Meeting Minutes

Date   : Wednesday, January 11, 2017
Place : Convention Center Hall E (10.15 - 10.30)

Main Topic:
Activity-Based Model

Interviewee(s):
Peter Vovsha, Parsons Brinckerhoff (vovsha@pbworld.com)

JICA Research Team:
Sadayuki Yagi, Deo Nobel

Obtained Data:
(none)

Household Travel Survey

- Household interview survey for Jerusalem (Israel) was conducted in 2010. Two divisions (Jewish or east part, and Arabic or west part) of the city made the household interview survey method application different from each other. It was quite common method applied for the household interview survey in the Israel part. Surveyor came to the houses and asked household members questions.

- The case was different for the Arab part because living culture was different. One big house could consist of two or three families or more. Therefore, it was hard to find low income family since incomes are combined for plural families under one roof. Aerial photo image was utilized to obtain sample data. This condition was foreseen to potentially affect the modeling work because one origin might produce/attract unusually large trips with variation of modes. The household travel survey conducted in the Arabic part is the only one that he has experienced in the developing world.

- Peter Vovsha, then, developed the activity-based model out of the GPS-assisted survey that was conducted simultaneously with the household travel survey (non GPS) in Jerusalem. The survey involved respondents carrying GPS logger for the whole day, thus, the trip attributes were recorded. OD and mode data was produced from the recorded data.

Meeting Minutes

Date ：Wednesday, January 11, 2016
Place ：Marriot Marquis Lounge, 12th Floor (11.00 – 12.30)

Main Topic:
Problems on Survey in Developing Countries and Their Solutions, Activity Diary Survey and Activity-based Model

Interviewee(s):
・ Prof. Fujiwara (afujiw@hiroshima-u.ac.jp)
・ Associate Prof. Chikaraishi (chikaraishim@hiroshima-u.ac.jp)

JICA Research Team:
Hirohisa Kawaguchi, Yuma Tsumura

Obtained Data:
none

Problems on Survey in Developing Countries
・ 交通調査を実施した際に、ランダムサンプリングを適切に行わず、調査員に任せきりにすると階層ごと、ゾーンごとの抽出率が偏る傾向にある。また調査員の質も低い傾向にあり、ランダム抽出の信頼性には不安が多い。
・ M/P をはじめとした高度な技術力が求められる交通調査は「ドナーが実施してくれる」という観念が一部の開発途上国の政府職員に浸透しつつある。既に開発がかなり進んでいるイスタンブールでそのように感じた。交通調査・交通需要予測に関していえば JICA 案件を通した現地人材の育成は十分に成功を収めてきたとは言えない。
・ 基礎学力・留学生数の向上に伴って、途上国の交通担当者における能力的な問題は解決に向かうと思われる。
・ 交通調査の実施における最大の問題は、おそらくコストである。開発途上国ではインフラ整備の前段階の計画策定に資金を投入する考えが定着していないため、日本のように交通調査に何億円ものオーダーの資金を投入することは困難である。

Possible Solution for the Above Problems
・ 近年の途上国では、携帯電話保有率の地域的バイアスも低下傾向にあり、携帯電話を介した聞き取り調査(欧米諸国でかつて主流だった方法)の採用も一考の余地がある。ただしその完全ランダム抽出には、統計的に信頼性の高い母集団が必要であるが、途上国ではその信頼性には疑問もある。
・ また途上国ではプライバシーに関するハードルが比較的低いため、携帯電話データの有効活用は途上国だからこそ可能なオプションの 1 つである。

