

Intelligent Information System for Philippine Public Transport – A Big Data Framework for Urban Transportation Development

Brian J. Rafor and Rosicar E. Escobar

Abstract—The main objective of the study was to unravel the answer on the following exploratory questions: (1) the benefit of having an Intelligent Information System for Philippine Public Transport (IISPT) as perceived by the respondents; (2) the essential features of IISPT as perceived by the respondents; (3) the essential inferential information of IISPT that should be rendered by the system; and (4) the effective framework to establish it. In undertaking this study, the exploratory method of research was employed. An extensive review of literature and studies related to the subject matter of this research combined with the inputs of the 400 respondents were the principal sources of inference used in developing the appropriate framework for IISPT. The respondents of this research were primarily qualified by the characteristics that they are persons who have used or are currently using the public transport facilities in the Philippines regardless of type and frequency. Based on the findings, the following conclusions were derived: (1)The IISPT shows a valid need to be implemented; (2) It can hold a lot of possible features and that the implementation of this solution should prioritize the launch of the ability to send alerts on public transport service interruption and advisories; (3) It can give a lot of possible inferential information and that the travel duration is currently what tops the need of the travelers; (4) The framework developed by the researcher is the most suited way considering all the factors relevant to the overall architecture.

Index Terms—Big data, framework development, intelligent information system, public transportation.

I. INTRODUCTION

Data, and the demand for it, is massively growing in today's technology-dependent world. As the organizations aspire to adapt to the model of continuous improvement, the focus of the Information Technology (IT) solution trends also shifted to highlight the significance of data to transform goals to realized benefits. Data is not just purely captured and stored anymore but rather used for a wide range of analysis [1]. In this era of big data, there is a struggle to shape the IT solutions into leaner frameworks. Organizations now need to accommodate the velocity and veracity properties of big data because according to KPMG Capital, today's issue is no longer about owning the most data but rather about how to gain the most insight from it [2]. Big data gains more and more popularity brought about by its proven value add to

organizations. The practice of the Big Data discipline has now reached the government functions in what is popularly tagged as smart city implementations where data framework is architected through interconnected intelligent information systems rolled-out to different sectors such as health, urban development, finance, transport and more. Through this direction of technology, public service is anticipated to be more effective, efficient and smarter. In the local setting, the Philippines are an equally potential beneficiary of what the big data discipline has to offer.

Transport is one of the biggest sectors and considered as the lifeline of almost any country. The country's advancement on civilization is commonly measured with the sophistication level of their public transport. The development of the means and ways on public transport supports the sustainable development of the sector and among the layers of focus such as infrastructure, public policy and other course of concern, it seems that public transport information system is the widespread spotlight.

The Regional Workshop on Intelligent Transportations Systems held in Tokyo in 2010 by ADB Institute cited that governments and municipalities have started to recognize and introduce intelligent transport systems as vital tool to solve social, economic, and environmental problems. The key concept in intelligent transport information systems is open data and frameworks [3]. This is not as simple as just the government publishing the data on the web according to Liz Carolan of Open Data Institute [4]. According to Ivy Ong of Open Data Philippines, open data is rather a culture change for the Philippines as this requires utmost transparency [5], which is a similar view of McKinsey Global Institute on their five applicable ways to leverage big data [6].

In the Philippines, over the past months, the transport issues in the greater Metro Manila area have caught media attention. The problem is the lack of proper understanding of the total picture [7]. This kind of issue is not just native to Manila because in London, urban public transport providers have historically planned and managed their networks and services with limited knowledge of their customer's travel pattern [8]. This means that transit agencies have not been able to easily observe where their passengers travel.

This research is expected to contribute to this approach by studying the dimensions of an Intelligent Public Transport Information System in bridging the applicability of this to the Philippine perspective.

Specifically, this research sought to discover the answers to the research problems revolving on the benefit, the essential features, the essential inferential information and the effective framework of the Intelligent Public Transport Information System.

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Brian J. Rafor is with the consultancy to the Office of the Information Systems and Technology of the Asian Development Bank (e-mail: ianibox@yahoo.com).

Rosicar E. Escobar is with the Information Systems Department of the National Grid Corporation of the Philippines (email: rose_escobar@yahoo.com).

