

Transport Operations Research Group - University of Newcastle

by Professor Phil Blythe, Director of TORG

This report describes the activities and portfolio of current research of the Transport Operations Research Group (TORG) during the year from March 2002 to date. Readers interested in acquiring a copy of any of the papers or reports referred to in this report, or in obtaining further information on current research, future Symposia, short courses, postgraduate study and PhD research should contact Mrs Christine Earle-Storey.¹

Staff Changes

Phil Blythe was appointed to the statutory Chair of Transport in March 2004 and also was confirmed Director of the TORG, for which he had been acting Director since the restructuring of the University in late 2002.

We welcome Annet Elhert who joined the Research Staff as a Research Associate in September 2003 to work on the EU SENSOR Project and to Oliver Heidrich a Research Associate in Environmental Engineering who has been appointed by TORG to provide research support on whole life-cycle assessment of asphalt.

In the Travel Dispatch Centre (TDC) Sarah Blakey left to pursue further studies and was replaced by Glynis Mitchinson and Stephen Hurst. Stephanie Murray took-up an administrative role in the TDC.

Sir Patrick Brown, former Permanent Secretary to the Department of Transport, Barry Hutton of the Transport Research Institute, Napier University and Professor Mike Bell from Imperial College continue as Visiting Professors to TORG. Fred Crouch was re-appointed as a Visiting Lecturer.

Prof AK Sharma of the School of Planning and Architecture, Delhi, a distinguished alumni of TORG, visited in April to discuss strengthening of links.

Research Students

Congratulations to Hakan Aslan on the award of his PhD.

Theses were submitted by Vincent Chow, Annet Elhert, Tessa Sayer and Susan Darroch during the year.

Welcome to Paulus Aditjandra, Amy Guo, Jati Hatmoko, Yue Huang and Xuefang Wang who have all begun their studies in TORG in the past year.

Investment in the School of Civil Engineering and Geosciences

Following the restructuring of the University in late 2002, the Transport Operations Research

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Group (TORG) is now part of the new School of Civil Engineering and Geosciences (CEGS). The School clearly recognises the significant contribution that TORG continues to make to research and teaching and have actively pursued the filling of the vacant Chair in Transport. The School wishes to extend their gratitude to Professor Richard Allsop for his unstinting support and for acting as an external advisor to this process.

Following the successful filling of the Chair in Transport, the School is currently looking to appoint to the newly established Chair in Earth Systems Engineering (a cross-cutting research theme across the whole School) and to 5 lecturer/senior lecturer posts across the School. It is anticipated that an announcement concerning new academic staff appointments in TORG will be made by the summer of 2004.

Finally we are delighted to report that Dr John Nelson will be appointed to a personal chair in Public Transport in August 2004.

Short Courses and Taught Postgraduate Degree Programmes

The three Transport MSc courses offered at Newcastle continue to flourish with the largest ever cohort of students registered on the 2003/04 programme.

The 30th Annual Residential Course on Asphalt Materials and Flexible Pavements was attended by over 110 delegates in September 2003.

Newcastle hosted the DfT's Transport Card Forum meeting in November 2003 as well as the UTSG conference in January 2004.

The short courses on Traffic Management; Vissim-users, and Railways were all successfully re-run and have become firmly established annual events for the transport industry.

New Projects for 2004

TORG has had a remarkably successful start to 2004 with more than £750,000 of new research funding awarded since the beginning of the year.

The DRT team have been awarded a number of new contracts in early 2004: John Nelson is the co-ordinator of CONNECT an FP6 project which is to gather and manage information on on-going research, the state-of-the-art and good practices in flexible transport. Another significant initiative is SUNRISE (an INTERREG 3C project with an emphasis on the role of DRT in contributing to social inclusion); advisory roles with GMPTe and Fife Council have also been awarded.

The ITS team has been awarded several contracts in early 2004: Steve Scott has secured funding from several sources to kick-start a new area of strategic research for TORG, namely the use of Virtual Reality to monitor and assess behaviour, safety and ITS systems in transport – this utilises the new Virtual Reality Centre that

has just opened in the Environmental and Sustainability Institute at Newcastle University. Phil Blythe has secured an IST 6th Framework Integrated Project (ASK-IT) to develop and trial innovative location-based technologies for elderly and disabled travellers. In addition several contracts have been secured: in the area of pervasive computing and mobile ad-hoc networks for transport applications; in smartcards/biometrics research; and also a framework contract to provide ITS support to the DfT. TORG have also been awarded one of the DfT's new Horizon Programme research projects to study applications of Smart-dust in Transport.

Roger Bird has recently been awarded a research project looking at the life cycle assessment of road paving materials and their impact on the environment.

Neil Thorpe will lead TORG's role in SOLUTIONS an EPSRC Sustainable Urban Environment Programme project led by Cambridge University.

Professional Activities

Professor Phil Blythe was appointed to the Chair of Transport and as Director of TORG in March 2004. Phil continues as the Director of Business Development for the new School of Civil Engineering and Geoscience and sits on the Executive Board of the School. He also leads the Transport in Infrastructure Research Grouping which comprise the transport, structures and geotechnical expertise within the school; as well as the recently formed ITS Research Unit which coordinates multi-disciplinary research in Intelligent Transport across the Schools of: CECS; Computing Science; and Electronic Engineering. His core research activities have focused in three main areas over the past year: research into a number of aspects of road-use pricing including the development of the strategy for the recruitment of volunteers for the DfT's National Trial of Road User Charging technology within the framework of the DIRECTS project in Leeds (jointly with Thorpe), an analysis of future communications and networking technologies and their applicability to road pricing, and advising TFL on the congestion charging technology trials; in the area of smart cards he has continued to advise the DfT, he has recently completed a projects on options and attitudes to biometrics on transport smartcards and on soft benefits of local authority smartcards, he continues to sit on the Steering Committee of the North East Regional Smartcard Consortium (NERSC); and thirdly the development of e-transport and e-Government location based services through a variety of delivery platforms including mobile devices and PDAs and their integration within mobile ad-hoc networks and intelligent agents in the EU funded projects IMAGE and ASK-IT.

