What are we doing to get the future transport skills we need?

Presented by
Stephen Hewett and Doug Wilson,
Skills gaps assessment for ITS in 2035

NZTA RR 639 Technology related transport skill requirements and availability

BERL
- Julian Williams; Fiona Stokes; Hugh Dixon

Beca
- Stephen Hewett

University of Auckland
- Douglas Wilson; Prakash Ranjitkar; Sujith Padiyara;
  Bevan Clement; Puti Wilson
Research Topic Focus

In an ITS environment in NZ by 2035, what are the likely gaps between demand and supply of:

- **Occupations** – a basket of skills
- **Skills** – a basket of qualifications and learning by doing
- **Qualifications** – a basket of training
- **Training** – a basket of learning experiences: codified and tacit, formal and on the job

Of ITS workers:

- **Professionals** – engineers, ICT, planning, policy
- **Technicians** – engineers, ICT, automotive technicians, etc
- **Others** – drivers

**This presentation focuses on skills gaps expressed as occupation gaps**
Research Framework

Conceptual framework:

- Technological change creates a change in demand for occupations
  - which creates a change in the demand for skills
    - which induces a change in qualifications sought
      - which leads to a change in demand for training

Evidence base (from research project):

- ITS studies – global (eg TSC) and local (eg ATAP)
- experts and stakeholders - individuals, survey and workshops (Auck & Wgtn)
- labour market statistics (official counts – Census 2013)
- macroeconomic modelled projections (BERL model) of future economy
Method – Skills Gaps

Assess technological change

• create scenarios of ITS uptake in terms of: technologies; transport users; public policy
• assess order of magnitude (%) of ITS change by 2035 – reports/experts

Assess skills change

• qualitatively assess types of skills that will change
• assign order of magnitude change from a baseline

Assess skills gaps

• project 55 occupations in demand in 2035 as a baseline (assume no-ITS)
• adjust each baseline projection with an order of magnitude change due to ITS
• conclude gaps in occupations in demand in 2035 for ITS scenarios from baseline
Assess Technological Change – S curves Profile

CONSUMPTION SPREADS FASTER TODAY

PERCENT OF U.S. HOUSEHOLDS

100%

80%

60%

40%

20%


ELECTRICITY  TELEPHONE  AUTO  RADIO  MICROPHONE  DISH-WASHER  CLOTHES DRYER  CLOTHES WASHER  AIR CONDITIONING  COLOR TV  COMPUTER  VCR  INTERNET

SOURCE MICHAEL FELTON, THE NEW YORK TIMES

HBR.ORG
Key underlying technologies for ITS are:

- Autonomous vehicles
- Internet of Things (IoT's)
- Big data
- Radio frequency identification technology (RFID)
- Geographic Information Systems (GIS)
- Global Positioning System (GPS)
- Dedicated-Short Range Communications (DSRC)
- Vehicle to Vehicle (V2V)
- Vehicle to Infrastructure - V2I

- Decision Support Systems
- Traffic Analysis and Modelling
- Variable Message Signs (VMS)
- Road Weather Information Systems (RWIS)
- Database Management Systems (DBMS)
- Data mining
- Security and access management
- Parking management systems
- Mobility as a Service-(MaaS)
Waterview Interchange & Tunnel
Transport Futures, Mobility and Smart Cities

- Understanding the need for mobility and changes over time
- There are many ‘new technologies’ – many not necessarily solving a real transport problem
- Important to understand the transport user drivers for change
- There are multiple potential scenarios some positive, some negative
- It is important that we address the right problems

http://164.100.127.26/agartalasmartcity/cont.pdf
Changes in Urban Future Investment by GPS

GPS 2021/22 to 27/28 - Last 7 years Mean

- Transitional Rail: 39
- Investment management: 76
- Local Road Maintenance: 721
- State Highway Maintenance: 734
- Road Safety promotion and Demand Management: 97
- Road Policing: 384
- State Highway Improvements: 711
- Regional Improvements: 139
- Local Road Improvements: 328
- Walking & Cycling Improvements: 97
- Rapid Transit: 408
- Public Transport: 741

Funding $M
Future ITS Uptake Pathways
Skills change example – drivers and auto technicians to 2035

Commercial drivers:
• slow - same
• rapid - less – Automation, Drones

Automotive technicians:
• slow - more – high tech diagnostic
• rapid – more – higher codified skills – brand specific
Skills change example – drivers and auto technicians to 2035

Engineers – professional & technical:
- slow – more – policy & planning – outcomes focused
- fast – more – multidisciplinary – human centric - collaborative

ICT – professional & technical:
- slow – more – data analytics
- fast – more – collaborative
  - information solutions
  - software solutions
## Occupation projections with no ITS technology change – BERL model

