Factors Supporting The Implementation of Mass Transport System in Indonesia

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Abstract. Development of cities in Indonesia is along with increasing of community mobility that traveling from the surrounding district (hinterland) to the central city and its reverse. However dominantly city in Indonesia haven’t mass transport system. Unavailability of mass transport facilities also have taken place in Cilegon, one of industrial city in Indonesia. The ratio of the use of public transport and private transport vehicles in Cilegon was 1:90. Bus Rapid Transit (BRT) was one alternative to serve good public transport. This research aims were look at factors that affect the success of the BRT application, and analyzing important factors that support BRT implementation. The approach on technology transfer was used in determining the characteristics of the transferor and transferee in supporting the implementation of mass transportation. Three parties involved in the transfer of technology in the BRT system were government, operator, and the community. This study procured there were nine factors supporting the implementation of Bus Rapid Transit (BRT) System, they were transferor readiness, basic capabilities and adaptation to the mass transport system, transferee readiness, supporting regulations and policies, cooperation in the supervision and services development, counseling and community management, culture, confidence level, and local sub contract. Nine construct factors represented the data in terms of variance explained (61.802\%). The transferor readiness was the main factor with percentage of explanation was 25.987\%. The main role in technology transfer in BRT system was hold by the Government as a manager that playing role in achievement of targets 46.89\%.

1. Introduction
Development of cities in Indonesia is along with increasing of community mobility that traveling from the surrounding district (hinterland) to the central city and its reverse. This phenomenon was the impact of population increasing, economic activities, and economic interactions. The direct implications of these circumstances led to two major problems, they are the necessity on infrastructure and the need for good transportation services. Further, the availability of good transportation service will increase the community mobility.

Cilegon is an industry region that placed 90 km from Jakarta, with population approximately 412 thousands in 2015. Cilegon constitute an industrial town which has 81 large industries and 20 thousands workers, but the town didn’t have good public transport system. Community need mass transportation system that integrated, cheap, safe, and reliable. This town like others region in Developing Country, did not have good public transport management because the government hasn’t served community with mass public transportation. Actually the public transportation system was managed by some small
automobile company. Poor transport management made community preferred using private vehicle for transporting. Planning Bureau of City of Cilegon (2014) reveal vehicle that operate in Cilegon dominantly was private vehicle, approximately private car was 9.40%, motorcycle was 86.52%, public transport was 0.81% and others 3.27%. They also said the ratio the use of public transport and private transport vehicles in Cilegon was 1:90. It had an impact on congestion at some node in Cilegon on rush-hour.

Planning public transport system should began with identifying the factors supporting the success of public transport program. Factors that affect the level of public participation using mass transportation already examined in several countries. Research by UCLA Institute of Transportation Study in Los Angeles-US got the higher numbers of no-vehicle households, percent Hispanics, and percent female within the vicinity of a transit stop were significantly associated with higher levels of bus ridership [1]. Meanwhile research about quality of pedestrian environment in San Diego-US said higher median household incomes was significantly associated with lower levels of transit ridership at any particular bus stop [2].

Build a new transit system can be likened as a process of transfer of technology in the transportation system in Indonesia. Analysis of mass transport procurement by the Government and the readiness of the community towards a new transportation system can be analyzed with Technologi transfer approach. A conceptual model for technology transfer have accommodated the numerous factors believed impact on the processes effectiveness, it derived outcomes the factors namely Technology Transfer Value Added (AV), and four technology transfer enabling factors: Relation Building (RB), Transferee Characteristics (TE), Government Influence (GI), and Technology Characteristics (TC) [3]. Warronkun [4] had identified 23 considerations as macro ergonomics factors of transferee on which management should pay attention to realize a successful technology transfer in Indonesia Companies. The factors that support technology transfer in industry in a number of developing countries had been examined. Some of the factors that affect the success of Technology Transfer were characteristic of transferee and government policy. Successfull of industrial sector in future depend upon the degree of which the country can develop, consolidate and strengthen technology development and transfer activities [5]; [6];[7].

Three parties involved in the transfer of technology in the Bus Rapid Transit (BRT) system were the government, operator, and the community. The Government of Cilegon was manager of the BRT system, and operator of the BRT was a private automobile company that was appointed by the Government. The Government was the transferor meanwhile the operator and the community were transferee. Bus Rapid Transit (BRT) was one alternative to serve good public transport in Cilegon. BRT had scheduling and service system of mass transport that is orderly and used the technology of electronic cards. The application of BRT system that examined in this research look at factors that affect the successful of the application. The approach on technology transfer was used in determining the characteristics of the transferor and transferee in supporting the implementation of mass transportation. Transfer technology and apply new system was issued in this research. Aims of this study were analyzing important factors that supporting implement BRT in Cilegon.