He has published widely during the year and has presented papers and keynote addresses at

conferences across the UK, in several European countries and at the ITS World Congress in Madrid as well as chairing several conferences and professional gatherings.

Phil's other professional activities include the steering committee of the DfT's Transport Card Forum, the Executive Board of the IEE's Professional Network in Automotive and Road Transport Systems and as a member of the EPSRC Peer Review College.

Roger Bird has continued his research and teaching activities within the Transport Group and the School of Civil Engineering and Geosciences. He leads the undergraduate Transport Engineering and Transport Infrastructure modules, and the postgraduate module in Traffic Management Techniques. He also supervises the Integrated Design Project with Stage 3 undergraduates. He is also the Pavior's part-time lecturer in Highway Engineering at Imperial College, London. The Annual Residential Course in Flexible Pavements and Asphalt Materials, of which he is Course Director, celebrated its 30th consecutive year. This course, run jointly with the Quarry Products Association, receives 75-100 delegates each year from a wide range of employers across the asphalt industry in the UK. Within TORG he is Principal Investigator for SENSOR, an EU funded project looking into the potential application of traffic sensors on the secondary road network. He is also Principal Investigator for a project to develop a methodology for area-wide safety audits for a local authority in the light of long term accident trends. His research interests include the consistency of alignment of rural single carriageway roads, highway design standards, junction capacity calculation methods, the quality of cycling infrastructure and life cycle assessment of road paving materials.

Dr John Nelson has continued to be engaged in many activities relating to his principal research area of Demand Responsive Transport (DRT). A highlight of the year included the publication of Demand Responsive Transport Services: Towards the Flexible Mobility Agency which was endorsed by UITP at a launch in Florence in December. A companion volume on e-logistics is currently in preparation. The award of the FP6 CONNECT project provides a platform for continuing collaboration with many European partners whilst locally, the recently-established Regional DRT Group is attracting national attention.

New appointments during the year included the Editorial Advisory Board of the Journal of the Ghana Institution of Engineers, Junior Vice-Chairman of the North Eastern Branch of IHT and an invitation to become external examiner to the MSc Transport Engineering and Planning course at Salford University. Overseas activities included a keynote address at the 2nd Arab Transport and Road Symposium in Bahrain in October and as an evaluator of the Government of Belgium Sustainable Mobility Programme. Other continuing professional activities include membership of the EPSRC Peer Review College

and the DfT's Clear Zone's Steering Group.

Corinne Mulley. This is the first year that she has undertaken both teaching and research in TORG, working with the Passenger Transport and Policy Unit in TORG on the research side and with MSc students in Transport. In the past year she has been particularly involved in the completion of the EU funded TRANSECON project which looked at the evaluation of the long term socio-economic impacts of urban transport policies and investments. Other projects have included a study of the 'soft' benefits of multi-application smart cards and the study of bus delay using GPS techniques. TORG has facilitated a UK group of urban bus operators, some of whom are now in the second stages of benchmarking where they are examining particular practices and learning from best practice. External activities have focussed on giving papers on benchmarking and participating in the activities of the ILT and election to the UTSG Committee.

Dr Steve Scott continues as Degree Programme Director for the postgraduate courses in Transport, which are attracting increasing numbers of students, with 51 students registered this year on the three Transport MSc programmes. He now chairs a group looking at quality assurance for the School in preparation for the forthcoming QAA Institutional Audit and remains as Chairman of the Editorial Advisory Board for Emerald's International Civil Engineering Abstracts. A recent paper published in the ASCE Journal of Professional Issues reports on research related to the new Society of Construction Law's Protocol for dealing with delay claims – a continuing theme in Steve's work. He continues to develop his interests in the use of virtual reality in transport environments and funds are now available to bring together a microsimulator and the new virtual reality suite at Newcastle University to provide a virtual traffic environment, which it is anticipated will bring in substantial funding in the future.

Neil Thorpe, Lecturer in Transport Studies, has focussed his research activity during the year on road-user charging and road safety. He has remained closely involved in the Department for Transport's (DfT) DIRECTS trial of interoperable road-user charging systems, and continues to manage two DfT research studentships which involve developing a system of charging HGVs for pavement damage and investigating the impact of charging on household activity patterns. In road safety, he continues as the independent data analyst for the Northumbria Safety Camera Partnership. Other research activities at the local level remain focussed on Local Transport Plan issues including public attitude surveys, Best Value, public transport provision in Northumberland and developing GPS-based solutions for investigating urban bus delay. He remains a co-opted member on the Quayside Transit Working Group to advise on automatic guidance technologies for buses. He has continued in his role as the Principal Investigator for the EU's 5th

Framework Programme project into long-distance passenger travel, and as co-investigator for the EMIREs project. Neil has recently been awarded the SOLUTIONS project under the EPSRC Sustainable Urban Environment Programme. He has also continued in his role as an expert evaluator for the Belgian Government's Sustainable Development research programme.

SUMMARY OF CURRENT PROJECTS

PUBLIC TRANSPORT: PROJECTS

Phone and Go (Northumberland County Council, from April 2001 to August 2004). *Dr J.F. Brake, Dr S.D. Wright. Contract holder: Dr J.D. Nelson. Partners: Tynedale and Getabout Rural Transport Partnerships, Northumberland Care Trust, Berwick Borough Council.*

The objective of Northumberland County Council's Rural Bus Challenge project is to demonstrate and evaluate Demand Responsive Transport (DRT) services in two diverse rural locations. The trial sites incorporate a variety of DRT route concepts and trip-booking scenarios. An additional five services are now part of the Phone and Go project. A Travel Dispatch Centre (TDC) has been established at TORG where routes are planned, scheduled and dispatched to the DRT vehicles using MobiRouter software. TORG is responsible for managing the TDC, implementing service design and is the Evaluation Manager for the Phone and Go project. A separate contract for project management services has required the preparation of an overall technical and financial project plan and on-going project management support.