<table>
<thead>
<tr>
<th>Occupation</th>
<th>1991</th>
<th>2015</th>
<th>2035</th>
<th>%pa</th>
<th>%pa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineer occupation group total</td>
<td>20,223</td>
<td>27,880</td>
<td>39,685</td>
<td>1.3%</td>
<td>1.8%</td>
</tr>
<tr>
<td>ICT occupation group total</td>
<td>20,244</td>
<td>52,025</td>
<td>72,405</td>
<td>4.0%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Driver occupation group total</td>
<td>30,528</td>
<td>47,295</td>
<td>68,105</td>
<td>1.8%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Repair and maintenance occupation group total</td>
<td>18,441</td>
<td>22,785</td>
<td>32,420</td>
<td>0.9%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Logistics occupation group total</td>
<td>5,634</td>
<td>6,615</td>
<td>8,360</td>
<td>0.7%</td>
<td>1.2%</td>
</tr>
<tr>
<td>Salesperson occupation group total</td>
<td>2,493</td>
<td>3,455</td>
<td>4,465</td>
<td>1.4%</td>
<td>1.3%</td>
</tr>
<tr>
<td><strong>Total 55 key occupations</strong></td>
<td>95,070</td>
<td>160,055</td>
<td>225,440</td>
<td>2.1%</td>
<td>1.7%</td>
</tr>
</tbody>
</table>
### Occupation projections – with ITS technology change – type and order of magnitude

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Total employment counts 2035</th>
<th>Difference between scenario and base line</th>
<th>Percentage change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base line</td>
<td>Scenario one</td>
<td>Scenario four</td>
</tr>
<tr>
<td>Engineer occupation group total</td>
<td>39,685</td>
<td>41,640</td>
<td>45,615</td>
</tr>
<tr>
<td>ICT occupation group total</td>
<td>72,405</td>
<td>75,965</td>
<td>83,215</td>
</tr>
<tr>
<td>Driver occupation group total</td>
<td>68,105</td>
<td>64,670</td>
<td>57,875</td>
</tr>
<tr>
<td>Repair and maintenance occupation group total</td>
<td>32,420</td>
<td>32,175</td>
<td>31,700</td>
</tr>
<tr>
<td>Logistics occupation group total</td>
<td>8,360</td>
<td>8,765</td>
<td>9,605</td>
</tr>
<tr>
<td>Salesperson occupation group total</td>
<td>4,465</td>
<td>4,465</td>
<td>4,465</td>
</tr>
<tr>
<td>Total 55 key occupations</td>
<td>225,440</td>
<td>227,680</td>
<td>232,475</td>
</tr>
</tbody>
</table>
So what are the impacts

- The NZ education system is unable to meet the demand for skilled jobs in the Tech sector

- Gaps in resource could grow as the demand for new tech rich capabilities increase across the ITS sector

- The education market is developing new Tech skills training for the industry, but is it too slow?

- Growth in trendy ICT skills but less trendy skills lag further behind
ITS NZ is currently seeking interested companies, those wish to develop new Tech skills whilst supporting the development of youth specifically for the ITS industry.

ITS NZ are proposing:

The formation of a panel of like minded industry participants to develop a framework for ITS Skills Development by the industry for the industry.
Why Should The Industry Get Involved?

- Can not leave this to universities and technical institutes

- The Industry can and needs to assist in the creation of new skills

- We need to trial new pathways to employment from tertiary to the industry

- Need to test learning via practical methods, using industry problems or current projects.
How will AI and Automation affect our industry?


Percentage time spent on activities that can be automated

<table>
<thead>
<tr>
<th>Time spent in all occupations</th>
<th>Manage</th>
<th>Expertise</th>
<th>Interface</th>
<th>Unpredict. physical</th>
<th>Collect data</th>
<th>Process data</th>
<th>Predictable physical</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>8</td>
<td>17</td>
<td>15</td>
<td>11</td>
<td>63</td>
<td>60</td>
<td>69</td>
</tr>
<tr>
<td>New Zealand</td>
<td>10</td>
<td>20</td>
<td>13</td>
<td>11</td>
<td>17</td>
<td>15</td>
<td>16</td>
</tr>
</tbody>
</table>
Review of Training / Curriculum

- University degree and post graduate level
- Polytechnic level
- Schools – and pathways for Science and Technology
- Private sector – Employers
- New providers (eg. Ecole 42 – Udacity)
- Training Modules for specific skills
Who benefits?

- **Individual future thinkers** with new applied learning skills and industry specific knowledge.
- **The industry** with the ability to hire agile thinkers with relevant skills – not all of these skills can be ‘purchased’
- **Government and RCA’s** that need skills and thinking that test new thinking & technology
- **Tertiary sector** that produce graduates with not only relevant skills and knowledge but problem solving context
- **ITS and the industry** with greater cross industry engagement
- **Youth** in schools that don’t necessarily see infrastructure as a potential or possible employment avenue.
How can we solve wage inequality as mid-level jobs decline due to automation?

Ethical and Social Responsibility

- Engineering NZ Professional Code of Ethics – **Our ethics are based on professional competence, personal integrity and social responsibility.**

- Change and demand for new skills is clear

- As Government, Agencies, Employers and Employees we should better value our human resources and ensure opportunities are provided for reskilling, training

- Cross sector working groups are required to monitor effects and training needs

- Distributional and socio equity issues – how do we ensure there are not ‘winners’ and ‘losers’

- How do we create the environment for new skills to be learnt and shared – technology test beds for learning and training

- We have a shared responsibility.
Summary

- Change is happening – skills and technologies will come and go but pace of change is rapid in some areas
- Agility in employees and employers is key – those that see opportunities and retrain to gain skills early will reap greatest benefits
- Corporate and Government responsibility - to leave no one behind – create ‘win-win solutions’
- Create technology test beds for testing and evaluation and shared learnings
- Allow / encourage life-long learning – grow our own NZ skills
- Cross sector and multi-disciplinary involvement required – get involved – be willing to help others in their careers.
So what are your thoughts on your needs for future transport skills?