Transportation Research Links between EU and Asia for Sustainable Development (TRANSLINK)

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Abstract: The quality of the transport system is a main factor in economic development. Transportation research provides the knowledge, skill and tools to implement efficient transport policies, systems and services. The three-year Translink project is a partnership between two European and two South-East Asian universities with the overall aim to promote sustainable urban development in this region through development of their human resources for transportation research. Institutional assistance is also be provided aiming at creation of full PhD programme in their own departments. The need for research is studied through identification of “Critical Issues in Transportation”. Furthermore guidelines for carrying out PhD research training, supervision and assessment are developed as well as advice for institutional development of Transport research Schools.

1. INTRODUCTION

1.1. Background
The rate of urbanisation is growing fast in the South-East Asian Region since the major cities generally provide better opportunities to obtain an income. These cities are also very important for the national economic development. However, their rapid population growth threatens to hamper the economic development due to congestion of their transport systems and subsequent life threatening air pollution. Adequate transport policies, transport infrastructure and transport services are universally recognised as key requirements for sustainable economic development. Transportation research can provide knowledge, skills and tools for analysis and implementation of cost-effective and sustainable solutions to complex transportation and urban development problems.

1.2. Scope And Objectives
The TRANSLINK project is a partnership between two European ((Royal Institute of Technology, Department of Infrastructure (KTH), Sweden; and Institute for Transport Studies (ITS), University of Leeds (UK)); and two South-East Asian Universities (University of Indonesia, Department of Civil Engineering, Indonesia, and Universiti Teknologi MARA, Malaysia). The aim is to promote sustainable urban development through development of a lasting capability of the involved Asian universities to carry out recognised research education
and training programmes at the Ph.D. level. The scope is particularly focused on the complex transportation and urban problems in this region. The results obtained on the PhD level can also be utilised to strengthen the corresponding educational programmes on MSc level at the partner universities.

The project receives funding from the EU Asia Link programme for the three year period ending August 2008.

2. METHODOLOGY

The means to achieve the project aims include the following activities that are further described in the paper:

a) Human resource development:
   - Review of “Critical issues in transportation” with the purpose to identify important transportation research areas and possible PhD research topics.
   - Development of guidelines for research education and training programmes at the Ph.D. level including admission, supervision and assessment;
   - Training of Ph.D. students from UI and UiTM at ITS Leeds and KTH;
   - Training of research supervisors from Ui and UiTM.

b) Institutional development:
   - Organisation and funding of Transportation Research Schools and Transportation Centres;
   - Development of guidelines for academic procedures, staff structure and responsibilities.
   - Exploration of institutional bottlenecks.

3. CRITICAL ISSUES AND RESEARCH NEEDS

3.1. Overview

One important and difficult step towards a PhD degree is selection of the thesis topic. On commencement of the programme the student in most cases only has an approximate idea of the topic of research, and even less idea about the research methods that will be used. There are of course exceptions to this, particularly in countries such as Sweden, where the topic often is pre-defined in some detail by the students sponsor. In the UK and many other countries including Malaysia and Indonesia however, it may be six months or longer before the topic is defined. This is a long time within the degree period which is normally three years.

3.2. Priority Issues and Research Needs

Against this background an important Translink activity has been the development of a report, or manual, on Critical Issues in Urban Land Transport. This will provide a background paper to the topic selection part of Translink’s research guidelines.
The purpose of the Report on Critical Issues (called RCI below) is to produce a document that can be used to help researchers define transport research topics suitable for PhD research based on real transport needs in their local area or region. The scope is urban transport in SE Asia, in particular Malaysia and Indonesia.

The RCI is designed to “focus attention on the most significant policy decisions relating to South East Asia in particular, and particularly Indonesia and Malaysia. Rather that focussing on ‘innovation’ the RCI concentrates on ‘research’. It borrows a similar flexible format to that used in the similar report for U.S. issued by the Transportation Research Board (TRB). In this format there is some overlap of critical issues, but given the purpose of the report this does not matter.

In establishing the Critical Issues, views were initially sought from members of the Translink team and their immediate colleagues, including lecturers and faculty Deans from both Asian Universities. This resulted in the production of a preliminary list of about eight issues. Initially the issues were ranked in order of perceived importance by Translink members. Later however the attempts at ranking were abandoned in the absence of any reliable means of determining relative importance. While agreement was fairly easy to obtain regarding the importance of a number issues (congestion and road safety for example), it was perhaps predictably difficult or impossible to agree on relative importance of others. In order to stimulate discussion and debate on the issues for the purpose of identifying potential research areas text from other sources which discuss the issue in question was included. The main source for this was the World Bank’s Urban Transport Sector review ‘Cities on the Move’ (World Bank 2002). This and other texts proved particularly useful for helping define potential research areas within each of Translink’s Critical Issues, and formed a catalyst for discussions within the Translink team and with others contributing to the project.

