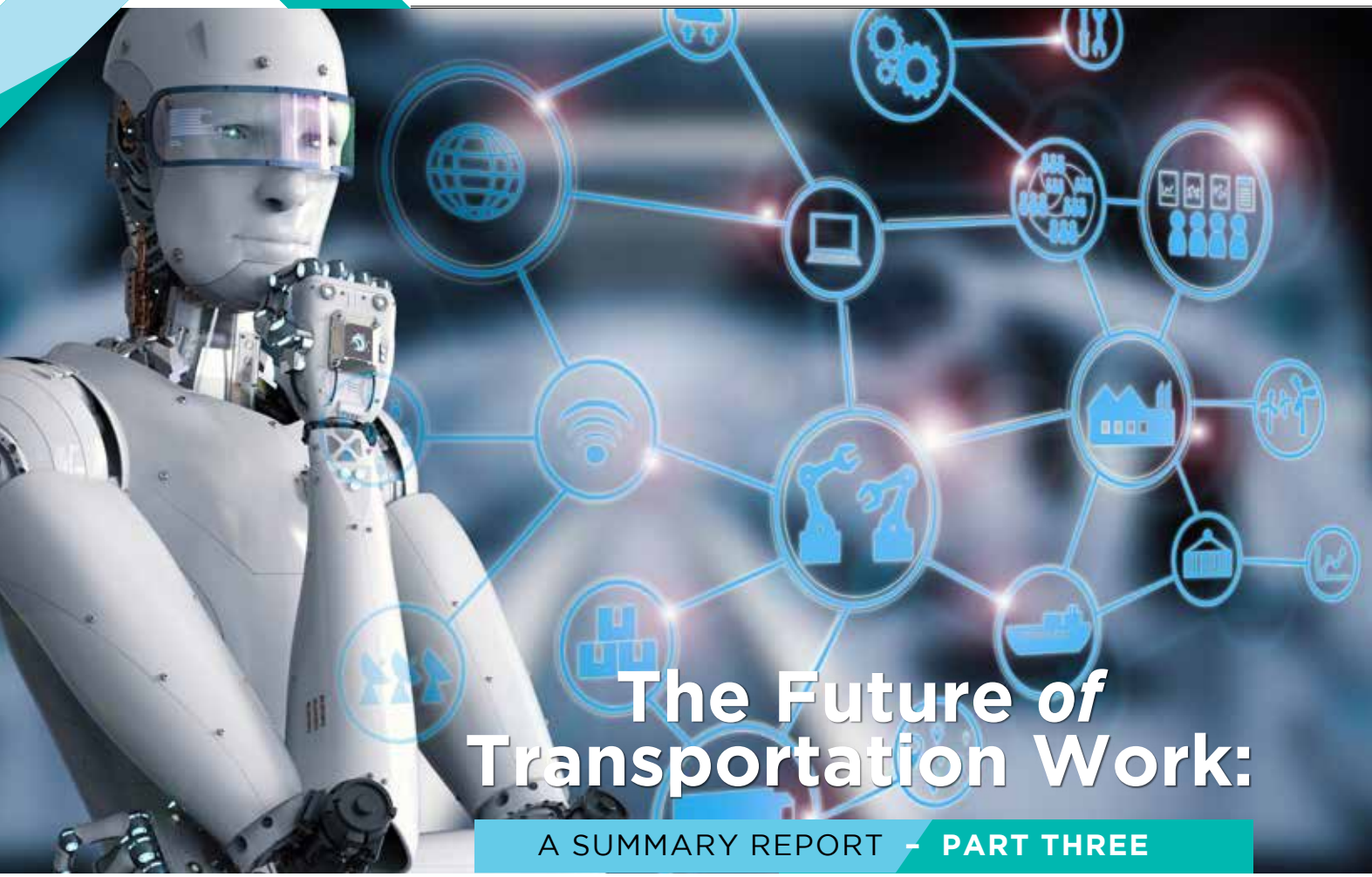

The Future *of* Transportation Work:

A SUMMARY REPORT – PART THREE

by **BY DR JIM STANFORD AND MATT GRUDNOFF** *as adapted by WA Transport Magazine.* // *Centre for Future Work at the Australia Institute*

Twin Drivers of Change

Australia's transportation industry continues to grow and develop, and it will become even more important to the national economy in the decades ahead. But the sector faces enormous uncertainties and challenges that will exert a powerful but unpredictable influence on transportation services, and transportation jobs, in the future.