- 交通事業者の有する交通情報と都市計画に関わる行政側とが、はじめから各々のデータ共有を可能とするような枠組みを構築すべきである。

Activity-Diary Survey/ Activity-based Modeling
- 既存の PT 調査と比較した際に、トリップの漏れやトリップチェーンの整合性の観点において、Activity-Diary 調査の採用は正しい方向性であると考える。
- Trip-Diary であっても 1 日のトリップの整合性のとれた形で質問することが望ましい（例えば 1 日 1 トリップのみは通常あり得ない等）。例えば通勤・通学等の義務的なトリップと自由目的のトリップを分けて聞くことで自由トリップの漏れを減らすことも可能である。
- 今後は一つの活動だけでなく、マルチタスクの活動についても質問する必要があるかもしれない。例えば自動運転が可能になれば移動中に他の仕事等をすることが可能である。
- 既存の 4 段階推計法のみでは、土地利用規制等による開発インパクト等を考慮することはできない。
- そのため自動車保有、土地利用や居住地選択モデル等との統合が強く求められ、それが無ければ正当な政策評価は難しい。
- どのモデルを適用するかはあくまでも適材適所であって、案件の目標・政策のスコープをどこに据えるかに大きく依ると考える。
- 以下のような課題はあるが、従来型の OD 推計法に固執すべきではなく、携帯電話データ(CDR)を前提とした OD 推計法も検討すべきであると考える。
  - トリップ目的の抽出
  - キャリア間のバイアス
  - SIM フリー携帯における頻繁な番号変更
- 日本式の交通需要予測の失敗は、代表的な 1 日のみの交通行動の拡大を試みた点にあり、特に通勤通学行動以外のトリップは欠落する傾向にある一方で、携帯電話データは時間的にシームレスであり、その欠点を抜本的に克服することができる。

- 途上国における交通実態の時間変化は極めて激しく、日本式の 10 年に 1 度のセンサスでは対応することは到底できず、投資評価も困難である。
  - ドイツ全土では、以下のような調査が実施されているが、日本では同一サンプルを継続的に追うような調査は実施されていない。
    - 5 年間隔：数万世帯を対象とした調査
    - 1 年間隔：1000-1500 世帯を対象とした 1 週間の Activity-Diary 調査・3 年ローテーションのパネル調査
  - JICA の交通調査も 1 度の調査で終えることなく、10 年等のオーダーで継続的に調査を実施できるようなプロジェクト体系を構築すべきである。

Others
- アメリカでは Activity-based Model のソフトウェアが完成しつつあり、パラメーターの調査のみで他都市への適用が可能となる段階が近づいている。またその構成は従来の 4 段階推計法に近く、比較的シンプルであり、途上国への適用に適しているかもしれない。MATSim は各段階の推計を統合的に実施できるメリットがあるが、その分システムが複雑となっており、入力が必要なパラメータも多いため、開発途上国での適用は容易ではない可能性がある。

- KTH の Dr. Susilo が 3 週間の Activity-Diary 調査をベースにしたインドネシアの ABM 開発事例がある。調査報告が出ており、アプリケーション等はオープンソース化している。
- 東京大学の日下部先生もスマートフォンを用いた交通調査について詳しい。

Meeting Minutes

Date   : Wednesday, January 11, 2017
Place : The World Bank (11.00 – 12.30)

Main Topic:
Travel Survey Method

Interviewee(s):
Michael Lokshin, Development Economics Data Group, the World Bank
(mlokshin@worldbank.com)

JICA Research Team:
Sadayuki Yagi, Deo Nobel

Obtained Data: Booklet about Survey Solution

Survey Solutions

- Michael Lokshin with his group works for Surveys and Methods Team in the World Bank. One of their jobs is to maintain and promote the Survey Solution software.
- The software has been contracted to clients in more than 70 countries, for millions interviews, for many types of surveys (not only survey in transportation sector). In March 2016, the latest big survey was conducted for about 2.6 million households, which are equivalent to around 11 million individuals in South Africa.
- The software requires a server for uploading survey data which is controlled by the World Bank, so called the World Bank Clouds. They allow clients to access the server only for certain period of time depending on the contract.
- As mandated by the World Bank, this software is free to download. Access to the server is also at very low cost to nearly free for projects tackled by government institution in developing countries. Private sector and university are also allowed to partner with the software and access the server at special cost.
- Client is required to create the survey questionnaire by themselves using a user-friendly questionnaire design program and this questionnaire will be displayed in the android tablet carried by the surveyors in the field. The World Bank has no responsibility to design the survey questionnaire or provide android tablets. However, they can assist the client with technical support which includes explanation of all necessary functions in the software and software installation.
- The software also allows intervention in the middle of the survey period for additional questions. All information acquired in the android tablet can be directly or cumulatively uploaded to the server as soon as it is connected to the internet. These are some of the best features that the software can offer.
- This software can only work with android operating system and it has been developed to low energy consuming application and work with, at least, 3G signal. One typical android tablet (costs around USD200) can last 12 hours from full battery to empty so that the surveyor can work in the field visiting households or establishments to fill the

questionnaires continuously in the daytime. Typical android tablet has 10 meters precision built-in GPS feature along with a camera. This should be enough for typical survey. However, if necessary to add preciseness, this software also works with external sensor.

