International Journal of Technology (2015) 5: 718-721
ISSN 2086-9614

ENHANCING THE QUALITY OF PRODUCTS AND PROJECTS THROUGH BETTER DESIGNS AND MODELING

Nyoman Suwartha[1*], Mohammed Ali Berawi[1], T. Yuri M. Zagloel[1], Isti Surjandari[1]

[1]*Faculty of Engineering, Universitas Indonesia, Kampus Baru UI Depok, Depok 16424, Indonesia*

Product quality improvement is one of the principal reasons to be more competitive in the global market. The essential methods widely employed to enhance product quality include discovering better designs and modelling. Moreover, creating alternative designs and stimulating innovation can be seen as important steps toward sustainable product and project development (Berawi, 2006; Berawi, 2015). To acquire better alternative designs, three basic common steps can be considered. The first step is to identify the needs of the project/product, particularly the functional requirements and design specifications. These parameters are combined and amended to determine the added value of the end results. The second step is to optimize the designs or project/product performances to obtain efficiency, safety, and sustainability, which can be done using simple- to advance-modelling and by simulating the design and process parameters throughout several iterations. The last step is to determine a rational method that should be well defined and formulated to improve the process and end result.

The selection of appropriate methods will lead to the accuracy of choosing optimum design requirements, parameters, and measurement procedures. At the end result, the use of better designs and modelling will significantly contribute to the quality enhancement of designated products and projects. Furthermore, technological developments may contribute to accelerating product manufacturing in various fields of projects. To support this additional so-called catalyst, technology development processes and improvements can be generated by identifying key attributes, as well as by creating insightful and comprehensive approaches. In addition, interventions in terms of added value in technology development processes can play an important role in technology contributions and outcomes.

At the close of this year, it is our utmost pleasure to welcome you with a special edition publication of the International Journal of Technology (IJTech). The present special edition is a series of some selected best papers from the 14th International Conference on Quality in Research (QiR) 2015, a two-year event organized by the Faculty of Engineering, Universitas Indonesia. This year, more than 600 participants from 20 different countries represented by many universities and research institutions attended. There are eight symposia in QiR 2015 that include many research themes, from current issues in engineering research based on lab works to community engagement. About 100 presented papers and 60 papers are selected and divided into three books of the special edition published this month; book #1 covered Civil and Industrial Engineering, book #2 covered Electrical, Mechanical, and Industrial Engineering, and book #3 covered Chemical and Materials and Metallurgical Engineering. As part of these special editions, IJTech will also publish two special editions next month in January 2016 with contributions of selected papers from the Symposium on Materials and Metallurgy of the QiR 2015 and the 8th International Meeting on Advances in Thermofluids (IMAT) 2015.

In this special edition, we are pleased to present 20 papers dedicated to product/project design and technology development. This edition will discuss various designs and modeling implemented to create more effective and improved technologies in various engineering contexts.

The first paper, written by Aki Aapoaja and Pekka Leviängkas, identifies the challenges related to urban innovation processes and their scaling-up, using the renewable energy solution pilot project as an example case. The results emphasize the essential role of the local building administration as a proactive stakeholder who started open-mindedly to address old-fashioned, inefficient and dominant practices of the construction industry. In addition, the authors argue that another innovation hot spot was that market actors

* Corresponding author's email: nsuwartha@eng.ui.ac.id, Tel. +62-21-7270029, Fax. +62-21-7270028
Permalink/DOI: http://dx.doi.org/10.14716/ijtech.v6i5.2783

needed to collaborate, take steps, and present their ideas to find, implement, and pilot the emerging solutions and innovations.

The second paper, written by E. Yuliawati, S.P. Hadiwardoyo, B. Susantono, and T. Tjahjono, built a development model for investment in hub-and-spoke airport networks using the system dynamics theory. The simulation model shows that the system dynamics approach can be used to simulate the airport infrastructure investment development in a hub-and-spoke network. The authors argue that if the congestion decreases, there will be an impact on the increase in the passenger demand, and on the other side, this will enhance the potential investment in airport infrastructure.

The third paper, written by I. Sonny, S.P. Hadiwardoyo, B. Susantono, and A. Benabdelhafid, analyzed freight distribution for the inter-island movement using the Furness and Maximum Entropy models to identify freight commodity supply and demand in a particular region. The results indicate that the Furness model finishes in the 4^{th} iteration and Maximum Entropy in the 6^{th}, while the negative exponential function offers the best calibrated estimation using sea freight movement data. The authors argue that the positive value of β means that any increment of travel time decreased the rate of freight flow, which mirrors the conditions in reality: the higher travel costs, the fewer the number of flows between zones.