Reports: Mageean, Nelson and Wright (2003a, 2004a and b).

Click and Go (Northumberland Health Authority, from April 2001 to August 2004). *Dr M.A. Smith. Grant holders: Dr J.D. Nelson and Dr J.F. Brake.*

This project investigates possible savings to the health services through transferring patient transport trips on to public transport. The long-term aim is to facilitate health trip planning through the County Council's journey planner, utilising the Phone and Go dispatch centre. A pilot evaluation into bookable health trips is to be carried out as part of the monitoring of a semi-fixed route taxi service, introduced to give access to GP's surgeries from the village of Shilbottle.

Reports: None yet available

Flexible Agency for Collective Demand Responsive Mobility Services (FAMS) (CEC 5th Framework, IST Programme, from April 2002 to February 2004). *Dr J.F. Brake. Contract holders: Dr J.D. Nelson, Dr J.F. Brake. Partners: ATAF SpA (Italy), Softeco Sismat SpA (Italy), European Transport and Telematics Systems Ltd. (Rep. of Ireland), SITA SpA (Italy), Angus Transport Forum, MobiSoft Oy (Finland).* FAMS is developing Demand Responsive Transport (DRT) services in Angus (a greenfield

site) and Florence (pre-existing site) as part of this Take Up Action. Existing DRT management tools are being adapted and made interoperable as part of the implementation and trial of the Flexible Agency concept. This operates in a collaborative environment amongst diverse transport service suppliers thereby providing a new value added service chain to customers. TORG is providing technical support to Angus Transport Forum by advising on: the establishment of the Angus Travel Dispatch Centre; the conduct of the User Requirements Analysis; and the evaluation and monitoring studies (including the Evaluation Plan design for both FAMS demonstration sites). In addition, liaison activities are conducted with other DRT scheduling systems in the UK.

Reports: FAMS (2003); Mageean and Nelson (2003); Finn, Mageean and Nelson (2003). All publicly available documents are at: <http://www.famsweb.com/>

Monitoring and evaluation of Demand Responsive Transport services for PTEG

(Passenger Transport Executive Group (PTEG, from May 2002 to May 2004). Dr J.F. Brake. Contract holders: Dr J.D. Nelson, Dr J.F. Brake. Partners: Nexus, West Yorkshire PTE, Greater Manchester PTE, South Yorkshire PTE, Strathclyde Passenger Transport, Centro, Merseytravel.

Following their success in securing substantial funding from the (then) DTLR Urban and Rural Bus Challenge programmes, the seven PTEG members have developed and implemented Demand Responsive Transport (DRT) services at diverse sites. These services are operating with varying levels of ITS and different strategies for service design in urban and rural areas. TORG has developed and is implementing a generic evaluation methodology, as it is a particular requirement that the methodology adopted is transferable to other DRT schemes so as to ensure a valid cross-site evaluation. Data collection in the field is using multi-application survey forms (face-to-face/postal/telephone) which have been designed for seven identified types of user groups.

Reports Mageean, Nelson and Wright (2003b):

Monitoring and evaluation of the Cango Demand Responsive Transport service (Hampshire County Council, from July 2002 to May 2004). Dr J.F. Brake. Contract holders: Dr J.D. Nelson, Dr J.F. Brake.

Hampshire County Council (HCC) has introduced several Demand Responsive Transport (DRT) services – under the brand name of Cango – in rural areas of the northern Test Valley from 1st July 2002 as a result of receiving funding from the (then) DTLR Rural Bus Challenge Fund. TORG is developing a programme of monitoring and evaluation for these Cango services. It is of particular interest that the methodology adopted should be based on that developed by TORG for the monitoring and evaluation of DRT services across the PTEs and for the Northumberland

Phone and Go project, so as to facilitate comparison of findings. Additionally, a number of strategic level indicators to establish the overall impact of the new services from the local authority viewpoint are required as part of this study.

Reports: None yet available

EMIRES – Economic Growth and Sustainable Mobility Supported by IST at Regional Level Including SME's (EC 5th Framework, IST Programme, from May 2002 to October 2004). Dr S.D. Wright and Dr J.M. Brake. Contract Holder: Dr J.D. Nelson and Dr J.F. Brake. Partners: ETRA (Spain), RCAUEB (Greece), Mobisoft Oy (Finland), CCSS (Czech Republic) and others.

The main goal of EMIRES in the UK is to provide a web based search facility for users to find job vacancies or training courses which match their pre-defined user profiles. The information has the added value in that details are also provided of public transport (including Demand Responsive Transport) which is available between the user's designated home address and the location of the job vacancy or training course. This service has been designed for use in predominantly rural areas where lack of transport is one of the main barriers to people gaining employment. Knowledge of jobs or training which match users profiles, but which have no public transport available to connect the user to the job will highlight to the Local Authority where there are gaps in the public transport provision. The demonstration phase of the project, based in the East Sutherland area of the Scottish Highlands, is due to commence in April 2004.

Reports: EMIRES Consortium (2003a and b), Wright et al (2004)

TRANSECON (CEC DG TREN, from June 2001 to December 2003). Dr M.A. Smith, Dr P. Lewis. Grant holders: Dr J.D. Nelson, Dr C. Mulley. Partners: BOKU (Austria) and others.

The broad socio-economic effects of thirteen different transport infrastructure projects were evaluated in 13 case studies across Europe. Policy impacts and organisational frameworks were studied using in-depth interview techniques, and different models are employed to evaluate the effects on local economy. These include a case study of the Tyne and Wear Metro, which has been compared with metro and light rail investments, amongst others, in a variety of different socio-economic and political contexts. Recommendations have been made on the maximisation of sustainable socio-economic benefits stemming from transport infrastructure investments.

Reports: Transecon (2003a, b); Klementshitz et al (2003)

Bus Delay Study – Mobile Automatic Data Collection (Newcastle City Council for Tyne and Wear Joint Transport Working Group, from February 2003 to December 2003). Dr P.R. Lewis and J Higgins. Contract holders: Dr J.D.

Nelson, Mr N. Thorpe and Dr C. Mulley.