A further source of guidance for the report was through discussion with Transport Professionals (outside academia) in Indonesia and Malaysia. These professionals included those attached to the following organisations:

Indonesia:

- The TransJakarta busway: a bus rapid transit system with similar characteristics to the Transmilenio busway in Bogotá, and dedicated to encouraging modal shift by providing a quality alternative to the car.
- The Municipal Government of DKI (Daerah Khusus Ibukota) Jakarta, Indonesia’s capital city, accommodating around 12 million populations.
- The Regional Government of the Kabupaten of Bandung in West Java, accommodating a population of around 40 million in urban, semi-urban and rural areas.

Malaysia:

- The ITS (Intelligent Technology Information System) traffic control centre, whose job it is to minimise traffic congestion in and around Kuala Lumpur through the use of traffic signal co-ordination.
- The Kuala Lumpur Municipal Government.
- Urban and sub-urban government railways in and around Kuala Lumpur.
- Shah Alam planning authority, including the bus regulator.
Some of the above, notably the TransJakarta busway and the ITIS traffic control centre, are to be used by the Translink project as case studies, from which PhD topics could be expected to be generated. The University of Indonesia and UiTM have close links with these projects.

In February 2007 a one-day seminar and workshop on Critical Issues was held in the University of Technology Mara in Shah Alam, Malaysia. Around 20 Malaysian academics both senior and junior were present, from UiTM in Shah Alam and UiTM campuses elsewhere in Malaysia, and also from other Malaysian Universities. The purpose of this event was to seek the opinion of a wider range of opinion on critical transport issues in Malaysia and to identify more specific research areas within them. The expertise and interests of members of this group included highway engineering, road safety, sustainable transport, public transport, traffic engineering and institutional development.

The workshop took the form of an introduction to Translink and the purpose and nature of its critical issues report. Participants then worked in about eight small groups and were asked to identify up with what they believed to be the critical issues faced by urban transport in Malaysia. No information was given beforehand on the draft items produced by the Translink team. All groups carried out the exercise in isolation from each other. Each group then presented its issues, the reasons for their choice and potential research areas within each topic. Interestingly there was general agreement between groups on a number of key issues. There was also good agreement between groups and Translink’s own draft list. There were also a few issues identified only by one or two groups: these were added, at least temporarily, to the Translink list. The potential research areas under each agreed issue varied much more between pairs and between them and the Translink Team. This appeared very much to reflect the particular interests of group members, but provided a useful range of topics for the Translink report.

Many of the topics in this process overlapped with, or were subsets of, other larger topics. The Translink team rationalised the list by reducing the overlaps, resulting in a list below of critical issues with supporting explanations (not in order of importance):

**Institutional issues - policy**
- Lack of integrated national, regional and urban policy and planning
- Lack of clear responsibilities – coordination/integration
- Different agencies deal with planning, funding, operation of transport systems
- Lack of skilled professionals – planners, engineers, economists, managers.
- Lack of professional regulations, registration, certification Lack of comprehensive, urban planning including land use and transportation.
- Lack of enforcement of plans

**Accessibility - security**
Difficult to travel due to poor transport supply and economic constraints
- Urban planning for land-use and different transport modes (including public transport) inadequate.
- Difficulty in travelling or inability to travel due to real or perceived danger, especially for women, children, elderly, handicapped
Transport for the poor
- Very poor or inadequate accessibility to essential activities due to poverty.
- Effects of negative impacts of transport are inequitably distributed amongst the population.
- Transport for the poor is essential to enable them to earn enough to live.

Congestion
- Unrestrained demand for car trips
- Inadequate transport alternatives, poor network,
- Poor traffic management and traffic control resulting in environmental degradation, long travel times – uncertainty / unreliability

Transport and the environment
Poor air quality and greenhouse gases. Not sustainable in the long term.
Problems:
- High level of emissions effecting health (Pb, CO, NOX, HC, particles) leading to poor air quality, and those affecting climate (CO$_2$).
- High noise levels
- Physical barriers
- Ecological problems (water supply, habitat)
- Energy consumption, growing dependency on oil

Urban freight transport
Freight in regard to the environment, including regulations for heavy vehicles, dangerous goods, distribution and location of logistics facilities in cities.