2. Literature review
Some researches have studied the needs of the community towards public transport both from the side of its characteristics such as public transport convenience and price, as well as other facilities that support the use of public transport such as the intermodal transfer facilities, station facilities and travel time. Using privet vehicle for transporting in Indonesia have made stagnation in some cities, so studies on shifting users from private transport to public transport are need.

A study by Abuhamoud [8] was conducted in Tripoli, Libya (which has high car ownership) using a binary logistic model. The results show that some measures have to be taken to encourage car users to use other forms of public transport. Transit oriented developments are often designed to promote the use of sustainable modes of transport and reduce car usage. The Binary Logistic models reveal that personal and transit characteristics have an impact on the decision of mode selection.
Cowdhury have researched in two major transport centers in Auckland - New Zealand and used theory of planned behavior to explore public transport users intention to promote ridership of public transport for community and find authorities need to focus on developing attractive transfer routes (e.g. reduced total travel time savings) with comfortable transfers from a user perspective to encourage ridership of public transport [9].

Stated preference survey was conducted in Brisbane–Australia to forecast travel behaviour in a hypothetical travel environment whereas the revealed preference survey was used to study the current travel behaviour [10]. The study revealed commuters mode choice was influenced by trip purposes and trip length. There were 45% commuters perceived to split to bus on busway if in-vehicle travel time can be reduced to 40 minutes.

Chauhan [11] used a binomial logistic regression model to predict whether existing metro users have shifted from buses or Privat motor vehicles in India. The mode shifted from was used as the categorical dependent variable and was correlated with categorical and continuous independent variables responsible for the shift. Studies revealed that commuters can actually shift to public transport if management concerns were addressed on quality of mass transport they are comfortable, quick and safer. Improving the quality of public transport alone was not sufficient to affect the desirable mode shift from privat motor vehicles to public transport (metro in India). In this study, this is reflected in the low share of privat vehicles to metro and the low likelihoods of commuters owning privat vehicles shifting to the metro.

Irawan [12] studied about the characteristics of the train users to travel for working in Yogyakarta Indonesia. Intermodal facilities that still limited was the attention in this research. The main reason of the community using railways to work because the distance of their home to the stasion was relatively close and parking fees stay relatively cheap. Dominantly mode that used by users to get the station is a motorcycle and then they continue their travel by train. Whereas for the purpose of shopping, trades, and social activities the train users using a variety of modes to get to the station. Users can shift from motorcycle to bus as mode out of the station, it was influenced by several variables such as distance of travel to the bus stop, in vehicle bus travel time, bus tickets price, bus waiting time, parking fees, and the distance to stasion parking location.

Carteni [13] studied the Sustainable Urban Mobility Plan of Naples, in southern Italy. This scenario distributes the metro and pedestrians evenly around Municipio square. The scenario also make the flow of traffic and pedestrians smoothly. This scenario gives advantage to pedestrians due to make widening sidewalks and paths. External layout of Municipio square was designed to service wider space for passenger as consequence of new metro stasion. Infrastructures and paths will build to minimize the conflicts.

3. Material and methods
This research was an exploratory research that studied factors of technology transfer in application of Mass Public Transport to users in Cilegon. The study involved community of mass transportation operators, and government as respondents in filling the questionnaire.

3.1. Questionnaire
The survey questionnaire was chosen as the data collection instrument. It was developed based on the inspiration of the conceptual model for technology transfer developed by Waroonkun (2015). Conceptual model technology transfer [3] included 29 variables support transport technology : Complexity Level, Mode of Transfer, Government Policy, Government Enforcement, Culture, Trust, Understanding, Communication, Commitment, Teamwork, Training, Local-Sub-Contract, Supervision, Willingness to Implement, Degree of Experience1, Transferor Management, Knowledge Base, Willingness to Learn, Degree of Experience2, Transferee Management, Knowledge Base, Competitiveness, Performance, Improved Knowledge, Improved Working Practices, Long-Term Adoption, Financial Performance, Schedule Performance, and Quality Standard. The survey questionnaire contained two separate parts. Part one examined the Technology Transfer Process
Enablers and their associated sub-factors, including: Transfer Environment, Learning Environment, Transferor Characteristics, and Transferee Characteristics. Part two focused on measuring the Outcome of the Technology Transfer strategy in the categories: Economic Advancement, Knowledge Advancement, and Project Performance. This section also solicited the respondents’ personal information to establish their demographic and professional profiles.