II. METHODS

In undertaking this study, the exploratory method of research was employed. An extensive review of literature and studies related to the subject matter of this research combined with the inputs of the 400 respondents gathered through the research instrument are the principal sources of inference that is used in developing the appropriate framework for the Intelligent Information System for the Philippine Public Transport. The respondents of this research is primarily qualified by the characteristic that they are persons which have used or are currently using the public transport facilities in the Philippines regardless of type and frequency.

The research instrument, on the other hand, is a published online questionnaire that the respondents used presented in two parts namely the profile section and the transport information system section. The researcher used the Likert Scale in the research instrument for items that asks the respondent's level of usage, experience, agreement, availability, and significance to assume equal distance among the choices. The scale is from 1-5 with 1 being the extreme negative, 3 being the neutral, and 5 being the extreme positive. The statistical tools employed to answer the questions raised in the study consisted of frequency counts, percentages, ranking, weighted mean and median.

III. RESULTS

The respondents rated their level of agreement on the perceived benefits of the intelligent public transport information system such as the access to vital transport information with 3.99; improvement on transportation planning from the traveler's perspective with 4.11; improvement of traveler's behavior on transport preference based on transport parameters with 4.12; improvement on public transport facility service through data-driven governance with 4.13; growth on the number of travelers that will use public transport with 4.01; and promotion of social

information sharing on public transport with 4.02. Aside from this, Fig. 1 shows how the respondents also highlighted that the availability of public transport data can lead to the reduction of public transport related issues and increased knowledge on traveler decision support which can then grow its benefits on promotion of local tourism, patronage of public transport over private transport, improved transport governance and economic growth and development.

On the essential features of the intelligent public transport information system, the respondents rated their level of agreement of presented features such as the ability to plan journey using location origin and destination with 4.14; ability to provide public transport inferential information with 4.11; ability to use map as a visualization tool with 4.16; ability to keep account/user information with 3.84; and ability to send alerts on public transport service interruption and advisories with 4.21. Fig. 2 shows the other essential features identified by the respondents.

The respondents rated their level of agreement on presented inferential information of the intelligent public transport information system such as the transport route option with 4.12; transport facility option with 4.07; transport schedule with 4.18; transport duration with 4.19; transport fares with 4.14; transport related incidents with 4.09, and transport reviews with 4.00. Aside from this, the respondents also identified other travel information that are essential such as the travel parameters like the cost information, safety rating, PWD rating; the travel facility information such as the vehicle plate numbers, operator information, driver information, passenger capacity, license to operate period, and transport availability; the location specific information such as the nearby places of interest, personal facility and landmarks. The framework created by the researcher, as summarized in Fig. 3, involved the application landscape, user layer landscape and the data landscape. It is envisioned to be an effective framework to accomplish the Intelligent Information System for the Philippine Public Transport. This framework was also used to create the web-based application

