International Journal of Engineering & Technology, 7 (2) (2017) 462-465

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Effect of The Building Maintenance and Resource Management Through User Satisfaction of Maintenance

Darmawan Pontan[1,2]*, Surjono Surjokusumo[1], Johny Johan[1], Cholil Hasyim[3], Muhammad Ikhsan Setiawan[4], and Ansari Saleh Ahmar[5], & Dani Harmanto[6]

[11]Department of Civil Engineering, Doctoral Program, Tarumanagara University, Jakarta 11440, Indonesia
[2]Department of Civil Engineering, Trisakti University, Jakarta 11440, Indonesia
[3]Department of Management, Darul Ulum University, Jombang, Jawa Timur 61419, Indonesia
[4]Department of Civil Engineering, Narotama University, Surabaya, Jawa Timur 60117, Indonesia
[5]Department of Statistics, Universitas Negeri Makassar, Indonesia
[6]University of Derby, School of Technology, Derby, United Kingdom
**Corresponding author E-mail: darmawanpontan.trisakti@gmail.com*

This Paper is based on a presentation given by the authors at "Workshop of KO2PI" held from 19 January 2018 to 20 January 2018 in Indonesia.

Abstract

PD Pasar Jaya manages 153 markets spread across Jakarta. Market building is a place of public services, in order to provide excellent service to the community, it is important to maintain it properly. Maintenance management of PD Pasar Jaya is still far from the expected. The purpose of this study was to determine the effect of directly and indirectly from the condition of the building and maintenance resources to user satisfaction through maintenance management. The research method is by taking a sample of 14 buildings market, then use the check list building condition assessment visually and dissemination of survey questionnaires to 216 respondents, namely the market manager, the kiosk, and visitors. The questionnaire consisted of four variables: the condition of the building (X1), maintenance resources (X2), as an variable, independent maintenance management (Y) as variable, an intervening while user satisfaction (Z) as the dependent variable. Furthermore, assessment data is processed by the descriptive analysis of the building, while the questionnaire survey data processed by path analysis using linear regression with SPSS ver. 22. The results of assessment of 14 buildings is a market average of 78 of the highest value of 100, this means that the condition of the building is being with only minor damage. The total yield of the influence of the condition of the building (42.38%) and maintenance resources (25.01%) towards satisfaction of a user through maintenance management (1.26%) is 68.65%.

Keywords: *building, damage, maintenance, market, public services.*

1. Introduction

Building a house seems easier than carrying out maintenance. Therefore it is not surprising that the new building was completed in later years have decreased the value of the condition of the building. How important the maintenance problems the building can be seen from the time the user utilization reaches 50 to 100 years, when compared with the period of construction that only takes 2 to 3 years, as time increases, the building with the amenities of a lot of changes, both physical and economic value in the building that is so. In general, the age of a building accounted for approximately 20 to 50 years depending on the specifications of the planned building, but a building often does not always correspond to the initial specifications[1]. Maintenance and upkeep of buildings includes requirements related to safety, health, comfort, convenience[2]. Furthermore, all the users of the building is expected to be responsible is to understand and appreciate the importance of the need for maintenance. Even the active participation of all users to be able to maintain and repair itself when managers felt slow to respond[3]. There are some things that cause a lack of attention to maintenance activities, namely: maintenance activities deemed non-urgent compared with development activities, the organizational structure of improper maintenance, facility managers thought that the maintenance of the building is a technical matter which is not associated with the goal of building functions corresponding user desires, absence of a clear strategy and policy on the investment value of the facility[4]. By preserving the public buildings such as schools, hospitals, terminals, markets, and others can make the community can feel safe, comfortable, in utilizing the building. Maintenance management requires knowledge and participation of all parties in terms of maintenance. It turned out to be more interested consultants and contractors involved in the new project compared to the repair and maintenance projects. Because it is the capital city of Indonesia, especially in Jakarta government has a duty to his buildings in the public interest must be maintained. The Jakarta provincial government is the owner of PD Pasar Jaya. Many buildings along the PD market facilities. Pasar Jaya were damaged or destroyed, which is because of it's time and even some of the time were broken before she had planned. PD Pasar Jaya not grown since 1985 until now, amid the rapid growth of private markets such as shopping centers, wholesale centers, hypermarkets, supermarkets, convenience stores and mini markets. (Figure 1)[5]–[20]