- The World Bank is currently working with University of Tokyo and will hold a training session for the software in Chiba sometime in February 2017. Prior to that, in 2015, Michael Lokshin himself went to Tokyo for introducing/promoting the software.

Meeting Minutes

Date : Wednesday, January 11, 2017
Place : Marriot Marquis Lounge, 12th Floor (13.30 – 14.45)

Main Topic:
Advance Travel Survey Method and Activity-Based Model

Interviewee(s):
Thomas Adler, RSG (Thomas.Adler@rsginc.com)

JICA Research Team:
Sadayuki Yagi, Hirohisa Kawaguchi, Deo Nobel

Obtained Data:
(none)

Advanced Travel Survey Method
- Thomas (Tom) Adler and his company, RSG, worked with the Beijing Transport Research Center for the smartphone-based survey platform owned by RSG. The name of the application is "rMove". Beijing was the largest city to apply advanced survey methods based on mobile devices to. However, in practice, rMove could not perform well enough as it was expected for the reason of limitation of internet bandwidth, security and access in China. In the end, the Beijing Transport Research requested to create the prototype of rMove. While use of the cloud server is planned originally, they cannot help setting up server locally due to security policy in China.
- The application rMove has been applied to wide-range areas in the US (e.g. NYC with 10,000 samples, Chicago with 7,000 samples, Ohio, etc.), and England. Being briefly worked together with the Beijing Transport Research Center in China was the only experience of RSG in developing countries.
- Targeted respondent for the smartphone-based survey receives mail invitation to join a survey at first. After agreeing to participate in the survey, the person/household will be visited by the surveyor to explain more detail about the survey and how the survey works in the respondent's smartphones. Basically, respondent will be asked to activate rMove and carry the smartphone with them during certain period time of day for certain amount of days. Whenever a trip starts and every time the application senses a new chain of trip is being made, respondent will be asked to fill up the pop-up questions in their smartphone. These pop-up questions can be cumulatively answered at the end of the day or week. However, cumulatively answering the pop-up questions may result in biased trip records in the final result because people tend to forget the trip detail or easily get tired. The application rMove works also with compass navigation and public Wi-Fi connection. This enables rMove to detect respondent's movement although phone signal reception is not available (especially for the case of underground movement such as subway).

- Depending on the scale and the duration of the survey, respondents are usually eligible to receiving incentive with terms and conditions applied. Usually, 50% of the incentive will be given to the respondent at the beginning of the survey and the rest will be given latter. Tom Adler said that the average of the incentive given is USD 10/device for survey period, 7days in his research, which is cost-effective considering the improvement of the data accuracy. For those who do not own a smartphone, RSG may be able to provide one for each respondent.
- As for urban trip, there were difficulties in mode choice detection. For example, if the participants continuously stop at the same transfer stations for several minutes (usually 2 minutes), the device tries to decide that they have changes in their mode of transportation, but the trains might have a brief stop over several minutes. Also, the estimation on travel behaviors of lower-income residents and less frequent travels should be challenging too.
- Battery used to be a huge problem when the application was firstly released. However, it is now being perfected and consumes only small amount of the battery energy.
- RSG's works are mostly located in the USA and only 70% of them are related to transportation sector. To enhance the performance of rMove, RSG always participates in the International Conference on Travel Survey Methods which is held once every three years. The next conference will be held in Quebec, Montreal, Canada in September 2017.
- To his best knowledge, CDR (Call Detail Record), the similar survey method using the smartphone, does not require a phone call to make to record the data, but just via the cell tower. So, data can be recorded every time the phone is within the signal range. He said that Prof. Kay Axhausen conducted such survey in France and compared it to the conventional survey. However, Tom Adler thinks that imputation of CDR is not so good.
- In US, there are outstanding companies for utilizing this kind of big data including CDR; Google, Inrix, PTV focusing on probe data on vehicles and TomTom famous for vehicle navigation system. Some of them provide OD data. Other than them, Uber started to provide the transportation data in Washington D.C., Philippine (Manila) and Australia (Sydney), and Taxicabs in New York City began to provide their travel data.
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Activity-Based Model
- RSG has a team that is in particular working on the activity-based model (ABM). They are: Mark Bradley (he completed an ABM called DaySim), Ben Stabler, and Joel Freedman. (together, they are building ActivitySim).
- According to Tom Adler, Mark Bradley spent 9 months working on ABM for Chattanooga, Tennessee, with a population of around one million. Thus, he thinks that it is good to think about some new ways to simplify this method and omit the required period of time.
- The ABM has been becoming more trending topic in the US since two or three years ago although it once surfaced in the late 1990s and early 2000s. Currently, DaySim, ActivitySim and CT-RAMP (by Peter Vovsha) are becoming the major software programs for ABM.
- Sample size is depending on sampling method such as choice-based sampling and multi-day sampling. In case of most US cities, sample size is in the rage of 2,000 to 6,000 except for the large metropolitan area such as New York with 10,000 samples and

Chicago with 7,000 samples. Out-reach group survey is one method to reach a specific social group with social media.