The fourth paper, written by A.I. Rifai, S.P. Hadiwardoyo, A.G. Correia, P. Pereira, and P. Cortez, presents a new approach to predicting the international roughness index (IRI) of pavement based on data mining (DM) techniques. DM was used to analyze the initial IRI data, including age, Equivalent Single Axle Load (ESAL), crack, potholes, rutting, and long cracks. The model was developed and verified using data from an Integrated Indonesia Road Management System (IIRMS) that was measured with the National Association of Australian State Road Authorities (NAASRA) roughness meter. The results of the model arecompared with the IIRMS analytical model adapted to the IRI, and the advantages of the new approach are highlighted. The authors claim that the novel data-driven model is able to learn (with high accuracy) the complex relationships between the IRI and the contributing factors of overloaded trucks.

The fifth paper, written by M.L. Siregar, H.R. Agah, and F.A. Arifin, examined the effects of three different types of medians to obtain an adjustment factor for road capacity calculation. They used video recordings of real traffic moving for raised medians, fenced medians, and line medians. The adjustment coefficients for roads with raised medians, fenced medians, and line medians obtained are 0.79, 0.78, and 0.81, respectively. The authors argue that in addition to the presence of the medians, the types should essentially be considered in calculating the road capacity.

The sixth paper, written by D.M. Sari, Nahry, and H.R. Agah, investigated the feasibility of pedestrian facilities and the effectiveness of utilizing a pedestrian bridge at a certain congested area in Jalan Lenteng Agung, Jakarta. An indicator of the level of service (LOS) is used to examine the feasibility of a facility, while the effectiveness of a pedestrian bridge is represented by the ratio of pedestrian bridge users to the total number of people crossing the street. The results signify that the facilities are not yet feasible; the speed of pedestrian flow needs to be increased using geometric improvement and the elimination of all disturbances throughout the facilities. The authors claim that the effectiveness of using the pedestrian bridge is quite useful (50.26%).

The seventh paper, written by I.J. Maknun, I. Katili, and H. Purnomo, developed the Discrete Kirchhoff-Mindlin Triangular (DKMT) element for error estimation in composite structures. Error estimation using various recovery methods, such as averaging, projection and super convergent patch recovery (SPR), has been studied. The DKMT element affords good convergence behavior and it is not sensitive to distortion. The recovery methods used in this paper give similar results and are close to the reference solution for $\boldsymbol{C}$=1 and $\boldsymbol{C}$=10 (with a relative error under 5%).

The eighth paper, written by G. Turu'allo, evaluated the effects of the water-binder ratios and levels of ground-granulated blast furnace slag (ggbs) in concrete with regard to the activation energy, which is needed for predicting the concrete's strength. The activation energies were determined using the American Society for Testing and Materials (ASTM) standard C1074 and the Freiesleben Hansen and Pedersen (FHP) method. The results of the experiment show that the apparent activation energy was relatively independent of the water-binder ratio and mainly affected by the ggbs level in the concrete.

The author argues that higher ggbs levels in the concrete resulted in the higher apparent activation energies.

The ninth paper, written by B. Widjaja and I.T. Pratama, evaluated the capability of Vallejo and Scovazzo's method to determine the viscosity valueand assumed that mudflow material behaves as a Bingham plastic material. The measurement was conducted using a flume channel with four different slope angles, water contents for Kaolin soil, and Parakan Muncang soil samples. The authors claim that the modified Vallejo and Scovazzo's equation encounters a limitation in that if the soil unit weight is smaller than the un-drained shear strength for a specific water content, the viscosity value becomes unsuitable.

The tenth paper, written by D. Sutjiningsih, H. Soeryantono, and E. Anggraheni, evaluated the applicability of a modified Schaffernak approach in estimating annual sediment yield in a small urban ungauged watershed. The hydrological model WinTR-55 was used to develop the discharge-duration curve based on a daily runoff simulation, while the total suspended solid is estimated using a sediment rating curve based on field surveys. The authors argue that the sediment yield from the ungauged watershed ispossible to be quantified using a modified Schaffernak approach in combination with the WinTR-55 application.

The eleventh paper, written by F.A. Loinenak, A. Hartoko, and M.R. Muskananfola, analyzed the coastal vulnerability of Doreri Bay using the Coastal Vulnerability Index (CVI) and Geographic Information System (GIS). The results show that the CVI values were within the range of 6.7–43.3, and the levels of coastal vulnerability at Doreri Bay primarily appear to be very low, accounting for 66.9% of the total area of the region. The remaining areas have a medium vulnerability (12.2%), a high vulnerability (7.2%), and a very high vulnerability (13.7%).