Copyright © 2016 Authors. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

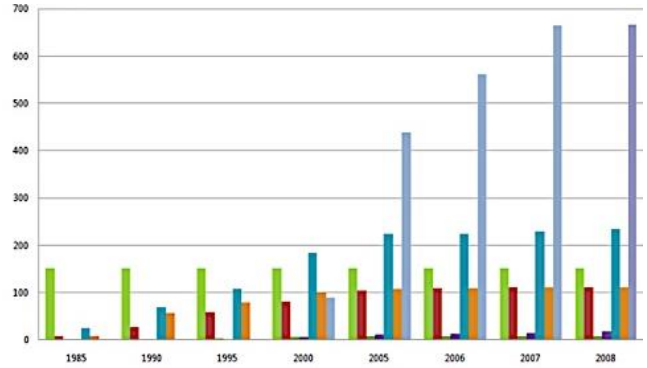


Fig. 1: The development of PD Pasar Jaya compared with shopping centers, wholesale centers, hypermarkets, supermarkets, department stores, minimarkets (PD Pasar Jaya, 2010)

2. Experimental Details

The research method that is a description of qualitative and quantitative analysis is also equipped with paths using linear regression analysis. Data from 153 buildings PD Pasar Jaya is taken as many as 12 buildings UPB market (Large Market Unit) and 2 units of building market that can develop into UPB, so that all the research object about the same classification. Then carry out questionnaires each 15 sets of 6 for kiosk users, 6 for visitors and 3 for the market manager. In addition a questionnaire was given also to 5 people who are experts in the field of maintenance. Secondary data, surveys the literature using journals and previous research, books, laws and government regulations on building and maintenance, and then explore the data and information such as planned maintenance management required from the relevant part is the field of care management and maintenance PD Pasar Jaya. The research was conducted in three (3) phases: first stage, carry out surveys assessing the conditions of the building 14 buildings PD Pasar Jaya, using the checklist building conditions, then the results were analyzed with descriptive analysis of non-statistical, phase II , implement the draft questionnaire and carry out deployment questionnaire, after the results collected implemented a validation test and reliable on the results of the 30 items respondents and 216 grains of respondents, if there are indicators that are invalid and not reliable then the item indicators (questions) were not involved in the process stage III, namely for the manufacture of models with linear regression path analysis using SPSS ver. 22. The name and location of the object of research for 14 markets, the first stage of implementing assessment of the condition of the building visually by using the checklist, then the second stage of primary data collection from direct survey by questionnaire and interview to "StakeHolder" the kiosk renters (tenants), the manager (owner) and visitors (visitors). The method of sampling of the population used in this study is the method of area sampling of 153 markets PD Pasar Jaya spread in Jakarta is set to 14 markets with a class that is almost the same and with locations spread across 5 regions, namely North Jakarta, South Jakarta, Jakarta west, East Jakarta and Central Jakarta. Furthermore, decision-member sample with method simple random sampling (simple random sample) that can represent of the population and the sampling is done totally random that exist in the population. So Simple Sample Random sampling is a simple procedure that select a sample of units most easily found or accessed. So that the sampling of the data elements of the population is obtained by setting the number of samples taken is a minimum of 100 respondents. From the number of sample selection criteria and also the condition of the building with almost the same classification so for this study as an object of research there are 14 markets. And classification respondents are 3 co-owner, 6 tenant representatives stall, 6 representatives of visitors, this respondent samples obtained from 210 respondents. And coupled with 5 people who are experts in the field of maintenance, as well as first responder that researchers themselves. So that the total 216 respondents. But to spare the respondent then distributing questionnaires conducted with a total of 255 sets. Form of variables in this study there are (2) two groups of exogenous variables which is an independent variable. Exogenous variables are variables that affect and be the cause of the onset of endogenous variable exogenous variables is a variable condition of the building (X1) and variable maintenance resources (X2). As for Variable Between is a maintenance management variable (Y) which is also the exogenous variables affecting the free variable and the cause of the emergence of endogenous variables as a result of variable variable User Satisfaction (Z). Visible model of the relationship between exogenous variables, variables intervening,endogenous variables, and each variable are factors with total factor 16 and in each of these factors are indicators for a total of 56 indicator questions for this study. In processing, scores the questionnaire answers are assumed to have the same properties with interval data (scale). Distance between 5-3 equals the distance with a distance of 4-2 or 3-1. Then the results of the questionnaire survey obtained created tabulation. Furthermore, to test the validity and reliability of the instrument consists of two groups, the test instrument 30 respondents from a total of 216 respondents. After eliminating indicator invalid and unreliable, next is the modeling of the path of structural look for the indirect effect of user satisfaction (Z) on the condition of the building (X1) and maintenance resources (X2) through maintenance management (Y). To determine the relationship of direct and indirect influence between variable multivariable and settlement multivariate statistical models Path Analysis using SPSS and MS Excel Software. The ultimate goal of this research is to form the main model is a model of structural lines where X1, X2, Y and Z is the independent variable is the dependent variable. Error coefficient ε1, ε2, ε3. correlation R21, r1y, r2y, r2z, Ryz, RZ1. Path coefficient P12, Py2, Py1, Pz2, Pzy, PZ1[21]–[29]