Meeting Minutes

Date: Wednesday, January 11, 2017
Place: Marriot Marquis Lounge, 12th Floor (15.00 – 16.30)

Main Topic:
Advanced Transportation Survey

Interviewee(s):
Johanna Zmud, Texas A&M Transportation Institute (j-zmud@tti.tamu.edu)

JICA Research Team:
Sadayuki Yagi, Hirohisa Kawaguchi, Takanori Oda, Deo Nobel
with Prof. Daisuke Fukuda

Obtained Data:
(none)

*** Advanced Transportation Survey ***
- In many cases of deciding the type and method of a survey, modeling work influences the most. However, characteristic of each study area should be taken into account as important as the modeling work. For example, CDR (Call Detail Record) seems to be promising in data collection process and input for the model. However, study areas may have different responses to this type of survey. The US, for example, is usually reluctant to give consent to provide the CDR data. The scale of privacy-related matter may be different in some other countries. In the developing countries such as Africa, where the cellphone ownership rate continues to rise, it seems to be easier to access to this kind of data because of their lower level of privacy protection. She knows a person named Stefan Krygsman who once worked on this type of survey in South Africa and a professor in the University of Washington (Cynthia Chen) whose research is around this area (email address: skrygsman@sun.ac.za and qzchen@uw.edu). They overcame the privacy problems by setting the project as research-based.
- As for web-based surveys, we always have to face the difficulties of literacy problems including how to use smartphones, which could result in biases in data. Thus, we have to think about the smallest number of samples and be careful about the sampling process.
- One caution of Activity-based modeling (ABM) is that demand of detailed data is hard. Most up-to-date models require data. As far as she knows, Prof. Kay Axhausen is consulting for a project in China. Their survey is combination of a new and traditional method.
- Carefully-designed efficient sampling is important in developing countries. Resident registration data is not correct in some countries. Rather than having a huge-scale survey like household interview survey, Johanna Zmud was once involved in a survey of which method she called "choice sampling" or "intercept technology". This method answers the need of a specific type of mode by directly interviewing respondents who choose that mode at a point where they gather. For example, if the survey looks for bus

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passengers, rather than household interview survey, it should be more efficient to collect the data at the bus terminal. If the survey aims at airplane passengers, it should be better to collect the data at the airport, and so on. Other alternative is geography-based sampling such as selection of house and apartment.

- Missing data and bias in the result are inevitable if there is only one method of survey to be implemented in various study area. This means that we should not stick to only one method for applying to developing countries. In many of the surveys, she was involved always in partnership with local counterpart or authorities. This way, local condition, culture, and so on that may affect the result of the survey could be avoided.

- Household travel survey with smartphone application is useful as the participants are likely to forget their own travel behaviors such as yesterday's activities. However, bias caused by sampling of smartphone users and internet connection speed are issues of using these method, compared to a conventional paper and pencil survey. Usually $10 to $25 per respondent is paid as an incentive for participation of the survey.

- Although she is not directly related to the smartphone-based survey conducted by RSG, she always keeps close communication with people in RSG as they are colleagues since she had a survey company around a decade ago (and sold it to PTV later).

- Johanna Zmud was one of the chairpersons for the 9th and 10th International Conferences on Transport Survey Method that were conducted in Chile (2011) and Australia (2014). She suggested the research team to also attend the conference that will be held this coming September in Quebec, Canada. There will be many more discussions related to the usage of the mobile device and advance survey method that may be suitable for research team's intention.