Respondents were requested to rate these variables in assessment columns that assess every variable based on its importance in implementing BRT. The assessment using a five-point of Likert scale. Respondents asked for their opinion about the statements related to BRT implementation, the scale range from 1 (strongly disagree) until 5 (strongly agree). Respondents consider their perception of the impact of Technology Transfer factors in public transit system environment, based on their experience and knowledge. These results were used to determine the importance/significance of each variable. These results were essential for determining the effectiveness of BRT implementation in Cilegon.

3.2. Respondents
There were three groups of respondents, they were included of users, public transport operators, and government. The users were community of Cilegon that used public transport that selected based on clustered sampling. Respondents for operators were private buses that already exist in the town. And respondent for government were bureau that regulate transportation in Cilegon related to BRT implementation. The questionnaires were hand carried and distributed to users which was clustered by each origin nodes of the corridor’s intersection. Respondents were clustered based on origin nodes of their transporting. Five origin areas were selected as sampling node and total 158 respondents were surveyed from these areas for the research.

3.3. Data Processing
The variables that influence the success of the BRT application were get from the dissemination of the questionnaires to the three parties involved in this mass transport system, they are the community as user, the bus operators, and Government as management. The variables were processed using factor analyzing with varimax rotation to get the factors supporting the implementation of the BRT system. Data from questionnaire was condensed and summarized into more defined data sets using Principal Components Analysis (PCA). This step purpose was identifying the factors that influence the successful implementation of BRT system. There were four steps in factor analyzing : 1). Conducting assumption tests to make sure that PCA can be used to analyze the data. The tests included a) Reliability test was performed and assessed by calculating Cronbach’s alpha, which was a coefficient of reliability (internal consistency). (b) Sampling adequacy. Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was used to find out there is no uncertainty due to the prediction of communality problems. and (c) Bartlett’s Test of Sphericity. 2). Communaliities. It explain how much factor which built can explain the variable. All of variables can be explained by the factors with value more than 0.5. 3). Extraction. Output of the extraction indicated the proportion of each variable’s variance that can be explained by the retained factors. 4). Rotation. For ease of interpretation of the factor extracted, the principal components matrix often rotated with goal to achieve a simple structure. Varimax exploratory principal factor analysis method was conducted to assess the 29 variables of the questionnaire into some new construct factors with minimum loss of information

4. Results and discussion
One hundred and fifty eight (158) respondents from the Cilegon responded to the survey questionnaires and eight questionnaire were not used further because had invalid data. The respondents gender were fairly distributed, 99 residents were male (66%) and 55 respondents were females (34%). The majority of the respondents (100%) had aged less than 50 years old. Respondent occupations were variably, they were included employees of automobile company, employees of private company, government employees, lecturer, teacher, housewife, bussinesmen, etc. Next table explained the respondent occupations.
Tabel 1. Respondents.

| No  | Group of respondent        | Number |
|-----|----------------------------|--------|
| 1   | Government employee        | 31     |
| 2   | Autobus employee           | 7      |
| 3   | Public company employee    | 4      |
| 4   | Lecturer                   | 3      |
| 5   | Teacher                    | 3      |
| 6   | Wifehouse                  | 10     |
| 7   | Privat company employee    | 32     |
| 8   | Student                    | 44     |
| 9   | Sailor                     | 1      |
| 10  | Businessment               | 15     |
|     | Total                      | 150    |

The Assessment column informed respondent’s perspective on importance of the variables in process of technology transfer in BRT, the values for all conceptual variables were displayed in table 2.

Tabel 2. Respond regarding variables

| Code | Variables                        | Assessment |
|------|----------------------------------|------------|
|      |                                  | Mean | SD |
| S 1  | Transfer Environment             | 4.12 | 0.74 |
| S 1.1| Complexity Level                 | 4.21 | 0.78 |
| S 1.2| Mode of Transfer                 | 4.08 | 0.74 |
| S 1.3| Government Policy                | 4.04 | 0.70 |
| S 1.4| Government Enforcement           | 4.15 | 0.72 |
| S 2  | Learning Environment             | 4.11 | 0.79 |
| S 2.1| Culture                          | 3.73 | 0.95 |
| S 2.2| Trust                            | 3.89 | 0.86 |
| S 2.3| Understanding                    | 3.87 | 0.81 |
| S 2.4| Communication                    | 4.12 | 0.83 |
| S 2.5| Commitment                       | 4.09 | 0.82 |
| S 2.6| Teamwork                         | 4.27 | 0.71 |
| S 2.7| Training                         | 4.36 | 0.66 |
| S 2.8| Local-Sub-Contract               | 4.28 | 0.72 |
| S 2.9| Supervision                      | 4.40 | 0.74 |
| S 3  | Transferor Characteristics       | 4.08 | 0.75 |
| S 3.1| Willingness to Implement         | 3.89 | 0.70 |
| S 3.2| Degree of Experience             | 4.12 | 0.74 |
| S 3.3| Transferor Management            | 4.19 | 0.76 |
| S 3.4| Knowledge Base                   | 4.13 | 0.78 |
| S 4  | Transferee Characteristics       | 3.70 | 0.97 |
| S 4.1| Willingness to Learn             | 4.00 | 0.84 |
| Code | Variables                      | Assessment |
|------|--------------------------------|------------|
| S 4.2| Degree of Experience          | 3.74       |
| S 4.3| Transferee Management         | 3.21       |
| S 4.4| Knowledge Base                | 3.86       |