Of course, one crucial driving force of change is the accelerating pace of innovation in the technology of transportation: including propulsion systems, driving and navigation, logistics, and information and data management technologies. But it is not just technology that will determine the future of transportation work. Other pressures are also acting on the sector, such as environmental challenges, fiscal and governance issues, globalisation, and demographic ageing. One particularly important driver of change in transportation work is the changing nature of employment relationships. New forms of engagement and compensation (including various self-employment and contractor arrangements), and the vertical disintegration of supply chain relationships (with more work occurring in independent ancillary firms rather than being integrated within a single enterprise), are affecting transportation jobs at least as much as new technology.

Transportation stakeholders must consider 'both' of these key drivers of change, as they position themselves to make the most of future opportunities, while minimising the negative effects of disruption.

DISRUPTOR #1: Technology

Most analysts agree transportation will be one of the sectors most dramatically affected by coming waves of innovation and automation. The startling prospect of driverless vehicles traversing the nation's roadways has captured much public attention (and elicited much concern); but there are many other less visible, but equally important, ways in which new technology will affect transportation jobs. This article will review new directions in technological innovation, and catalogue some of the important ways that new technology will affect the production and delivery of transportation service.

Predictions that machines will "destroy" large numbers of jobs, and impoverish the people who used to perform them, have been made for hundreds of years – dating back to the industrial revolution.

It is a historical fact that past waves of innovation did not produce mass unemployment

as a lasting outcome. To be sure, unemployment is a chronic concern, but it is not consistently correlated with technology. To the contrary, in some instances new technology, by sparking stronger business investment, led to stronger job-creation and 'lower' unemployment. So we must be skeptical about pessimistic predictions that technology will displace large numbers of workers and cause widespread unemployment.

But there are also clear ways in which the current wave of technological change is indeed "different" from those that preceded it, and hence its labour market impacts may be more concerning. Current innovations in computing and automation are capable of undertaking whole new sets of tasks that in the past were not amenable to machine-aided production.

Traditionally, functions being automated had to be routine and precisely described by programming code. These could be manual tasks (involving the movement of objects) or cognitive (involving the manipulation of data), but in either case automation was only possible for routine and replicable functions.

The current wave of automation, in contrast, allows the automation of 'non-routine' tasks -- including those that require judgment, flexibility, and decision-making capacity, in the face of non-controllable or unpredictable environments and stimuli. These new applications include machine learning (ML), data mining, machine vision, computational statistics, artificial intelligence (AI), and mobile robotics. In every case, computers rely on large databases of past experience to make best judgments in the face of unpredictable circumstances. This allows them to undertake non-routine functions, again covering both manual and cognitive tasks.

Since machine learning and other new computing strategies allow for a wider range of tasks to be computerized, economists are now considering the impacts on employment. One approach, pioneered by economists Carl Bendict Frey and Michael Osborne, involves detailed audits of various occupations to simulate their amenability to computerisation. They analysed the specific task content of different jobs, and then judged the extent to which they could be automated given the new abilities of computers to perform non-routine functions. They came to the startling conclusion that almost half of all jobs in the U.S. economy were "highly vulnerable" to automation within a few years, on the basis of technology that already exists.

Moreover, transportation was seen as one of the most-affected industries; Table 2 reports the Frey and Osborne estimates of the vulnerability of several key transportation occupations to computerisation.

These results need to be interpreted very cautiously. Frey and Osborne do not suggest that half of all jobs will 'disappea'r: there are many countervailing forces that will tend to create other work, as the process of automation unfolds. But as an indicator of the number of jobs likely to fundamentally changed by the new wave of automation, the Frey and Osborne results are insightful, and have sparked significant follow-up research extending and replicating their results.

In the next edition of WA Transport Magazine will be Part Two of the 'Twin Drivers of Change'. ■

PROBABILITY OF COMPUTERISATION, TRANSPORTATION OCCUPATIONS

OCCUPATION	PROBABILITY	OCCUPATION	PROBABILITY
Commercial pilots	55%	Transportation attendants	75%
Transit & railroad police	57%	Heavy truck drivers	79%
Transportation & distribution managers	59%	Railroad brake / signal / switch operators	83%
Motorboat operators	62%	Railroad conductors	83%
Bus drivers	67%	Industrial truck drivers	93%
Postal mail carriers	68%	Locomotive engineers	96%
Light truck & delivery drivers	69%	Driver sales workers	98%
Aircraft mechanics	71%	Shipping & receiving clerks	98%
Bus & truck mechanics	73%	Cargo & freight agents	99%

Source: *Adapted from Frey and Osborne (2016).*

> ONE CRUCIAL DRIVING FORCE OF CHANGE IS THE ACCELERATING PACE OF INNOVATION IN THE TECHNOLOGY OF TRANSPORTATION: INCLUDING PROPULSION SYSTEMS, DRIVING AND NAVIGATION, LOGISTICS, AND INFORMATION AND DATA MANAGEMENT TECHNOLOGIES

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