Meeting Minutes

Date: Wednesday and Thursday, January 11 and 12, 2017
Place: Marriot Marquis Lounge, 12th Floor (17:00 – 18:20) and Eatsa Restaurant (12.20 – 13.30)

Main Topic:
PTV Software – VISUM and "Activity-Based" VISEM

Interviewee(s):
Michael Oliver, Arnd Vogel, Peter Mohl, and Nate Chanchereon
(michael.oliver@ptvgroup.com, arnd.vogel@ptvgroup.com, peter.mohl@ptvgroup.com, nate.chanchereon@ptvgroup.com)

JICA Research Team:
Sadayuki Yagi, Hirohisa Kawaguchi, Takanori Oda, Deo Nobel

Obtained Data: (by flash drive on the day of meeting and email on Jan. 25, 2017)
· 	Presentation of PTV VISUM in general
· 	Presentation of PTV VISUM 16
· 	Presentation: "Aggregate Tour Based Modeling, A Pragmatic Step-Up from the 4-Step Model"

PTV Software (VISUM)

- One of the best features of VISUM is that this platform has more detailed functions in the public transportation sector (i.e. stop location, headway, time table, and editorial options that are user-friendly), which are based on request of key clients such as DB (Deutsche Bahn / German Rail). Input data for this platform usually comes from the household travel survey and population data, while the data on household relationships is not necessary.
- VISUM contains GIS system and combination with Open Street Map, Google Map, other GIS data and satellite images for backgrounds.
- They offer two types of the platform prices; one is for developed countries and another is for developing countries which is cheaper.
- In their 13-year history, they have already sold about 10,000 licenses of VISUM to: U.S., UK, German (mostly major), France, and Japan (PCKK), and, as for Asian economies growing their share, China (Beijing and several cities), Taiwan, Vietnam (several cities), Malaysia (Kuala Lumpur), United Emirates Arab (Dubai) and Singapore. So far, feedback received from the clients is always good and clients want to extend the license contract. In case of Dubai, they used to utilize SATURN model before changing to VISUM in early 2000s. They have been loyal ever since and keeping updating 5-year implementation plan in Dubai Strategic Model (DSTM) using VISUM.
- VISUM is still evolving, and it is planned to be connected to RSG's disaggregated activity-based model, DaySim, for Philadelphia within this year. For this project, MPO in Philadelphia requested the connection between PTV and DaySim.

PTV Software (VISEM)

- PTV is about to officially launch a new modeling software program called VISEM as an add-on module of VISUM, a travel demand forecast software. VISEM works in the activity-chain principle in an aggregated way with a nested logit model and no population synthesizer. Thus, it is less likely to miss any trips and easier to simulate changing transportation modes and calibrate travel-survey data. VISEM will also incorporate freight tours.
- To purchase VISEM, user needs to purchase VISUM and VISEM add-on module in it. The price of VISEM including VISUM is about $25,000 for 400 zones and $30,000 for 500 zones, plus 15% - 18% annual maintenance fee depending on the country's status (developed or developing). VISEM has been sold to Dubai, Qatar, Colorado Spring (U.S.), France, and Beijing. So far, VISEM has just been applied to developed cities.
- In regard to the question of "why PTV has not thought of making a platform that works on the principle of activity-based model yet?", Peter Mohl answers that the reason is highly related to the business idea. Since there is no big demand for this ABM platform, PTV does not put this as a priority. For development of VISEM, there was a necessity since 2003. Prof. Udo Hiedl is the one who is working behind the desk to create the ABM platform.
- PTV does not compete with the consulting firms. Therefore, sending experts to do modeling work is not part of the field of work of PTV. However, PTV offers many types of assistance such as: training program, webinar, manual guide book, and customer support services.

Meeting Minutes

Date: Thursday, January 12, 2017
Place: Marriot Marquis Lobby (8.30 – 9.30)

Main Topic:
Activity-Based Model

Interviewee(s):
Mark Bradley, RSG (mark.bradley@rsginc.com)

JICA Research Team:
Sadayuki Yagi, Hirohisa Kawaguchi, Takanori Oda, Deo Nobel

Obtained Data:
Posters and papers on DaySim (received by email)