| Value Added                  | Mean | SD |
|------------------------------|------|----|
| N 1 Economics Advancement    | 4.18 | 0.71|
| N 1.1 Competitiveness        | 4.16 | 0.74|
| N 1.2 Performance            | 4.21 | 0.68|
| N 2 Knowledge Advancement    | 4.09 | 0.75|
| N 2.1 Improved Knowledge     | 4.14 | 0.71|
| N 2.2 Improved Working Practices | 4.02 | 0.72|
| N 2.3 Long-Term Adoption     | 4.12 | 0.83|
| N 3 Project Performance      | 4.03 | 0.85|
| N 3.1 Financial Performance  | 4.03 | 0.79|
| N 3.2 Schedule Performance   | 3.87 | 0.98|
| N 3.3 Quality Standard       | 4.21 | 0.76|

Mean score were computed by equally weighting the mean score of all variables. The average value of the Transfer Environment construct was 4.12, the average value of Complexity Level was 4.21, Mode of Transfer was 4.08, Government Policy was 4.04, and Government Enforcement was 4.15. Mean values of all variables on approval and impact showed a value of more than 3, its indicated that the 29 factors present in the questionnaire were important and those factors had a good impact on the implementation of Bus Rapid Transit (BRT). Among the successor data can be seen that the Supervision with average score 4.40 was the most accepted variable of the respondents for its influence in the implementation of BRT, while Training Variables with score 4.43 plays an important role in the process of implementation of BRT System. Survey also revealed variable of Transferee Management (S.4.3) had the lowest value (3.21) for its influence in the BRT implementation. Respondents agreed that the added value in the implementation of BRT was very important to consider. A very important concept factor was Economic Advancement with an average value 4.18. Performance and Quality Standards with an average score 4.21 emerged as the two most important factors as the added value in the implementation of BRT, while Quality Standards with an average value 4.29 was also variable that have the great impact in the technology transfer process, followed by Competitive that have an average value 4.23.

Next graphics showed assessment of respondents on successors and impact of each successor in implementing BRT.
4.1. Extracting factors

Data from questionnaire was condensed and summarized into more defined data sets using Principal Components Analysis (PCA). The general purpose of this step was to identify the common factor and explain their relationship to the observed data. Next steps had conduct to interpret Principal Components Analysis (PCA) on transfer technology factors in BRT program.

1. Conducting assumption tests to make sure that PCA can be used to analyze the data. The tests included: (a) Reliability test was performed and assessed by calculating Cronbach’s alpha, which was a coefficient of reliability (internal consistency). Correlation test on 150 data got alpha cronbach 0.878, it mean data was reliable and had high internal consistency; (b) Sampling adequacy. Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was used to find out there is no uncertainty due to the prediction of communality problems. KMO sampling Adequacy of the data was 0.847; (c) Bartlett’s Test of Sphericity was got α = 0.000, it mean data was significant with 95% of confidence; Variables are ready to conduct PCA based on three tests above.

2. Communalities. This is the proportion of each variable’s variance that can be explained by the factors. Communalities explain how much factor which built can explain the variable. All of variables can be explained by the factors with value more than 0.5.

3. Extraction. Output of the extraction indicated the proportion of each variable’s variance that can be explained by the retained factors. Variables with high values were well represented in the common factor space. However in this research only the first nine factors will be retained as we requested based on eigenvalue-greater-than-one. On this step we have got the variance of technology transfer that can be explained by factors: the factor 1 explained 25.978% of variance, the factor 2 explained 5.618 % of variance, the factor 3 explained 5.301% of variance, the factor 4 explained 4.851%, the factor 5 explained 4.594 %, the factor 6 explained 4.307%, the factor 8 explained 3.679 percent and the factor 9 explained 3.485%. The total of 9 factors explained 61.802% variance in BRT technology transfer. Then factor loading determined each independent variable that fit into one of the 9 construct factors. Rotated Component Matrix was used to determine the member variable of any factors that are constructed.