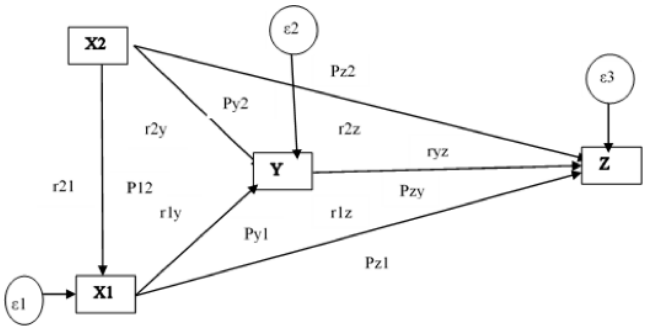


Fig. 2: Model Line Structural

For the modeling of pathways such structural (Figure 2) must require data from a questionnaire that was tested classical statistics. First, validity and reliability Test; Item indicator questions tested for validity method Pearson is correlating each of the questions in the Item Total Statistics with a score total (Corrected Item-Total Correlation), validity relating to the accuracy of instruments rationally reflect the measured object, so that the criteria exist inside the instrument. Test item validity of indicator questions on 30 respondents so the results of the group item selected is invalid if it has a value of r arithmetic ≥ r table = 0.3 (N = 30), and the value of r arithmetic ≥ r table value = 0.13 (N = 216), with sig. ≤ 0.05. Test reliability is related to repeatedly measure will produce consistent data. Meets reliability means that the instruments used in the few cal i to measure the same object will generate the same data, sufficient reliability if the value of Cronbach's Alpha ≥ 0.40. If there is a grain that question is invalid or unreliable, then that item is removed from the list of questions, to maintain the validity or the validity of a study. Second, Correlation coefficient; the correlation coefficient addressing the power relationship between two variables. Third, t Test and F Test; in the t test by looking at

the count value t on Coefficient results of SPSS, to determine whether or not the influence (alone) given the independent variables on the dependent variable, while the F test to see the calculated value of F on Anova test results of SPSS, to determine whether or not the effect of simultaneously (together) were given independent variable on the dependent variable. If sig. <0.05 or t> t table then there is the influence of independent variables with the dependent variable, while for the F test if sig. <0.05 or F count> F table are jointly independent variables on the dependent variable. Finding t table = t (α / 2, nk-1), while searching for F table = F (k, nk), with α = 0.05, n = total number of respondents, k = number of independent variables. Fourth, Normality Test and linearity test and test Autocorrelation; On Normality Test methods linearity test chart histograms and frequency polygons. And the autocorrelation test seen the value of DW (Durbin Watson) count on the model summary. If the value of DW on the model summary>dU table then there is no autocorrelation if DW <dL table then occurs autocorrelation, if dL table <DW <dU table it can not be detected. And the linearity test determine the relationship of independent and dependent variables are mutually forming linear curve. Fifth, heteroskedasitas test and Multicollinearity test; In Heteroscedastic test patterns the scatter *zpred to the column X and *sresid to column Y, then if it does not form a specific pattern then regression heteroskedastic free of problems. And on the test multicollinear if VIF is far from the first, or tolerance away from one then the problem multicollinearity. After a structural path models obtained, the next process is the model fit testing to determine if the model considered is appropriate (fit) or consistent with empirical data. The test is performed by comparing the theoretical koresali matrix with empirical correlation matrix. If the two are identical then the model can be concluded perfectly acceptable. Statistically W approached distribution chi-Square with degrees of freedom (db) = d = 1 at a significance level α = 0.05. , If the proposed theoretical model fit (Fit) with the existing data, it must qualify $\chi 2$ count $<\chi 2$ Turns $\chi 2$ count = 0 $<\chi 2$ tables (0.05: 1) = 3.84. If such a model obtained is appropriate or suitable (Fit) with the data obtained[21]–[29]