Activity-Based Model (ABM)
- 20 out of the 25 largest metropolitan regions in the US have applied ABM for the modeling work. Smaller regions of population size around 1 million are still using conventional 4-step model due to budget reasons, but, more and more regions are shifting to ABM. However, cost of the ABM work has been decreasing since many ABM software platforms have been developed these past five years.
- The reason why the US started to shift from conventional 4-step models to ABMs was that the model is more geographically sensitive including detailed level of up to micro-zones such as the tax parcels. Therefore, non-motorized transport (e.g., bicycle and walk) and transit for shorter trips as well as upper-level decisions such as working at home could also be analyzed. Such level of detailed, direct, and precise analysis is more powerful to simulate people shifting to public transport.
- ABMs could replace all other models such as conventional 4-step model, trip-based model and tour-based model, but ABM is still under development because of time and cost.
- RSG has been developing an ABM named "ActivitySim" which is tour-based with Ben Stabler and Joel Freedman since 2016. Previously, the company developed a fairly similar model named "DaySim" which was applied for Sacramento in cooperation with John Bowman (2006-2008) works well with spatial data and has been utilized for making three regional transportation plans in (2008, 2012, 2016). It is expected that the new model (ActivitySim) would run the ABM faster and give better result. Other tour-based ABMs prevailing in the US are "CT-RAMP" (by Peter Vovsha), which especially focuses on household member interactions, and "TourCast" (by Cambridge Systematics). There are some other practices of developing ABMs for cities in the US; however, the one that was developed by professors Chandra Bhat, Ram Pendyala, and Kostas Goulias for Los Angeles and seemed to be promising eventually was too complicated for practical application but more for research or academic purpose.

- All of the government planning agencies in the US already own and use one of the network software packages for their existing work. TransCAD and CUBE are the two most popular ones. Some use VISUM or EMME; however, those two are not as popular yet in the US as in other parts of the world, although they are becoming a little more popular now. VISUM has some schedule-based transit assignment options that are unique, and they also support writing scripts in Python.
- Since they have different clients that already use the above four packages, they have made it so that DaySim can work with any of them, mainly through reading and writing matrices in the correct formats. In simple terms, DaySim replaces the trip generation, trip distribution and mode choice (and time of day) steps in a 4-step model, and the resulting trip lists are converted to trip matrices for the assignment step, and the travel time and cost matrices from the assignment are read back into DaySim in the next global iteration.
- One of the challenges of developing these types of ABM is the complexity that does not interest client much. Clients tend to prefer simpler model with huge coverage. What the clients do not realize is that a thorough model can be modified in any way that the modeler/client wants and may be transferable to other study area which could save client's budget in the long run. Also, the model can be developed on an hourly basis or with a focus on peak hour only, and so on. RSG, to the best of Mark Bradley's knowledge is the only consulting firm that conducts software management and testing. This is among their other methods to prioritize the client's need.
- Mark Bradley and John Bowman made a poster for TRB 2017 that is related to ABM transferability (17-02964). They utilized DaySim for this work. They analyzed locally-customized population synthesis over 13 city areas in the US. Synthesizing process is not so difficult for the case of the US because open-source population synthesizers based on the same data source such as "PopGen" (by University of Arizona) and "SimPop" (by Parsons Brinckerhoff), which runs faster, work really well with the available public data such as NHTS (National Household Travel Survey) add-on data. Although NHTS is not really for the modeling purpose, it is really powerful for descriptive purpose to help synthesizing process due to its higher sampling rate. Some cases of utilizing NHTS add-on data in the DaySim are in Tampa and Jacksonville, Florida. It would have been nicer for the modeler to work with a specific survey conducted for the study. However, NHTS helped describing the input data for these two cases.
- M/P in a US metropolitan area is usually a regional transportation plan up to 25 years while transportation plan in a city level is shorter (up to 10 years). So, from today's point of view, regional transportation plan is forecasted to the year of 2040 and city-level transportation plan is forecasted to 2025. Usually, city-level transportation plan is a follow-up project after the regional-level plan is done. It also requires more detail and technical study.
- In China, there was one attempt to change their former model to ABM with DaySim, funded by their own budget. Government of Beijing tried to model their plan of rearranging the city by relocating governmental offices or about 200,000 jobs to outside the city. However, it did not turn out well because there was no population data (especially employee population) outside Beijing and so called "professional guess" was made. Eventually, PTV's VISEM was utilized.
- Also outside the US, ABM with DaySim was implemented in Copenhagen, Denmark by John Bowman, only for improving bicycle access and transfer. Survey data in which the

model was developed was small, however, the city will expand the survey and regenerate the model next year.