The aim of this study was to develop a method of automating the data collection necessary for an investigation of bus run times and delays. The project partners were interested in measuring bus run times and delays. Relevant data regarding time delay was collected including bus location, speed and the status of the doors. There are a number of reasons why such information should be useful: to measure the performance of bus lanes and other priority measures; to identify the factors that contribute to delay as a bus progresses along its route; to identify the proportion of buses operating within given time "windows". Subsequently, the technique proposed in this study, using Passenger counting and Vehicle Location equipment, could be used to influence the development of the Nexus core bus network.

Reports: University of Newcastle (2004)

Bus Benchmarking Group Continuation Study (A number of bus companies, from December 2003 to April 2004). Dr P.R. Lewis. Contract holders: Dr C. Mulley, Dr J.D. Nelson and Dr J.F. Brake.

The first benchmarking project was concerned with the measurement of the participating companies in a number of key areas. The companies involved collected the data as specified by the handbook devised by TORG. This project continued the work of benchmarking data collection and also focussed on two more specific areas of the companies, namely driver productivity and engineering. Further performance indicators were developed to collect more detailed data in these two areas. Reports were issued, which identified the strengths and weaknesses within the various companies, in comparison to the other companies. In addition, a final project report reports on the main data collected and is suitable for comparison with the equivalent report for the previous year.

Reports: Mulley and Nelson (2003)

Public transport networks and methods and tools for assessing public transport schemes (Civitas, from October 2003 to October 2004). Contract holders: Dr C. Mulley, Dr J.D. Nelson.

The focus of this project is principles and methods for network planning for public transport in towns and regions within restricted budgets, regulations and fiscal context. The idea is to develop and implement customer-oriented and financially solid public transport networks, and identify any possible needs for new public transport infrastructure.

The three main objectives can be stated as:

- to examine and define optimal characteristics of co-ordinated public transport networks;
- to identify suitable methods and tools for the assessment of solutions for optimal public transport, with specific focus on the "border area" between bus and rail solutions; and

- (c) to identify institutional barriers to optimal network development, i.e. how organisational, legal and financial frameworks can restrict or stimulate the development of more optimal solutions. The findings of the study will be presented in a "Good practice guide for network planning and assessment methods". This will give concise advice about public transport network planning under the considerations of different institutional settings.

Reports: None yet available

PUBLIC TRANSPORT: RESEARCH STUDENTSHIPS

Regional Integration & International Travel Demand (*Foreign and Commonwealth Office Studentship, from April 2002 to March 2006*). H K. Cho. Supervisor: Dr. J D Nelson.

The principal purpose of the research is to examine the dynamic relationship between the demand for international travel and the level of regional integration by examining travellers' individual perceptions on the level of deterrence of a state border, and analyzing their travel behaviour and preferences. Unlike the previous studies, the research is based on an anthropocentric approach which assumes that people have general perceptions and attitudes on the progress of regional integration and cross-border travel, and those perceptions and attitudes have a role to play in explaining the change of international travel demand. The research is being carried out by developing indicators to suitably represent the level of regional integration. These indicators are being transformed into a questionnaire to identify the individual perception and attitude to the level of regional integration.

Reports: None yet available

Land value impacts of transport infrastructure and land value capture (*Self-financed studentship, from October 2002 to September 2005*). H. Du. Supervisor: Dr C Mulley.

In recent years, land value capture has attracted increasing attention as a result of its potential for funding transport infrastructure. Location plays a key role in property choices and accessibility is one of the most important factors about location. Transport infrastructure can improve accessibility to employments and amenities. Therefore, improved accessibility can add value towards land. This study is looking at the question 'Can the added value be captured to fund or partly fund transport infrastructures?'

This study is focussing on the UK and building on the substantial research into this issue recently in the US. In the UK, very few studies have considered this subject and none have considered the relatively smaller conurbations such as Newcastle and Manchester which might be more representative for many British cities. This study is looking at the Sunderland Metro Extension to examine land value impacts of transport infrastructures and land value capture mechanism.

Reports: Du (2003) and Du (2004)

The role of neighbourhood design in transferring travel from private automobile to public transport, walking and cycling (*Self-financed studentship, from January 2004 to December 2006*). P. T. Aditjandra. Supervisor: Dr J D Nelson.

The aim of this research is to gain insight into options for encouraging the use of public transport, walking and cycling in urban settings and to make some recommendations for changes to the way in which housing development takes place. This research proposes an examination of demographic variables associated with high public transport, walking and cycling levels in West European cities/towns. Multivariate statistics will be applied to identify public transport, walking and cycling 'hotspots' in West European, North American and Far East Asian and to compare the extent to which they share similar demographic and geographic characteristics.

Qualitative approaches would involve document analysis, interviews and possibly questionnaires about which leading up to the conditions being met for a public transport/cycling/walking friendly built environment. The applied part of the research would however involve an effort to document the types of conditions which if replicated could lead to similar transportation conditions in areas where private auto dependence is greater.

Reports: None yet available

Alternative models for DRT operation (*Greater Manchester PTE, from October 2002 to September 2007*). Abdul Quayam. Supervisor: Dr J D Nelson

GMPTe are proceeding with the development and implementation of Demand Responsive Transport (DRT) services in Wythenshawe and subsequently across the metropolitan area. This study focuses on the route, service levels and booking regime appropriate for the implementation of DRT in each of the sites appropriate for DRT in urban areas. The potential role of integration of bus-based DRT services with taxi services is a specific interest of the research.

Reports: None yet available

Best practices for procuring sustainable, efficient, bus services in urban areas. (*Self-financed, from September 2000 to August 2005*). Brendan Finn. Supervisor Dr. J. D. Nelson

This new work will examine the processes involved in the provision of urban bus services in a range of regulatory frameworks and competitive environments. A functional model will be developed which will describe the tasks involved in each of the key stages of planning, procuring and monitoring bus services in urban area, with specific emphasis on services which are operated under licence, tender or franchise. One or more organisational models will be layered on the functional model to describe how the processes work in a range of regulatory environments. The actual processes in

European, Asian and American cities will be examined both to develop the model and to identify best practice.