The twelfth paper, written by R.S. Arifin, S.S.Moersidik, E.T.B. Soesilo, D.M. Hartono, and Y. Latief, developed an interactive approach using System Dynamics (SD) modelling to represent the Project Interdependencies (PI) dynamics, as well as a project selection tool/technique within a project portfolio. The results show the SD approach has the ability to challenge an organization's perception of their project portfolio interdependencies and to enhance strategic decision-making capabilities. The authors suggest that PI should be leveraged more to determine a complete picture of the PI importance within a Project Portfolio Management (PPM).

The thirteenth paper, written by D.M. Hartono, G.A. Kristanto, and S. Amin, analyzed the characteristics and composition of solid waste generated from traditional and modern markets and their potential reductions. The results showed the average volume of solid waste generation from Pasar Pondok Bambu and Pasar Segar Cinere is 2.74 m^3/day and 0.76 m^3/day, respectively.The main components of the solid waste are 58–65% garden, and 13–20% vegetable waste. The authors claim that based on solid waste composition, the potential waste reduction in both Pasar Pondok Bambu and Pasar Segar Cinere is around 40%.

The fourteenth paper, written by Y. Setiawan and A. Surachman, assessed the paper industry's reject waste pellets (RWP) as a boiler fuel and their contribution to greenhouse gases (GHG). They analyzed the approximate calorific value and the sulfur content of RWP. The results show that RWP contains much organic matter and has a high calorific value and low sulfur content, which gives it the potential of being used as fuel. The authors argue that the utilization of 10% RWP mixed with 90% coal as a boiler fuel could reduce CO_2 GHG emissions by about 9%.

The fifteenth paper, written by R. Nurcahyo, A.D. Wibowo, and R.F. Eka Putra, describes the development of a Key Performance Indicator (KPI) in an Indonesia government agency engaged in the education and training of the energy sector. A government agency has a different character than a profit-oriented organization, from financial, activity, or cultural perspectives. The KPI development was conducted in three stages: (1) evaluation of the organization's vision and mission; (2) positioning of the organization using a Strength, Weakness, Opportunity and Threat (SWOT) analysis; and (3) strategic planning using the Analytical Hierarchy Process (AHP).

The sixteenth paper, written by R.A. Wibowo, A. Hidayatno, Komarudin, and A.O. Moeis, presented a simulation of various expansion plans for the Jakarta International Container Terminal (JICT) as the main international port of Indonesia. Using an agent-based modelling approach, the plans

were translated as scenarios that have effects on the agents in running the logistic processes. The result shows that some of the plans can support the JICT vision, and it can be used as an input for the decision maker to either choose one of the plans or to renegotiate the plans to reach results that greatly support the JICT vision.

The seventeenth paper, written by A. Dhini, I. Surjandari, M. Riefqi, and M. A. Puspasari, examines the use of autoregressive time series data forecasting (i.e., ARIMA and SARIMA), neural network, and a hybrid of neural network and ARIMA to generate an accurate forecasting model for consumer goods demand that will minimize inventory. The performances of those three approaches were compared using their error values. The results indicate that hybrid method does not always produce better results than the single method, in which the neural network outperformed the hybrid method.

The eighteenth paper, written by A. Suzianti, N.D.P. Faradilla, and S. Anjani, proposes a preferred service for fashion online shops based on customer preference. This study used the Kano model to classify service attributes and then used those attributes as an input for a conjoint analysis to obtain customer preferences. The results showed that cash-on-delivery, shipping cost based on weight, a 2–4-day delivery period, a return and refund policy, and data protection are the preferred services for fashion online shops. The authors argue this service design could be adapted to other products of online shops.

The nineteenth paper, written by A. Hidayatno, I. Rahman, and R. Muliadi, investigated the evaluation of two mitigation scenarios in reducing Jakarta's GHG emissions that differ in the authority level of the local government using a policy analysis approach. The method emphasizes the use of a system dynamics model to gain the insight of each alternative. The result reveals that the city's development targets will be best satisfied through a joint partnership with the national government. The cooperation would have a significant effect on economic, social, and environmental sustainability over other scenarios.

The last paper, written by A. Hidayatno, A.O. Moeis, A. Sutrisno, and W. Maulidiah, is a comprehensive study focusing on a big project. The purpose of this study is to obtain a financial risk model, map the potential risk factors, and calculate the financial impact of risks on the project. The Project Risk Management method with Value at Risk (VaR) are used to calculate the impact of risk on investment. The result showed that production capacity has the greatest influence on the net present value of the project. The authors argue that risk management could be a significant tool to formulate alternative plans in handling risks (Risk Responses Planning) that can significantly hamper the project.

We hope this edition of IJTech conveys some new insights into the way we conduct our research, and we invite you to join us in this venture by sending your work for consideration.

With warmest regards from editorial board members,

Dr. Nyoman Suwartha

Dr. Mohammed Ali Berawi

Prof.Dr. Teuku Yuri M. Zagloel

Prof.Dr. Isti Surjandari