Public transport inadequacy
Public transport must be expanded, improved and made affordable for low income groups. through planning and subsidies in order to reduce congestion (high travel time, discomfort and unreliability) and ameliorate environmental costs.
- Urban mass transit systems can create job opportunities, eradicate poverty.
- Public awareness campaigns for sustainable urban transport are needed.

Road transport safety
Accident rates unacceptably high and can be expected to worsen due to increasing motorisation.
Results:
- Direct injury and trauma to victims
- Economic loss to families and communities through loss of earnings.

The format of the critical issues report (RCI) follows is similar to that of the TRB report, but with some differences. The RCI format consists of:

- Introduction: The purpose of the document; a background to urban transport conditions in S.E. Asia; a broad indication of the main transport concerns in Indonesia and Malaysia.
- Critical Issues: The issues, each with the following sub headings:
  - the issue: a two-or-three-line elaboration of the issue;
Discussion of the issue taken from a related text, in particular ‘Cities on the Move’;
- Possible areas for research under each topic;
- Skills likely to be needed for each area of research (engineering, psychology, sociology, mathematics, etc).
- One or more specific potential PhD research topics related to each research area.

- Human and Intellectual capital: Though not presented as a critical issue or transport area, this importance of the development of human resources to support transport development is given its own chapter, being the focus of the Translink project.

The report is currently in the form of a draft, possibly with additional material from an Indonesian workshop to be added. The report will be made available as a handbook to help guide the selection of PhD topics in transport, to Translink Universities and more widely, via the Translink websites, to the other universities in Asia.

4. PHD PROGRAMS AND GUIDELINES

4.1. PhD degree aims and requirements

KTH: The aim of PhD studies at KTH is for the student to acquire theoretical and methodological competence for a career as a professional researcher inside or outside the academic community. This includes competence in independent formulation and solution of research tasks, and in the communication of research results. The PhD study program consists of two parts: course work (35%) and a thesis (65%) together totalling four years of full time study. The purpose of the large course module component is to ensure that the students have a good knowledge of transportation science as well as a range of general research methodologies, not just those required for their own thesis topic.

ITS: The aim of PhD studies at ITS is “pushing forward the barrier of research & knowledge frontier”. Only the thesis is a required part of the three year study program which can be extended to a maximum of four years. However, a range of course modules are offered on a voluntary basis.

UiTM: The PhD Research Degree Program is totalling three years of full time studies, i.e. the same as in the U.K. system. Year 1 is about determining of area of specialization, making research methodology, reviewing literature, preliminary work, etc. Year 2, students have to collect and analyze data, then in Year 3 the thesis must be completed and submitted to the Department.

UiTM: The PhD requirements at UI include a first year during which the students are required to undertake compulsory course modules, and to make a research proposal for a selected thesis research topic including initial methodology. The PhD students must complete the program between three and five years, all of the students being treated as full time students.

Discussion: Internationally PhD programs are increasingly becoming “standardized” according to the 3-2-3 year (B.Sc-M.Sc-PhD) Bologna principle. In practice this means that admission to the PhD programme requires a M.Sc. degree in a transport related subject, and that the time
available for compulsory course modules will be very limited. In Sweden most PhD graduates obtain employment outside of the academic sector, a development which so far has been slow in Malaysia and Indonesia.

4.2. Admission

KTH: Admissions to studies for PhD degrees at KTH can take place anytime during the semesters and follows the steps described below:

- Establishment of contact between a potential PhD student applicant and the responsible professor at KTH. This can be initiated by an advertisement looking for PhD candidates for a new, externally funded research program.
- Primary selection of student based on fulfilment of entry requirements and availability of funding for the studies.
- Development and submission of an application form including an Individual Study Plan for the student listing required course modules, thesis proposal, time schedule and undertakings from the department and the student. After admission this plan is updated annually and serves as a form of “contract” between the university and the student.
- Decisions regarding admission are taken by the KTH school for Architecture and the Built Environment (ABE) after recommendation from the Research Tutor for this school. The PhD students are normally employed by KTH and have to carry out some departmental duties during this period.

Since the Swedish universities do not charge tuition for the PhD education the program costs including employed PhD student salaries must be covered to a substantial degree through external research grants or scholarships. Admission of new students is thus linked to the availability of such resources.

ITS: Applications for admission to postgraduate research are considered by the Postgraduate Research Tutor and by potential supervisors. Careful consideration will be given to the suitability and qualifications of the applicants, the availability of suitable expertise for the proposed research topic, and the existence of adequate resources for the proper conduct of the research. Where the applicant's first language is not English all possible steps will be taken to ensure that he/she has sufficient command of the language to embark on the research.