4. Rotation. For ease of interpretation of the factor extracted, the principal components matrix often rotated with goal to achieve a simple structure. Varimax exploratory principal factor analysis method was conducted to assess the underlying structure for the original 29 variables of the questionnaire into small set of construct factors with minimum loss of information. The
method produced 9 factors that can support the implementation of BRT in Cilegon. All the conceptual variables were grouped under construct factors. The factors include:

1. Transferor readiness, include in this factor were willingness to implement, degree of experience, transferor management, knowledge base, quality standard, and financial performance. The factor indicated 25.978% variance explained.

2. Basic capabilities, include in this factor were competitiveness, performance, improved working practices, long-term adoption, and schedule performance. The factor indicated 5.618% variance explained.

3. Transferee readiness, include in this factor were understanding, willingness to learn, and degree of experience. The factor indicated 5.301% variance explained.

4. Supporting regulations, include in this factor were complexity level, mode of transfer, government policy, and government enforcement. The factor indicated 4.851% variance explained.

5. Cooperation in the supervision and services development, include in this factor teamwork, training, and supervision. The factor indicated 4.594% variance explained.

6. Counseling and community management, include in this factor were communication, transferee management, and knowledge base. The factor indicated 4.307% variance explained.

7. Culture is the only variable that occurred in this factor therefore this factor will also be called by culture with total 3.979% variance explained.

8. Confidence level, include in this factor was trust & commitment. Factor indicated 3.679% variance explained.

9. Local sub contract is the only variable that occurred in this factor therefore this factor will also be called by culture local sub contract with total 3.495% variance explained.

10. Nine construct factors best represented the data in terms of variance explained (61.802%). As rule of thumb for significance level 0.05 and sample as many as 150 samples the acceptable factor loading was 0.45 or above.

4.2. Supporting factors and recognisance

Nine factors that determined the success of the BRT implementation was analyzed based on the roles and responsibilities of the three parties involved in the BRT activities. They were users, operator, and government. The following table informed supporting factors of BRT implementation and recognition of each factors.

| Number | Factor name                                      | Impact on variance of target | Recognisation by |
|--------|--------------------------------------------------|------------------------------|------------------|
| 1.     | Transferor readiness                             | 25.978%                      | Government       |
| 2      | Basic capabilities                                | 5.618%                       | Operator         |
| 3      | Transferee readiness                             | 5.301%                       | User             |
| 4      | Supporting regulations                           | 4.851%                       | Government       |
| 5      | Cooperation in the supervision and services development | 4.594%             | Government       |
| 6      | Counseling and community management              | 4.307%                       | Government       |
| 7      | Culture                                          | 3.979%                       | User             |
| 8      | Confidence level                                 | 3.679%                       | Government       |
| 9      | Local Sub Contract                               | 3.485%                       | Government       |
| Total  |                                                 | 61.802%                      |                  |
Based on the cumulative value of variance of implementation of BRT system, the main role was held by the Government as a Manager that playing role in achievement of targets 46.89%. Government had role on Transferor readiness, supporting regulations, cooperation, counseling, confidence level, and local subcontract. The operator had role in achievement of targets 5.618% on the implementation of the Basic capabilities, meanwhile the user had the role 9.28% in Transferee readiness and Culture. Indonesian were undiciplinary community in the road, but this habitual will be minimalized under control the Government which play dominant role in implementing technology transfer in the BRT system. The Government management was the dominant factor for success implementation of the BRT system. Every subject had kept theirs duties under Government control.

5. Conclusions and suggestions

5.1. Conclusions
Factors supporting the implementation of Bus Rapid Transit (BRT) System in Cilegon were transferor readiness, basic capabilities and adaptation to the system SAUM, transferee readiness, supporting regulations and policies, cooperation in the supervision and services development, counseling and community management, culture, confidence level, and local sub contract. The transferor readiness was the main factor with percentage of explanation was 25.987%. The main role in technology transfer in BRT system was held by the Government as a manager that playing role in achievement of targets 46.89%. In order to be successful in BRT application Government should make planning and production management, manage the operators and the community, make regulations and rules of the game and run the mass transport in a professional manner.

5.2. Suggestions
This research has analyzed the role of the three parties involved in the development of mass transport systems, so that the need to do more detailed analysis against the readiness of the Government as a manager in the project. More research can be done with a focus on Government with a makroergonomic approach and focus on community travel behavior.

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