- In the future, improving ABM has more benefit compared to improving the four-step model. Level of detail that ABM produces is more powerful. Mark Bradley said that the automatic vehicle will most likely affect the model since it behaves differently in the model. However, it still can be accommodated in the model through dynamic traffic assignment. In Philadelphia, DaySim was linked with traffic simulation. ABM also has benefit in analyzing downtown parking location or assigning bicycle lane network.
- Prediction to conduct a full ABM model with DaySim usually takes about 1 year assuming all regional data is available. At least, about 6 months are required for modeling if additional human resources are available and all data is ready. Most of the work items are putting data together, population synthesizing, calibration, comparing with survey data, forecasting and sensitivity test. Analysis zones can also be narrowed down to micro-zones depending on the census data.

Meeting Minutes

Date   : Thursday, January 12, 2017
Place : Marriot Marquis Lounge, 12th Floor (9:30 – 11:00)

Main Topic:
Activity-Based Model, Advanced Transportation Survey

Interviewee(s):
Yusak Susilo, KTH (Yusak.susilo@abe.kth.se)

JICA Research Team:
Sadayuki Yagi, Hirohisa Kawaguchi, Takanori Oda, Deo Nobel

Obtained Data:
His papers and MEILI sources are available at his web site: www.kth.se/profile/yusak/

Activity-Based Model (ABM)

- Prof. Yusak Susilo feels that some cities in developing countries are not ready to apply ABM because they do not exactly know how to utilize the model let alone how to develop it. It may appear to them that ABM is just a fancy thing that is recently trendy and they want to have the model without knowing the meaning of the model itself.
- Equity analysis, which is nowadays compulsory for transportation planning, is very difficult to conduct with a four-step method. This is one of the reasons why ABM should be utilized.
- To the best of Prof. Yusak Susilo's knowledge, ABM in Europe has been applied in Copenhagen (with DaySim by John Bowman and RSG), Lyon, Swiss cities, Berlin, Stockholm (all with MATSim), and London (with TASHA Toronto model). MATSim is a regional agent-based activity-based model that has been developed by Kai Nagel, Gunnar Flotterod (Nagel's student), and Kay Axhausen. He recommended a meeting with Kai Nagel in IATBR.
- In case of Asia, Prof. Yusak Susilo himself is planning to conduct a mobile phone-based activity-travel diary survey in Bandung City, Indonesia, with 800 users for 3 weeks. He also knows that an Indonesian Professor (named Dimas, formerly Axhausen's student) in PETRONAS University in Malaysia is trying to build ABM for Jakarta.

Advanced Transportation Survey

- Prof. Yusak and his research group developed a smartphone-based (open-source) application named MEILI for travel diary survey. The platform is semi-automatic which means it still requires human intervention in the data collection process. He argues that by making the platform completely automatic at the beginning stage of a survey could be dangerous because validation process needs to be done redundantly until it creates fixed patterns. This is how the machine learning process works in the system.

- Although the scheme of the survey process seems to require shorter period of time, at this initial stage, the data collection process takes as much as conventional survey. Main reason for this is that low respondent's knowledge towards the "new" survey method. Therefore, human intervention is still needed. Investment for somebody to learn is also necessary. Furthermore, some secondary data (such as census data) are not compatible in format; therefore, conversion of the data is required, too.
- Depending on the study area, some types of survey calibration and validation are needed. In the case of Sweden, smartphone-based survey is only a complement to the conventional National Travel Survey. One of the reasons is that there were so many flaws in one type of mobile operating system that the application failed while it was still running. Also most of the users were young people, so the samples did not represent the entire population.
- Even in a mobile phone-based survey, paper and pencil-based survey is still necessary to correct the data. Regarding the data accuracy, in the case of Stockholm, it was found that about 80% of travel modes were correct while purposes go down to 40-50%. Without paper and pencil, the collected data may become just garbage. It should also be reminded that, as you seek for better accuracy, it will consume more battery of the mobile phones.
- MEILI is also powered by machine that can distinguish the difference between stop for traffic congestion and stop for transferring. MEILI was used for two cities in Sweden: Stockholm (200 respondents) in 2012 (English report is available on his web site) and Gothenburg (50-100 respondents). Since 80% of the people used iPhone, he had to deal with Apple, who also requested adding some more data/questions on their behalf. After a long discussion on the privacy and security issues, they gave him approval; however, the next day iOS was upgraded. Thus, Apple caused a more hassle.
- In Gothenburg, where the script for the mobile phone-based survey had already been given from the previous survey in Stockholm, the survey up to the reporting process took three to four months (from September to November/December) with simplified 6 modes. Following this survey, Stockholm government was interested in applying the same survey in a larger scale than its previous trial survey.
- After Bandung, Singapore will be his next target area for mobile phone-based survey. Now it depends on MIT, the freight movement authorities tried to conduct the freight movement survey with smartphones. Human intervention by calling the respondent whenever suspicious patterns showed up was proven effective in this survey.
- He recommended the research team to read Adrian Corneliu Prelipcean's paper "Three Case Studies on Semiautomation (learning process) of Activity Travel Diary Generation Using Smartphones." (17-02898)
- There will be a NECTAR (Network on European Communications and Transport Activities Research) conference in Madrid from 31 May to 2 June, 2017.
- CDR contains data of detailed activity of people, but it creates more noise. There are also privacy and security concerns and the government may have so many questions. Generally EU countries are more protective while US is more open. Professor Rein Ahas from University of Tartu, Estonia has a paper on passive data (CDR).