Reports: None yet available

Application of Spatial Information Systems in the Analysis, Planning and Optimisation of Routes and Stop Points for Road-Based Passenger Transport Services (*EPSRC Research Studentship with additional support from Northumberland C.C., Claritas, Beacon Dodsworth Ltd, from October 1999 to July 2003*). Jonathan Higgins. Supervisor Dr J.D.Nelson

Contemporary methods for optimising road-based passenger transport services are too crude for application at the stop point level. At this level data must be processed as individual dwellings or groups of dwellings. In order to achieve this it is expected that this project will develop tools within a telematic/GIS environment that will optimise the position of stop points and hence routes for a given network. The tools developed will analyse the propensity to travel, accessibility as well as management information for a given route.

The project has reviewed current practice and examined suitable ITS systems for the collection of location and passenger data. This equipment has been procured and commissioned and is in place streaming data from 2 vehicles. These vehicles are in operation on a subsidised route in the South-east corner of Northumberland. It is also expected that the system in use can be evaluated for the automatic collection of stop point locations, negating the need for addition expensive survey work.

Reports: None yet available

INTELLIGENT TRANSPORT SYSTEMS AND SERVICES: PROJECTS

Intelligent Mobility Agent for Complex Geographical Environments (IMAGE) (*EU 5th Framework IST programme, Co-ordinating Partner: Hellenic Institute of Transport, from November 2001 to December 2003*). Mr Simon Edwards. Contract holders Professor P.T.Blythe and Dr S.Scott.

IMAGE was completed in November 2003. Using a web-based agent that can be accessed through mobile phones, PDAs, PCs or info-kiosks, it provided dynamic, regularly updated transport and tourism information and services, including m-payment, aimed specifically at users travelling in complex urban environments. It provided a range of navigation and localisation technologies and information from multiple sources. User profiling was also available thus enabling services to be "pushed" to individual users if they so wished.

The system was trialled at two test beds: Tampere (Finland) and Turin (Italy). These test beds carried out the majority of the IMAGE evaluation process, which was divided into three types: user acceptance, technical, and legal issues. A range of more generic evaluation measures was carried out in other participating countries (Greece, UK, and Germany). Broadly, it

was found that user acceptance of such a system is high, and demand for and willingness to pay for such a system increases in an unfamiliar location.

Reports: Blythe (2003d and e) Edwards, Blythe & Scott (2003 a and b) and Blythe (2004a)

An Investigation of e-Tolling Options for Tamar Toll Bridge

(Tamar Bridge and Torpoint Ferry Joint Management Board, from September 2002 to May 2003). Professor P.T.Blythe. Contract holder Professor P.T.Blythe

TORG is subcontracted to Kellogs Brown and Root to provide technical advice on the specification of a new automatic toll system for the Tamar Bridge and the Torpoint Ferry. This included an investigation of the technical options and a study of the cost benefit and business case associated with the different options and the level of integration that could be achieved with other transport payment systems likely to be implemented in the region.

Additional work included an investigation into the integration of this new e-toll system with the ITSO public transport smartcard and the Cornish Keycard smartcard project.

Reports: Restricted

Demonstration Of Interoperable Road-User End To End Charging And Telematics Systems (DIRECTS)

(Department for Transport, from October 2001 to December 2004) Mr Neil Thorpe. Contract holders Professor P.T.Blythe and Mr Neil Thorpe

The aim of the DIRECTS project is to demonstrate the interoperability of different road-user charging technologies and to develop a comprehensive and robust road-user charging solution appropriate for the unique conditions of the UK road network. The overall output of the project is a delivery of a National Specification for DSRC-based road-user charging equipment.

TORG's principal role in the DIRECTS project is to develop and assist with the implementation of a volunteer recruitment and management strategy as part of the on-road trials of the end-to-end road-user charging system. As part of this trial, which is expected to run for 12 months in the city of Leeds from the Spring of 2004, the consortium aims to recruit sufficient numbers of volunteer drivers to create a mixed fleet of commercial and private-vehicles. These vehicles will be equipped with suitable DSRC and/or GPS-based road-user charging technology to generate sample transactions as they pass through the various charging sites on the Leeds network. In addition a supplementary trial of GPS-based charging has also been hosted by the City of Bristol. As part of the trial, drivers will receive specimen transaction reports and enforcement notices to demonstrate the various components of the end-to-end charging system. The detailed strategies for the recruitment, management and retention have been devised and volunteers recruited. Equipment from the charging system suppliers is currently being

integrated and installed in Leeds following a year of testing and evaluation at the TRL test track facility.

Reports: Blythe (2003b and c)

Assessment Framework for the Evaluation of the Soft benefits of Smart Card Schemes

(Southampton City Council on behalf of the Office of the Deputy Primeminister, from December 2003 to April 2004) Mr Simon Edwards, Ms Amy Guo and Dr Paul Lewis. Contract holders Professor P.T.Blythe and Dr C.Mulley.

The business case for a smart card scheme revolves around the costs and benefits to the supplier of the smart card product, primarily the costs associated with implementing a scheme (card production, roll out, labour, etc.), and what revenues will be accrued (from whom). Such costs and benefits are 'priced' by the market and are, as such, quantifiable.

However, there are further costs and benefits associated with smart card schemes which have no market price. These can be called 'soft' costs or benefits and include such attributes as 'efficiency', 'convenience' and 'security'.

This project addresses the problem of how to identify and evaluate the 'soft' benefits which may arise as a result of implementing a Local Authority-led smartcard scheme in a city or region for access to a range of citizen-centric and private sector applications and services.

The project team comprises TORG, Nexus and Southampton City Council, and is under the auspices of the ODPM-sponsored National Smart Card Project.