UiTM: Entry requirement for a PhD program is a Masters Degree in relevant field or other relevant qualifications recognized by the UiTM senate or 1st Class honors degree in relevant field recognized by senate. Candidates are required to fill up application forms together with a short research proposal to the Deans of The Institute of Graduate Studies (IGS). The research is reviewed and an interview will be conducted to evaluate the candidate. Upon a successful interview candidates will be admitted to the postgraduate program registered through IGS.

UI: The PhD program at the University of Indonesia is basically handled on department level, but except for inter-disciplinary topics and administrative matters which is under the University Graduate School. However. Admission is carried out by the university twice a year and candidates must take the entry examination that consists of: The Academic Potential Test (similar to GRE at the United States), English, and interview. Mostly transportation research will
be directed to the Department of Civil Engineering, but other departments can also accept transportation related research students i.e. Departments of Economics, Psychology etc.

4.3. Supervision

KTH: The supervisor for a PhD student to be a full professor or assistant professor with a PhD degree supplemented with a further research degree. The main supervisor is therefore normally the head of the scientific subject area in which the thesis topic falls. If needed one or more co-supervisors may also be appointed to support the thesis research work in specific areas. The selection of thesis topic is often tied to the source of funding for the student, who however still has the possibility to focus on specific aspects within the same program area.

ITS: Supervisory support is based on one main supervisor with a second supervisor. The second supervisor may be external to the University. Formal meetings with the student are held at least annually with the supervisors and the Postgraduate Research Tutor or Head of Department to review reports submitted by students. Written reports on each student’s progress must be provided by supervisors to the Postgraduate Research Tutor on at least a six-monthly basis (the lead supervisor has responsibility for ensuring this is done), and these reports will be discussed at appropriate Postgraduate Research Supervisors Meetings. All students are expected to make a verbal presentation of their work, at least once per year, to either internal seminars involving other staff and research students or to external conferences.

UiTM: The Faculty will identify suitable supervisors for the student, and forward their proposal to IGS to be approved by the university senate. Students will be supervised by one main supervisor and one co-supervisor. The main supervisor shall be the academic member of the university and of the faculty where the candidate is registered, and must have a doctoral degree qualification or its equivalent and/or professional expertise in the area of candidate research. The co-supervisor may be appointed internal or external of the university. Upon admission candidate would have decided on their proposed thesis topic. However the final working of topic will depend on the agreement between the students and their advisor.

UI: The main supervisor must be qualified to professor level. The supervisor’s role is very strong: acting as student tutor, conducting supervision and determining the need of a special taught course if required depending of the student background. Both the main and the co-supervisor also act as examiners at every stage of the student progress.

Discussion: The requirements to become main supervisor for a PhD student should focus more on scientific skill in the selected study area than formal academic status. If this is not possible the student should also be assigned a co-supervisor which has this skill. The selected topic should be relevant and possible to pursue within given time and cost constraints. The need for a certain amount of originality must be observed, e.g. regarding development of new concepts and research methods. The supervisor must guide the student through this process in order to save time and increase the likelihood of success. The student should make work progress reports, seminar presentations and production of scientific papers as required/recommended. Part time PhD students (e.g. supported by their employer) must be given special consideration regarding length of study period and availability.
4.4. Assessment

**KTH:** There are no formal regulations for PhD student assessment besides those related to the external review and the final examination procedures. Typically internal research seminars are organized by the supervisors for presentation and discussion of different stages of each student thesis work. When the student has completed around 50% of his/hers PhD studies a special review is made by another professor at the university. A similar review and quality assessment is made when the thesis is completed. A professor acting as reviewer has to sign a written statement that the draft thesis satisfies KTH quality standards (equivalent to 4 papers accepted for publication in refereed scientific journals).

The thesis is printed beforehand and publicly defended at the final examination by the student based on discussion with an external opponent (usually a well known professor). The postgraduate tutor also appoints an external Evaluation Committee with 3-5 members at professor level who decide whether the student passed or failed (almost all student pass since it would be very embarrassing to fail somebody at this stage).

**ITS:** Each student (except those undertaking miscellaneous research) will be subject to a transfer examination after an initial study period, normally after 9-12 months for full time students. The transfer decisions will be made by a panel consisting of the supervisors and an independent Chairperson. The Chairperson is normally from the Institute or the Department in which the student is registered and will be someone who has sufficient knowledge of the topic in question. Requirements for the examination of research degree candidatures, including the appointment of examiners, are prescribed by Senate Research Degrees Committee. The overall assessment is made on both the report and oral examination.

**UiTM:** IGS acts as secretariat for the final examination procedures (viva). Members of the viva panel are chairman (Deputy of Vice Chancellor of Academic Affairs) and examiners (2 external and one internal). Requirements for the final thesis document include its relevance, position in relation to the knowledge frontier, its originality, and transparency of documentation.