Meeting Minutes

Date : Thursday, January 12, 2016
Place : World Bank I Building (10.30 – 11.00)

Main Topic:
FMS (Future Mobility Sensing) Application to Tanzania

Interviewee(s):
Ms. Nancy Lozano Gracia (nlozano@worldbank.org)

JICA Research Team:
Hirohisa Kawaguchi

Obtained Data:
none

FMS (Future Mobility Sensing) Application to Tanzania

- With a WB budget, the first phase of a research project to understand spatial dimensions of the city taking Dar es Salaam, Tanzania and a city in Haiti as an example has been conducted. In Dar es Sal
- aam, a baseline survey of 2,400 households on living standard has been completed. 300 households were sub-sampled from the baseline survey to conduct detail survey on activity pattern and transportation with a smartphone-based activity-diary survey utilizing FMS (Future Mobility Sensing) technology collaborating with MIT.
- The baseline survey was conducted for acquiring socio-economic data such as household consumptions, housing histories and economic activities.
- 550 smartphones for 300 households with the FMS application were distributed for this survey free of charge. This also works as an incentive for them.
- Activity interviews were continuously conducted at intervals of 30 mins for 4 weeks.
- The problems are that the research participants cannot read a map around them and they even don't know how to use their smartphone.
- The application asked the research participants to verify their activities and trip which are automatically generated from the FMS application. They also have to input travel costs, mode choices etc.
- In addition, phone-calls were conducted to support participants and to verify the result of this survey data at intervals of about twice a week.
- Since this survey is in the research-based project, so far, there are not specific ideas to apply to OD estimation, transportation master plans formulation and BRT F/S studies.
- The second phase of the project is under preparation. It might include verification of FMS data, descriptive analysis such as mode choice etc., accessibility analysis and analysis on disaster management.

- Also, this group is welcoming to share their own data. In the case of household interview survey, they are preparing to share the data. However, the census data is likely to have sensitive and privacy problems which force them to aggregate data.

OD Survey in Brazil
- An OD survey is on-going too in Sao Paulo metropolitan area by the Brazilian Government funded by the World Bank.
- A following person is in charge of this project in the Latin-American department of the transportation group in WB.
  - ➢ Ms. Bianca Bianchi Alves, Urban Transport Specialist, WB

DEC (Development Economics Group), WB
- DEC is a complementary research department in charge of "Survey Solutions" and data collection including census surveys.

添付資料６

需要予測の照査シート(案)

■需要予測の照査シート（案）

カテゴリ	No.	照査項目	解説欄	M/P更新の場合の対応が必要な事項	M/P	F/S大	F/S小	D/D
基本項目	1				○	○	○	○
	2				○	○		○
	3				○			○
	4				○			
社会経済指標の確認	5				○	○		○
	6				○	○		
	7				○			
	8				○			
	9				○	○		
	10				○			
	11				○	○		○
	12				○			○
	13				○			○
	14				○			
大規模開発の影響	15				○			
	16				○	○		○
	17				○	○		
	18				○		○	
	19				○			
	20				○			
	21				○	○		○
	22				○			
	23				○		○	
	24				○			
全体モデル 共通	25				○			
	26				○			
	27				○			
	28				○	○		○
	29				○	○		○
	30				○			○
推計モデル 手法の 妥当性	31				○			
	32				○			
	33				○			
	34				○			
	35				○			
	36				○	○		○
	37				○			○
	38				○	○		○
	39				○			○
非集計モデル（四段階推計法等）	40				○			○
	41				○	○		○
	42				○			○
非集計モデル（ABM等）	43				○	○		○
	44				○	○		○
	45				○	○		○
	46				○	○		○