Reports: Edwards, Mulley, Blythe, Guo and Lewis (2004)

Future Communications and Networking Technologies for Transport *(Department for Transport, from December 2003 to April 2004). Contract holders Professor P.T.Blythe and Dr A. Tully (School of Computing Science).*

The advent of new and emerging communications technologies, such as 4G, WiFi, RFID, and CALM as well as the promise of new networking possibilities through mobile ad-hoc networks and the future nanofication of the technologies into Smartdust suggest that it would be timely to examine the potential for using these new technologies in the transport sector.

The DfT have contracted TORG and the School of Computing Science to undertake review of the emerging state of the art in communications technologies and the mobile internet. The review identifies most relevant candidate technologies and the likely way in which the technology may evolve to support services in the transport domain.

The ultimate aim of the study are to provide recommendations as to how the new mobile technologies could best be deployed to benefit the transport sector. These recommendations should provide a broad list of application areas, likely timescales to market and a strategic assessment of the impacts the technologies may

have on the transport sector. Moreover the impact that these new technologies may have on standards is also to be examined.

Reports: Blythe (2003g) and Blythe (2004c)

North East Regional Smartcard Consortium (NERSC) *(NERSC, from January 2001 to December 2004) Professor P.T.Blythe*

TORG provides a wide range of support and advice to the North east Regional Smartcard Consortium – which is an association of all North East Councils, transport and service providers who are developing an interoperable citizen smartcard for the North east region. TORG, as a member of the steering committee has provided advise and research on technology options, security, business case analysis, roadmap to the implementation of the eURI and how a multi-tiered reward and loyalty scheme could be introduced as part of the card roll-out.

Reports: None yet available

Transport Direct *(DfT Framework Contract as Subcontractor to WSP Systems, from June 2003 to December 2005). Professor P.T.Blythe*

TORG is part of a consortium which provides technical support, research and advice to the DfT's Transport Directs real-time transport information programme under a framework contract. Key contributions that TORG can make include location based services, evaluation of user requirements, business case analysis and the delivery of personalised services to mobile devices.

Reports: None yet available

The Extended User Related Information Data-Set on Multi-Application Smartcards (eURI)

(CEN ISSS Standards Organisation, from January 2002 to August 2003) Professor P.T.Blythe

In 1999 one of the key results of the EU funded DIRECTS project (led by TORG) was the delivery of a CEN-ISSS standard for putting profile and preference information onto smartcards in a standard way. This offered great potential for customising card accesses services for an individual based upon the users specific needs and requirements for transport, e-government and a wide range of e-services and transactions. Of particular significance was the use of the data to support elderly and disabled users by configuring services to suit their specific needs.

In 2002 the eEurope Smartcard Charter requested that CEN-ISSS update the standard to take into account new developments in microprocessor smartcards and multi-application smartcard platforms. A project team was formed and the 3 parts of the revised standard was published by CEN in August 2003.

Reports: CEN-ISSS WSA Parts 1,2 and 3

Options for and Attitudes to Biometric Templates on Transport Smart Cards *(IBF and ISIS International, from June 2002 to August 2004) Professor P.T.Blythe*

TORG has undertaken a series of studies to examine the use of a biometric template on

transport smartcards for anti-fraud and security purposes. Studies have identified the options for making a biometric template and their suitability for operation in various transport environments. Furthermore, a study of public attitudes to biometrics on smartcards has been undertaken which includes questions on preferred and least-preferred biometric methods, where such a template should be stored and what services end-users would be happy accessing with their template. A follow-up study aimed specifically at assessing views and attitudes regarding a biometric template on a passport is currently underway.

Reports: *Blythe (2003a and f) and Blythe (2004b)*

Review of London Congestion Charging

Technology Trials (*Transport for London, from December 2003 to December 2004*) Professor P.T.Blythe

TFL is currently undertaking a series of trials with a range of different technologies to explore which could be candidate systems for the future extension of the London Congestion Scheme. A peer review panel of experts has been established to review the performance of the trials and to advise TFL on the next stages of the study.

Reports: *Restricted*

INTELLIGENT TRANSPORT SYSTEMS: RESEARCH STUDENTSHIPS

Future Personalised Transport Information Delivery using Pervasive Mobile Computing

Services (*School Studentship, from December 2003 to November 2006*). Amy Guo. Supervisor Professor P.T.Blythe.

The opportunities of using future pervasive computing infrastructures in a mobile environment are to be examined from the view of the delivery of real-time, personalised trip planning and on-trip information. How such information may influence travel behaviour and trip choices will be studied

Reports: *None yet available*

The development and evaluation of a road user charging system for heavy goods vehicles

(*Department for Transport Research Studentship, from October 2001 to September 2004*). N. A. Dadoo. Supervisor: Neil Thorpe.

The principal aim of this project is to develop and evaluate an on-board system for charging heavy goods vehicles taking into account costs associated with pavement wear caused by vehicles. Key tasks undertaken so far in this research include critical reviews of vehicle-pavement interactions, current procedures for allocating road track costs between different HGV groups as well as current developments in electronic charging systems for HGVs. The findings from these reviews have been the basis for the specification, functional design and development of a prototype charging system involving the use of GPS technology and an on-board axle weighing system. Initial on-road tests of the system have been

successfully completed. The research is currently in the next phase of on-road tests which will involve equipping a number of HGVs with the on-board charging system. This will enable testing and evaluation of the system under normal HGV operating conditions. It is hoped that analysis and evaluation of the results of the trials will enable recommendations to be made for the specification of a long-term solution to improved road track cost allocation for HGVs. Reports: *Dadoo and Thorpe (2004)*.

CONSTRUCTION MANAGEMENT: RESEARCH STUDENTSHIPS

An investigation of the use of key performance indicators in the UK construction industry

(*Sudan University of Science and Technology, from November 2000 to July 2004*) Salma Mahmoud Supervisor: Dr S Scott

Key Performance Indicators (KPIs) have only recently been developed for the construction industry, following the publication of the Egan report. They are intended to be used to assess the current state of the UK construction industry, as generation of this information should allow comparison, not only between a company's contracts, but between construction companies and also between the construction industry and other industries. Salma is making good progress and has completed an interview survey of local contractors, consultants and clients to determine what use the industry is making of performance indicators and how useful they find the information generated.