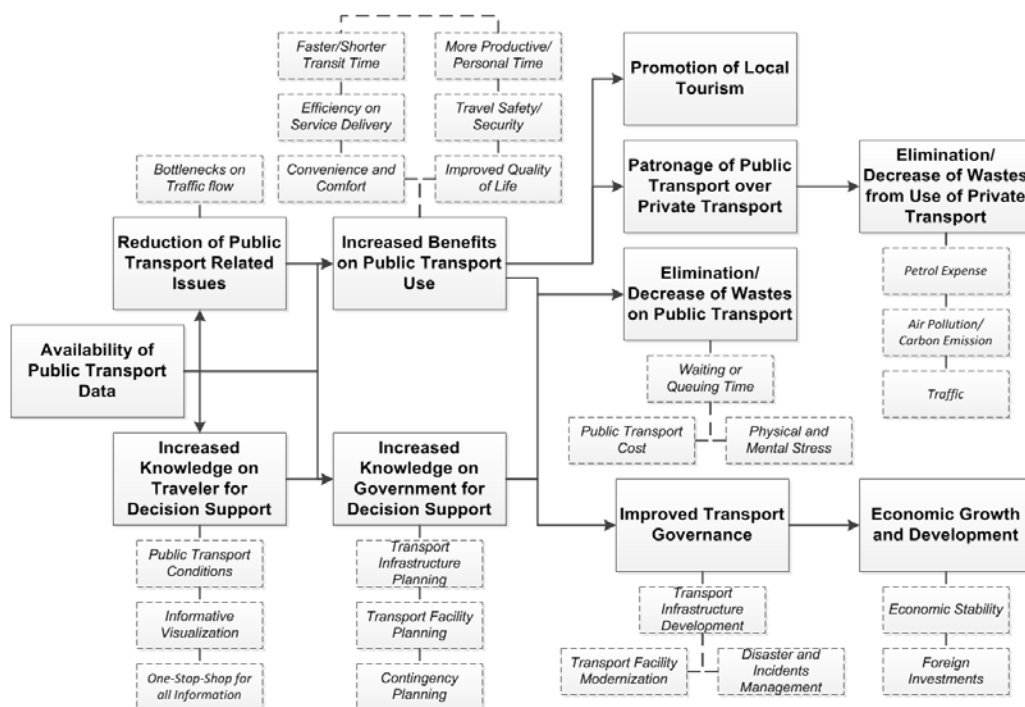


Fig. 1. Other possible benefits of intelligent public transport information system as perceived by the respondents.

prototype that showcases the most important features of the Intelligent Public Transport Information System.

considering all the factors relevant to the overall architecture.

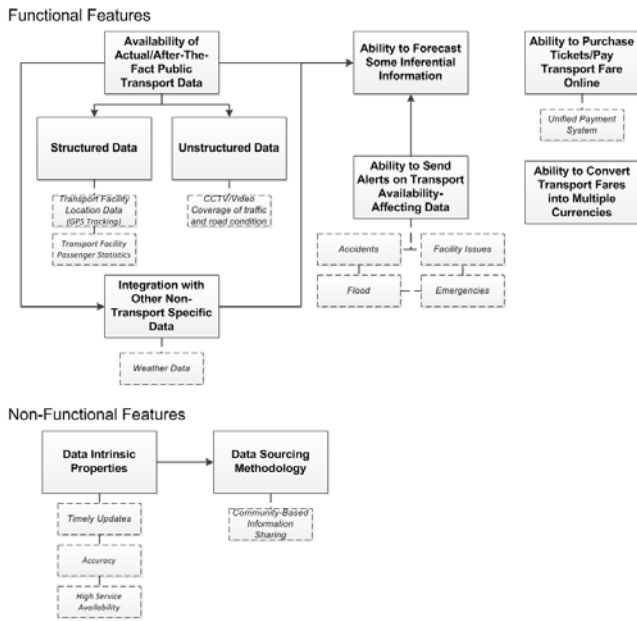


Fig. 2. Other possible features of intelligent public transport information system as perceived by the respondents.

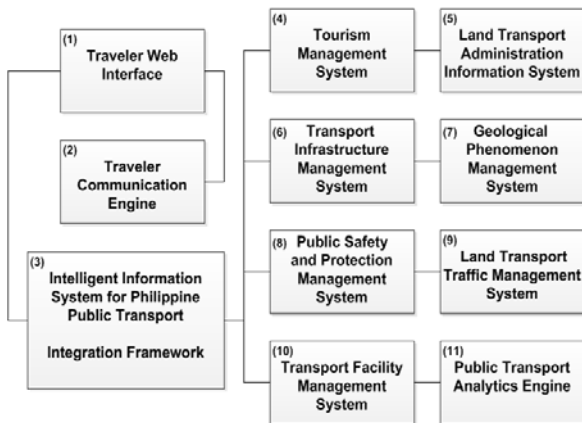


Fig. 3. Proposed application framework of the intelligent public transport information system.