3. Result and Discussion

Examine 56 indicators that question reliable or not, if not reliable, the indicator of the question should not be included in the next process .. Based on the results if the SPSS give Cronbach's Alpha= 0.96 > 0.6, means the 56 indicators that question all reliabel and then be executed next process. Furthermore, all of the answers of 216 respondents were tested by looking for the validity and reliability to know that the 56 indicators of the question was valid or not. When invalid indicator that question should not be included in the next process. With a value of N = 216, sig = 0:05 (two tail) obtained r table = 0.13. Based on the results if the 216 respondents to provide results that 56 indicators that question there are seven indicators of questions rhitung <r tabel, and this means that 7 out of 56 indicators that question is invalid, so the 7 indicators such questions should not be included for the next process. So 12.5% of the 56 indicators is not a valid question. Next process discussed path models structural (Formula) to determine the effect of direct and indirect condition of the building (X1) and maintenance resources (X2) on user satisfaction (Z) through maintenance management (Y). The value of DW (DurbinWatson) = 2.163 > 1.7, does not happen autocorrelation. For model 1, the coefficient of determination (R2) is a mean of 69.7% 0.697 User Satisfaction variables (Z) can be explained by the variable Maintenance Management (Y), Building Condition (X1) and Resource Maintenance (X2), so the error (ε) = 1- R2 = 1 to 0.697 = 0.303. While the model 2, the coefficient of determination (R2) is a mean of 69.7% 0.697 User Satisfaction variables (Z) can be explained by the Building Condition variables (X1) and Resource Maintenance (X2). So the error (ε) = 1- R2 = 1 to 0.697 = 0.303.

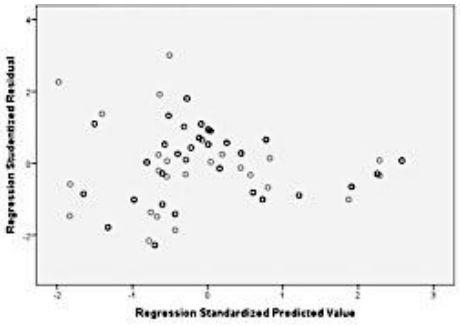


Fig. 3: Scatterplot

Looks scatter plot residuals do not form a particular pattern, the regression of this structural model free from the problem of heteroscedasticity Then see Figure Normality Test results and linearity for the structural model data 3, with the variables X1, X2 , Y, Z is normally distributed and also linear.



Fig. 4: Histogram and Normal P-P Plot

Where for model 1, obtained by Fo = 162.429, db1 = 3; db2 = 212; p-value = 0.000 <0.005, so that the Maintenance Management variable (Y), Resource Maintenance (X2) and the Building Condition (X1) effect on User Satisfaction. (Z). And to model 2, obtained by Fo = 244.768, db1 = 2; db2 = 213; p-value = 0.000 <0.005, so the variable Resource Maintenance (X2) and the Building Condition (X1) effect on User Satisfaction. (Z).

4. Conclusion

PD Pasar Jaya manages 153 markets spread across Jakarta. Market building is a place of public services, in order to provide excellent service to the community, it is important to maintain it properly. Maintenance management of PD Pasar Jaya is still far from the expected. The purpose of this study was to determine the effect of directly and indirectly from the condition of the building and maintenance resources to user satisfaction through maintenance management. The research method is by taking a sample of 14 buildings market, then use the check list building condition assessment visually and dissemination of survey questionnaires to 216 respondents, namely the market manager, the kiosk, and visitors. The questionnaire consisted of four variables: the condition of the building (X1), maintenance resources (X2), as anvariable, independent maintenance management (Y) as variable, an intervening while user satisfaction (Z) as the variable. dependent Furthermore, assessment data is processed by the descriptive analysis of the building, while the questionnaire survey data processed by path analysis using linear regression with SPSS ver. 22. The results of assessment of 14 buildings is a market average of 78 of the highest value of 100, this means that the condition of the building is being with only minor damage. The total yield of the influence of the condition of the building (42.38%) and maintenance resources (25.01%) towards satisfaction of a user through maintenance management (1.26%) is 68.65%..