Reports: *Mahmoud and Scott (2002)*

The influence of supply chain management practice on construction site performance

(*TPSDP Project, ADB Loan, from October 2003 to October 2006*)

Jati Utomo Dwi Hatmoko Supervisor: Dr. S Scott Many construction processes are beset with problems, e.g. poor controllability, delays, budget overruns, poor quality, etc. Analysis of these problems has shown that a major part of them are supply chain problems, which are originating at the interfaces of different parties or functions. The supply chain network in the construction sector can be very complex and may involve many subcontractors and suppliers for just one project. There is therefore an opportunity to make significant improvements in construction supply chain performance, which will inevitably improve construction site performance. Current research on supply chain management (SCM) in construction is mainly focusing on issues such as relationships between contractor-subcontractor-supplier, JIT, organisational perspectives on construction processes, SCM mapping and IT. There is however, to date, little hard evidence on SCM practice and its impact on construction site performance. This research, which is still in its infancy, will investigate this important area, aiming to increase understanding of the problem and to identify avenues for improvement.

Reports: *None yet available*

TRAVEL BEHAVIOUR: PROJECTS

Design and Application of a Travel Survey for European Long Distance Trips Based on and International Network of Expertise (DATELINE)

(*EU 5th Framework DG TREN, from April 2000 to June 2003*). Dr J.F. Brake, Dr M. Smith. Contract holders: N. Thorpe, Dr J.D. Nelson. Partners: *Institut für Verkehrs- und Infrastrukturorschung GmbH (Germany), Consultores em Transportes, Inovação e Sistemas, S.A. (Portugal), Statistics Netherlands (Netherlands), University for Bodenkultur (Austria), Institut Socialdata i Sverige AB (Sweden), Helsinki University of Technology (Finland), Ministry of Transport (Netherlands), University of Maribor (Slovenia), Politecnico di Milano (Italy), TRIAS SA (Greece), Peter Davidson Consultancy.*

Prior to DATELINE the need for a high quality database of passenger statistics at the European level had not been addressed. This project developed the concepts and methods for a homogenous survey design for long distance passenger travel, which was implemented successfully in all Member States of the European Union and Switzerland. The single database of 80,000 usable returns was prepared and integrated in the EUROSTAT statistical programme in order to provide answers to transport policy and planning related issues. TORG was responsible for project dissemination and networking; produced a Briefing Handbook, which was a guide to the conduct of the surveys, with particular reference to potential causes in data discrepancies between countries; made substantial contributions to the European Coding Book; and undertook comparison and quality checks with other national and international databases.

Reports: *DATELINE Consortium (2003a – g); Mageean, Nelson, J.D. and Thorpe (2004)*. All publicly available documents are at: <http://cgi.fg.uni-mb.si/elmis>

TRAVEL BEHAVIOUR: RESEARCH STUDENTSHIPS

The Potential Effects of Alternative Transport Policies on Commuters Mode Choice in

Metropolitan Kuwait (*College of Technological Studies (Kuwait), from September 2001 to July 2004*). H. AISaeid. Supervisor: Dr J. D. Nelson. Kuwait is a car dominant country. Car represents 97% of commuter's mode choice. In order to achieve a mode choice balance between the only two available modes for commuters' car and bus, a package of policy measures has developed. First, to find the most technically feasible policy measures, focus groups have been utilised. Then to find a combination of these policies considered to be acceptable and effective in terms of public and politics point of view, a preliminary survey has conducted. The final outcomes of this survey were four policies: road-user charging, bus lane, bus priorities, and reduced bus fare.

To find out to what extent (how well) these measures will be effective in reducing car-use levels a discrete mode choice model (Logit) has

developed based on a Stated Preference experiment and revealed preference data and estimated using ALOGIT software.

Reports: None yet available

Developing the Singly Constrained Gravity Model for Application in Developing Countries

(Technical and Professional Skills Development Sector Project / Asian Development Bank (ADB), Institut Teknologi Sepuluh Nopember (ITS), Surabaya; Indonesia, from May, 2002 to April, 2005). W. Herijanto. Supervisor: Mr. Neil Thorpe

The main problem with modelling trip distribution in developing countries is the inadequacy of the data used in trip attraction forecasts, which is one of the inputs to the doubly constrained gravity model. The singly constrained gravity model (i.e. where trip production is constrained) can overcome this problem but the model's outputs are often less accurate. This research aims to develop an improved singly constrained gravity model for application in developing countries. For this, primary data (i.e. travel patterns, O-D travel times, and traffic volumes) and secondary data have been collected in Surabaya, Indonesia. The calibration is based on the frequency distribution of travel times. Possible future development work includes using fluid analogy theory and consideration of changes to land-use and the deterrence function. The results will be validated for the base year (1993) and horizon year (2003).
Reports: None yet available

The cost consequences of motorcycle casualties in developing countries.

(September 2002 – 2005). H. Widyastuti Supervisor: Mr R. N. Bird
Motorcycling generally attracts above average risk of casualties in road traffic accidents. This is a particular cause for concern in some developing countries where it forms the predominant mode of private transport for wage earning, productive people. Where there is no welfare state, social security system and state health service, the intangible indirect costs and consequences of a road traffic accident can be more far reaching in the effect on families and dependants of the casualty. This project seeks to establish a method of assessing this impact and to compare the results with other methods of assessing casualty costs.

Reports: None yet available

INFRASTRUCTURE DESIGN AND PAVEMENTS: RESEARCH STUDENTSHIPS

The relationship between geometric design consistency and safety in rural single carriageways.

(Egyptian government Research Studentship: September 2002-2005). I. H. Hashim Supervisor: Mr. R. N. Bird

The concept of highway design consistency has emerged in the ten years in North America and some European Countries. However, no research has been done to date in the UK. It is believed that there is a strong relationship between consistency measures and safety. Inconsistent roads may produce a sudden change in the characteristic of the roadway that can lead to motorists' errors. These errors may cause an

unfavourable level of accident risk. Previous studies in various countries have shown that this phenomenon is recognized in rural single carriageways. The aim of this research is to develop two types of models. The first model is to reflect the relationship between the consistency measures and roadway characteristics. The second model is to establish a correlation between these measures and safety. Based on the second model it is anticipated that it could be possible to identify and treat any inconsistency on a highway and this may improve its safety performance.