**UI:** The assessment procedure follows the research program thantis divided into 4 stages or 4 semesters, i.e.:

**Research 1:** Preparing the research proposal and state-of-the-art methodology and taking the examination to the board (5 up to 7 members including main supervisor and co supervisors). This is comparable with transfer or upgrade process in ITS and UiTM or Thesis Proposal in KTH.

**Research 2:** At the end of this stage, PhD students must finish carry out their survey activities or development and carry out research instruments or models and produce an interim report of results or finding and take the examination to the examination board (5 up to 7 members including main supervisor and co supervisors).

**Research 3:** The student continues the analysis by taking into consideration of any comments given by the examination board and preparing for the pre doctorate examination to the examination boards. This is the most critical stage. Basically, there is still a strong probability that student can be failed at this stage because the level of the
product is unsatisfactory by the examination board (5 up to 7 members including main supervisor and co supervisors) and directive by the university regulation.

Research 4: This stage is for preparing the doctorate examination by taking into consideration any comments and corrections given by the examination board and the final product is a thesis that must be defended openly to the public by the examiners under the university senate academic forum.

Discussion: The assessment procedure at the four Translink partner universities i summarized in Figure 1 below. ITS and UiTM have a similar system that divided into two parts: the provisional PhD student at year 1 and Full PhD student at years 2 and 3 by passing the transfer or up-grade examination by the end of year 1 (or not more than 18 months in Leeds). The differences between ITS and UiTM are that in ITS, the examination is solely under the department levels while in UiTM has a two level system: the department level and the Institute of Graduate Studies.

The need for a transfer examination already during the first year was debated. An alternative could be to apply the KTH solution with a “half-way” examination or quality control with the support of an external reviewer (or a reviewer from a different department). KTH also has the “toughest” requirements before allowing a student to the final examination stage.

The ITS model for final PhD examination, where the student could be asked to make revisions of the thesis and resubmit with or without the need for a new examination had great merits. However, in the interest of quality control there should be more than one external reviewer, although inviting foreign professors for this purpose can be costly.

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**Figure 1: Schematic Diagram of PhD Program Assessment at Translink Member Universities**
4.5. Organization and Funding

Transport is a multi-disciplinary field including among others Engineering, Planning, Management, Economy, Environment and Human Behaviour Sciences. Transport research thus deals with a large number of aspects as shown above in Section 2 on critical issues in transportation. From this follows that transportation research and PhD education may take place at different university faculties and departments, which makes it difficult to obtain sufficient critical mass and a good transport research environment. University of Leeds has solved this problem by creation of the “Institute for Transport Studies” (ITS) charged with the responsibility to carry out all post-graduate education and research training in the transportation field with support from the involved faculties/departments. Translink recommends other universities to examine this model as a possible solution.

The methods for funding of the post-graduate research training programs differ very much between the Translink partner universities:

- ITS and UI: Tuition fees paid by students
- UiTM: Government funding (Ministry of Education)
- KTH: Mainly external funding through research grants or contract research.

Translink concludes that the KTH model with mainly external funding imposed many restraints in terms of admission of students and freedom to undertake relevant research tasks.

5. TRANSLINK VISIONS

Most major urban centres in S-E Asia have serious transport problems. One reason for this situation is the lack of adequate transport systems, policies, transport planning expertise, taxation and legal systems providing skill and resources for transport system development as well restraint for car travel in congested city centres. The critical issues in transportation that have been identified show that these factors are closely related to economic development and reduction of poverty. At the same time they are among the most complex tasks that exist in modern society. The Translink project vision is that improved human resources in the form of well educated professional with PhD degrees in transport related subject areas can assist towards solution of some of these problems through transportation research.

Currently most PhD students from Malaysia and Indonesia travel to Western countries to obtain their degrees. The long-term aim of the Translink partners is to support the creation and operation of high-quality transportation PhD research schools and education in the S-E Asian region. This will offer opportunities for more professor and post-doc positions, create a critical mass in their research environment, and produce new PhD graduates focused on solving local and national problems in their home countries. Transportation research schools will also improve possibilities to offer better B.Sc. and M.Sc. education in the region.

Currently Translink has two Asian and two European university partners. The long-term ambition of the project, which also corresponds to the Asia Link program as a whole, is to create an expanded and sustainable network for educational co-operation in the transport sector including major universities from all interested countries in S-E Asia. This could enable joint
production of post-graduate research training programs in specific subject areas were there are too few candidates from each individual country.

REFERENCES