Acknowledgement

This paper is a part of a PhD Dissertation titled “Effect of The Building Maintenance and Resource Management Through User Satisfaction of Maintenance” with Prof. Ir. Surjono Surjokusumo, M.Sc.F, Ph.D and Dr. Ir. Johny Johan, M.Eng, MM, as the counselors.

References

[1] Direktorat Jendral Cipta Karya Departemen Pekerjaan Umum, *Pedoman Pemeliharaan dan Perawatan Bangunan Gedung, Peraturan Menteri Pekerjaan Umum Nomor : 24/PRT/M/2008 Tanggal 30 Desember 2008*. Direktorat Jendral Cipta Karya Departemen Pekerjaan Umum, 2008.

[2] Peraturan Pemerintah, *PP Republik Indonesia nomor 36 tahun 2005 tentang Peraturan Pelaksanaan UU nomor 28 tahun 2002 Bangunan Gedung*. 2005.

[3] Kementerian Pekerjaan Umum, *Peraturan Menteri Pekerjaan Umum nomor 24/PRT/M/2008 tanggal 30 Desember 2008 tentang Pedoman Pemeliharaan dan Perawatan Bangunan Gedung*. 2008.

[4] A. A. Oladapo, “Study of tenants maintenance awareness, responsibility and sastification in institutional housing in Nigeria,” *Int. J. Strateg. Prop. Manag.*, 2006.

[5] L. Mastura, “Manajemen Pemeliharaan Fasilitas dalam Pengelolaan Gedung,” *Mektek, Jur. Tek. Sipil, Univ. Tadulako, Palu, Indones.*, vol. 10, no. 1, 2008.

[6] Perusahaan Daerah Pasar Jaya, *Petunjuk Pelaksanaan Pembangunan dan Revitalisasi Pasar Secara Mandiri oleh PD Pasar Jaya Provinsi DKI Jakarta*. PD Pasar Jaya DKI Jakarta, 2014.

[7] Kantor Tata Bangunan dan Gedung Pemda, *Sistem Perawatan dan pemeliharaan Bangunan Gedung Pemda*. Pemda Provinsi DKI Jakarta, 2005.

[8] A.-S. Ali, S. Kamaruzzaman, R. Sulaiman, and Y. Cheong Peng, “Factors affecting housing maintenance cost in Malaysia,” *J. Facil. Manag.*, vol. 8, no. 4, pp. 285–298, Sep. 2010.

[9] Badan Peneliti dan Pengembangan Kota Medan, *Survey Kepuasan Pelanggan Terhadap Pasar Tradisional Kota Medan*. 2013.

[10] B. Chanter and P. Swallow, “Building Maintenance Management,” *J. Build. Apprais. UK*, 2007.

[11] M. Chew, “Building Maintainability—Review of State of the Art,” *J. Archit. Eng. Singapore, Natl. Univ Singapore*, 2014.

[12] C. Antony and K. Hadi, *Teknik Manajemen Pemeliharaan*. Erlangga, Jakarta, 1992.

[13] H. H. Y. Lee, “Strategis and Operational Factors’ Influence on the Management of Building Maintenance Operation Processes in Sports and Leisure Facilities, Hongkong,” *J. Retail Leis. Prop.*, vol. 8, no. 1, pp. 25–37, 2009.

[14] H. Mulyandari and R. A. Saputra, *Pemeliharaan Bangunan : Basic Skill Facility Management*. Andi Yogyakarta, 2010.

[15] K. Usman and R. Winandi, “Kajian Manaejmen Pemeliharaan Gedung di Universitas Lampung,” *J. Sipil dan Perenc.*, vol. 13, no. 2, 2009.