Reports: None yet available

The use of recycled materials in road paving materials.

(September 2004-2007) Y. Huang. Supervisor: Mr R. N. Bird
Much interest is focussed on sustainability in the construction industry. This project seeks to analyse and quantify the benefits and disbenefits of using selected recycled materials in asphalt. The project looks at the practicality of preparing the material, the quality and properties of the resulting mix, and the life assessment of each option.

Reports: None yet available

TRAFFIC MANAGEMENT: PROJECTS

Secondary Road Network Traffic Management Strategies (SENSOR)

(EU 5th Framework IST Programme, Project Coordinator ETRA, from January 2001 to September 2004). Anett Ehlert, Sergio Grosso. Contract holders R.N. Bird, Professor P.T. Blythe and Dr J.D. Nelson
No efficient road traffic and information management systems can exist without appropriate details on the current status of the network. SENSOR is aiming at optimising the number, type and location of data collection points (sensors). A Decision Support System (DSS) tool is being developed to help planners in their choice of detectors and their strategic positioning. Among the software modules which comprise the DSS, there are two developed at TORG: a detector optimization tool for detector positions (OptTool), and a program called Path Flow Estimator (PFE), which is used as a network observer with tasks of data completion, and the identification of faulty detectors. Both activities are carried in collaboration with Prof. Mike Bell (Imperial College, London). Tests are currently underway at the UK pilot site which is being hosted by Gateshead – this utilises the councils existing detectors network which has been integrated with the PFE and OptTool models developed by TORG.

Reports: None yet available

Monitoring and Evaluating the Implementation of SCOOT in Delhi

(Delhi Traffic Police, from April 1999 to September 2003). Dr Steve Wright, Fred Crouch and Jan-Dirk Schmöcker. Contract Holder: Dr J D Nelson
Peek Traffic Ltd are installing the SCOOT traffic control system at 47 junctions within the main commercial district of New Delhi, India. This is

being done on a trial basis and TORG have been commissioned to independently monitor and evaluate the performance of the system. The monitoring of the system requires 'before' and 'after' surveys to be conducted. The 'before' surveys were undertaken between July and September 1999 and the results were transcribed, analysed and reported by early 2000. Since then, the task of installing and calibrating the SCOOT system has been subject to various delays and teething problems. The current status is that the system is in operation but "temperamental". It is important that consistent operation is maintained to enable a settling down period before the 'after' surveys are conducted and these were conducted in January 2002. Detailed analysis of 'after' results and comparison with 'before' conditions will contribute to a final assessment report. Evaluation of the accuracy of the calibration of the SCOOT system will also be considered.
Reports: Restricted.

Road Casualty Reduction (Northumbria Road Safety Camera Partnership, from April 2003 to March 2005 Contract-holder: Mr. N. Thorpe

TORG has been recruited for an initial two year period to act as an independent data analyst for the Northumbria Safety Camera Partnership (NSCP). This role will involve coordinating the collection of a wide range of data relating to the impact of safety camera activity on road casualty reduction in Northumbria. It is expected that an additional element of this work will involve a joint project with local Health Trusts to investigate the wider impacts of casualty reductions on health-care provision in the region.

Reports: None yet available

TRAFFIC MANAGEMENT: RESEARCH STUDENTS

Sustainable Travel Demand Management (Self-financing, from April 2002 to September 2003.

Ms S.M. Darroch. Supervisor: Mr Neil Thorpe
The principal objective of this study is to investigate the consequences that Travel Demand Management (TDM) measures, and packages of measures, may have on business location. Newcastle upon Tyne will be used as a case study.

Using stated preference techniques survey data will be collected using the mail-out format, from a sample of businesses located in central Newcastle. The business respondents will be presented with hypothetical scenarios involving certain TDM measures, for example road user charging. They will then be asked to state their attitudes towards these TDM measures, with respect to the location of their businesses. Statistical analyses will be undertaken on the collected data.

Conclusions will be drawn from the outcomes of the analyses and will focus on the consequences that TDM measures, and packages of measures, may have on business location.

Reports: None yet available.

Modelling the Relationship between Design Consistency Measures and Safety in Rural Single Carriageways (*Egyptian Government, from September 2002 to September 2005*). Ibrahim Hashim. Supervisor: Mr. R. N. Bird

The concept of highway design consistency has emerged in the ten years in North America and some European Countries. However, no research has been done to date in the UK. It is believed that there is a strong relationship between consistency measures and safety. Inconsistent roads may produce a sudden change in the characteristic of the roadway that can lead to motorists' errors. These errors may cause an unfavourable level of accident risk. Previous studies in various countries have shown that this phenomenon is recognized in rural single carriageways. The aim of this research is to develop two types of models. The first model is to reflect the relationship between the consistency measures and roadway characteristics. The second model is to establish a correlation between these measures and safety. Based on the second model it is anticipated that it could be possible to identify and treat any inconsistency on a highway and this may improve its safety performance.

Reports: None yet available

SCORE: A Pragmatic Multi-Criteria Decision Support Method for Transport Option Appraisal and Ranking (*EPSRC, from March 1999 to Sept. 2004*). Tessa Sayers. Supervisors: Dr Corinne Mulley and Dr John Nelson.

Transport option appraisal requires decision makers to evaluate options with respect to many diverse criteria and make an assessment of the overall merit of each. The aim of this research is to develop a methodology and interactive tool to aid them in this complex process. It is based on the simple linear additive model, in which a weight is assigned to each criterion. SCORE adopts a pragmatic approach to judgments leading to criterion weights, accepting varying degrees of uncertainty. The nature of SCORE's output is exploratory rather than prescriptive, providing insights into the impact on the option ranking of the decision maker's value judgments.

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