IV. DISCUSSION

The Intelligent Information System for Philippine Public Transport shows a valid need to be implemented due to the numerous advantages and benefits not only to the travelers, who are seen as the primary direct and indirect beneficiaries of this solution, but also to other members of the society. The Intelligent Information System for Philippine Public Transport can hold a lot of possible features that would help support the perceived benefits. With the current state of the public transport in the Philippines, the implementation of this solution should prioritize the launch of the ability to send alerts on public transport service interruption and advisories. The Intelligent Information System for Philippine Public Transport can give a lot of possible inferential information for the specific use of the stakeholders. The travel duration is currently what tops the need of the traveler. The framework developed by the researcher is the most suited way

V. CONCLUSION AND RECOMMENDATIONS

In summary, the study proved that there is a need for the Philippines to adapt to the usage of intelligent information system for public transport. Therefore, The Intelligent Information System for the Philippine Public Transport should be implemented as part of the strategic solution for fulfilling a public transport sector development. To showcase the continuous improvement in this solution, it would be beneficial to have a study on the evaluation of the developed Intelligent Information System for the Philippine Public Transport focusing on the two research agenda such as the solution evaluation on the perspective of its users and the other on its effect and influence on the improvement of the state of public transportation in the Philippines. Future researchers can conduct a technical and logistic study on the integration of automated transport data collection system in the current version of the Intelligent Information System for Philippine Public Transport as described by this study. Future researchers can also conduct a study on the augmentation of the current capabilities of the Intelligent Information System for Philippine Public Transport in terms of the analytics dimension focusing on the data mining methodologies, data manipulation strategies and introduction of prediction models involving the transport parameters. The Philippine government may use this study as a starting reference to explore and establish a concrete framework for open data strategies not only to the transport sector but also to the other equally important sectors of the society.

APPENDIX

The following tables show the references of the findings:

TABLE I: LEVEL OF AGREEMENT ON THE PERCEIVED BENEFIT OF THE INTELLIGENT PUBLIC TRANSPORT INFORMATION SYSTEM

	Mean	Median	Interpretation	Rank
Access to vital transport information	3.99	4	Agree	6
Improvement on transportation planning from the traveler's perspective	4.11	4	Agree	3
Improvement of traveler's behavior on transport preference based on transport parameters (for example: cost, safety, comfort, travel time)	4.12	4	Agree	2
Improvement on public transport facility service through data-driven governance	4.13	4	Agree	1
Growth on the number of travelers that will use public transport	4.01	4	Agree	5
Promotion of social information sharing on public transport	4.02	4	Agree	4

TABLE II: LEVEL OF AGREEMENT ON THE FEATURES OF THE INTELLIGENT PUBLIC TRANSPORT INFORMATION SYSTEM

	Mean	Median	Interpretation	Rank
Ability to plan journey using location origin and destination	4.14	4	Agree	3
Ability to provide Public Transport Inferential Information	4.11	4	Agree	4
Ability to use map as a visualization tool	4.16	4	Agree	2
Ability to keep Account/User Information	3.84	4	Agree	5
Ability to send alerts on Public Transport Service Interruption and Advisories	4.21	4	Agree	1

TABLE III: LEVEL OF AGREEMENT ON THE INFERENTIAL INFORMATION OF THE INTELLIGENT PUBLIC TRANSPORT INFORMATION SYSTEM

	Mean	Median	Interpretation	Rank
Transport Route Option	4.12	4	Agree	4
Transport Facility Option	4.07	4	Agree	6
Transport Schedule	4.18	4	Agree	2
Transport Duration (Travel Time)	4.19	4	Agree	1
Transport Fares	4.14	4	Agree	3
Transport Related Incidents	4.09	4	Agree	5
Transport Reviews	4.00	4	Agree	7

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Brian J. Rafor is currently a senior consultant for Business Intelligence to the Asian Development Bank in its headquarters at Manila, Philippines. He earned the master of science degree in information technology from the Polytechnic University of the Philippines Graduate School in 2016. He is a graduate of bachelor of science in information technology from the Baliuag University receiving the magna cum laude honor. Mr. Rafor's fields of study are in database administration, data warehousing, analytics, and business intelligence.



Rosicar E. Escobar is a PhD in business management graduate of the Manuel L Quezon University. At present she is taking her PhD in information technology at St. Paul University, Philippines. She obtained her MS in information technology from De La Salle University in 1993. She likewise graduated in systems engineering course in 1991 as a scholar from the Center for International Cooperation for Computerization in Japan. She is a cum laude when she graduated in bachelor in computer data processing management from PUP. She is an associate professor V of PUP on a part-time basis handling ICT and business courses. She was the first chairperson of the MSIT program of the PUP Graduate School. Currently she is the IS head of the National Grid Corporation of the Philippines.