[16] H. H. Y. Lee and D. Scott, “Overview of maintenance strategy, acceptable maintenance standard and resources from a building maintenance operation perspective,” *J. Build. Apraisal , Univ. Hong Kong*, 2008.

[17] Mohamed A. El Haram and M. W. Horner, “Factors Affecting housing maintenance cost,” *J. Qual. Maitenance Eng. Emerald Insight*, 2002.

[18] K. Usman and R. Winandi, “Kajian Manajemen Pemeliharaan Gedung di Universitas Lampung,” *J. Sipil dan Perencanaan, Lampung, UNILA*, 2009.

[19] W. I. Efrianto, “Studi Pemeliharaan Bangunan Gedung (Studi Kasus Gedung Kampus),” *J. Tek. Sipil, Atma Jaya Yogyakarta*, vol. 7, no. 3, 2007.

[20] Y. Yau, “Multicriteria Decision Making for Homeowners Participation in Building Maintenance,” *J. Urban Plan. Dev. ASCE*, 2012.

[21] J. Suyono, A. Sukoco, M. I. Setiawan, Suhermin, and R. Rahim, “Impact of GDP Information Technology in Developing of Regional Central Business (Case 50 Airports IT City Development in Indonesia),” *IOP Conf. Ser. J. Phys. Conf. Ser.*, vol. 930, p. 11002, 2017.

[22] N. Kurniasih, C. Hasyim, A. Wulandari, M. I. Setiawan, and A. S. Ahmar, “Comparative Case Studies on Indonesian Higher Education Rankings,” *J. Phys. Conf. Ser.*, vol. 954, no. 1, p. 12021, 2018.

[23] Y. Hanun, M. I. Setiawan, N. Kurniasih, C. Hasyim, and A. S. Ahmar, “Airport Performance and Construction Enlargement Activities,” *J. Phys. Conf. Ser.*, vol. 954, no. 1, p. 12016, 2018.

[24] Sabib, M. I. Setiawan, N. Kurniasih, A. S. Ahmar, and C. Hasyim, “Pavement Technology and Airport Infrastructure Expansion Impact,” *J. Phys. Conf. Ser.*, vol. 954, no. 1, p. 12017, 2018.

[25] Ratnadewi, R. P. Adhie, Y. Hutama, A. S. Ahmar, and M. I. Setiawan, “Implementation Cryptography Data Encryption Standard (DES) and Triple Data Encryption Standard (3DES) Method in Communication System Based Near Field Communication (NFC),” *J. Phys. Conf. Ser.*, vol. 954, no. 1, p. 12009, 2018.

[26] M. I. Setiawan, S. Surjokusumo, D. M. Ma’soem, J. Johan, C. Hasyim, N. Kurniasih, A. Sukoco, I. Dhaniarti, J. Suyono, I. N. Sudapet, R. D. Nasihien, S. W. Mudjanarko, A. Wulandari, A. S. Ahmar, and M. B. N. Wajdi, “Business Centre Development Model of Airport Area in Supporting Airport Sustainability in Indonesia,” *J. Phys. Conf. Ser.*, vol. 954, no. 1, p. 12024, 2018.

[27] D. Napitupulu, R. Rahim, D. Abdullah, M. I. Setiawan, L. A. Abdillah, A. S. Ahmar, J. Simarmata, R. Hidayat, H. Nurdiyanto, and A. Pranolo, “Analysis of Student Satisfaction Toward Quality of Service Facility,” *J. Phys. Conf. Ser.*, vol. 954, no. 1, p. 12019, 2018.

[28] T. D. Laksono, N. Kurniasih, C. Hasyim, M. I. Setiawan, and A. S. Ahmar, “The Impact of Airport Performance towards Construction and Infrastructure Expansion in Indonesia,” *J. Phys. Conf. Ser.*, vol. 954, no. 1, p. 12015, 2018.

[29] A. S. Ahmar, N. Kurniasih, D. E. Irawan, D. U. Sutiksno, D. Napitupulu, M. I. Setiawan, J. Simarmata, R. Hidayat, Busro, D. Abdullah, R. Rahim and J. Abraham, “Lecturers’ Understanding on Indexing Databases of SINTA, DOAJ, Google Scholar, SCOPUS, and Web of Science: A Study of Indonesians,” *J. Phys. Conf. Ser.*, vol. 954, no. 1, p. 12026, 2018. .