UNTAR Goes to Google Apps

Lina Gozali <linag@ft.untar.ac.id>

Journal Publishing : Volume 11 Issue 1, Jan 2020

IJTech <noreply@ijtech.eng.ui.ac.id> Wed, Jan 29, 2020 at 3:07 PM
Reply-To: "noreply@ijtech.eng.ui.ac.id" <noreply@ijtech.eng.ui.ac.id>
To: linag@ft.untar.ac.id

International Journal of Technology
www.ijtech.eng.ui.ac.id

Journal Publishing

Dear Mrs. Lina Gozali,

Greetings from Depok!

On behalf of the Editorial Board, I am pleased to inform you that your article entitled **Performance Factors for Successful Business Incubators in Indonesian Public Universities** has been published online in *Volume 11 Issue 1, Jan 2020*. You can check the online version at: http://ijtech.eng.ui.ac.id/issue/61

The articles are available to be accessed and downloaded free of charge. The hardcopy version is being printed and one copy will be delivered to the corresponding author.

Thank you for your contribution to IJTech and we look forward to a good collaboration in the next future.

Yours sincerely,

Dr. Mohammed Ali Berawi
maberawi@eng.ui.ac.id
Editor in Chief
International Journal of Technology (IJTech)
p-ISSN: 2086-9614
e-ISSN: 2087-2100
http://ijtech.eng.ui.ac.id/

IJTech is currently indexed in SCOPUS and Emerging Sources Citation Index (ESCI) Thomson Reuters

International Journal of Technology 11(1) 1-4 (2020)

International Journal of Technology

http://ijtech.eng.ui.ac.id

Managing Artificial Intelligence Technology for Added Value

Mohammed Ali Berawi[1*]

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

Many industrial sectors are in the midst of a digital transformation that has emerged from the advancement of information and data technology, enhancing the use of computers and automation with smart and autonomous systems powered by data and machine learning. This revolution has been broadly adopted in industry by initiating the use of digital technologies, sensor systems, intelligent machines, and smart material in its processes.

Some examples of industrial innovation are the invention of artificial intelligence (AI), the deployment of the Internet of Things (IoT)/Internet of Services (IoS), 3D printing/additive manufacturing, machine learning, and the use of Big Data. These have enables the digitization, automation, or integration of service and product value chains. Implementing digitization and automation is believed to help construction transform into a technology-driven industry and keep pace with other industries.

AI Technology Impact

Many industries, from product manufacturing and construction projects to business services, are now extensively using AI to facilitate industrial automation. AI has become an industry, with more investment and new technologies and applications being produced. It is also creating benefits for other industries by improving performance, enhancing efficiencies, and offering new and extended markets—the digital economy.

As technology progresses, the nature of work in organizations, social relations and interaction, and individual lifestyles are rapidly changing. AI is making organizations provide better customer service and products, changed with the impact of robotics and automation. Automation has already reduced the number of human workers doing repetitive work and increased work in creative industries.

AI facilitates decision-making, creates integrative systems, and simplifies complex mechanisms though automation. For example, a computer-aided design system that uses 3D modelling in project management or design helps increase product or project efficiency and effectiveness and improves communication and collaboration between stakeholders, while the availability of information from sensor networks in the application of the IoT plays an important role in augmenting and improving the quality of decision-making. 3D printing technology is also seen as an innovative strategy with the potential to revolutionize industry, since it is projected to effectively save time, reduce costs, and help protect the environment by generating less material waste. Further, smart 3D printing can be used to teleport an object from one place to another.

*Corresponding author's email: maberawi@eng.ui.ac.id, Tel.: +62-21-7270029; fax: +62-21-7270028
doi: 10.14716/ijtech.v11i1.3889

A mobile compact 3D printing machine can produce items to meet everyday needs. The use of blockchain as a group of people sharing data with trust enhances transaction transparency in the blockchain network. Furthermore, machine learning as an artificial approach is used to solve problems such as face and speech recognition, online fraud detection, and automatic language translation. Public transportation services are incorporating AI technology to create self-driving cars, trains, and planes. AI technology is also expected to help us create artificial lifeforms, personal assistants such as Echo and Alexa and human-like robots capable of complex interactions like Valkyrie and Sophia. AI systems are also greatly influencing our communication and interaction. Machine learning models will help us understand context and meaning for and in various languages.

Given the many benefits of technology in project—product—service deliveries, I argue that the value of tomorrow's product or service will not much depend on production cost but rather the intellectual properties involved in designing and creating and product or service.

Advancing Scientific and Technological Capacity Development

Technologies are invented to improve project, product, and service performance. In this edition, we are pleased to present nineteen selected papers dedicated to technology improvement in science and engineering. The papers consist of various studies that contribute to improving end-result performance.

The first paper, written by V.V. Strokova, P.S. Baskakov, A.M. Ayzenshtadt, and V.V. Nelyubova, proposes a method for silver nanoparticle (AgNP) stabilization in polymer coatings obtained from aqueous acrylic dispersions. The authors argue that the developed coatings using AgNPs, synthesized in propylene glycol in the presence of non-ionic PVP and modified with ammonium hydroxide, demonstrate high inactivation of bacteria.

The next paper, written by T.I. Sari, A.H. Saputra, S. Bismo and D.R. Maspanger, examines the production and resistance test of copolymer DPNR-g-PAN/PS in DME with the influence of acrylonitrile and styrene monomer. The authors argue that the presence of acrylonitrile and styrene increase the mechanical properties of DPNR and DPNR-g-PAN/PS and that increase in the concentration of acrylonitrile decreases rubber swelling and increases its shrinking.

The third paper, written by Y. Astuti, D. Amri, D.S. Widodo, H. Widiyandari, R. Balgis, and T. Ogi, investigates the effect of fuels on the physicochemical properties and photocatalytic activity of bismuth oxide synthesized using a solution combustion method. The authors argue that the photocatalytic activity of bismuth oxide synthesized using urea fuel on the degradation of methyl orange exhibited better photocatalytic activity with a constant degradation rate.

The fourth paper, written by S.J. Munarso, S.I. Kailaku, A. Arif, A. Budiyanto, I. Mulyawanti, K.S. Sasmitaloka, N. Setyawan, K.T. Dewandari, and S.M. Widayanti, investigates the reduction of chili postharvest losses after implementation of an aqueous ozone treatment, perforated packaging, and refrigerated transportation in inter-city distribution. The authors argue that the implementation of the aqueous ozone treatment reduced the postharvest losses of chili by 60.61%.

The fifth paper, written by D. Purnama, Winarto, N. Sofyan, A. Prihastomo, and K. Ito, investigates the microstructure and mechanical properties of AH-36 steel weldment welded using magnesium modified E6013 electrode. The authors argue that with the increase of Mg layer content, the metal-oxygen oxygen level decreases, and the content of Mn and Si increased.

The next paper, written by F. Citrawati, R. Dwiwandono, and L. Firmansyah, examines the effect of Ni on the formation of bainite in Fe-Ni lateritic steels through a semi-continuous cooling method. The authors argue that the variation of Ni in Fe-Ni alloys in the range of 0.01 to 4.5 wt% affects the morphology of bainite formed in the as-treated samples, which then affects their mechanical properties.

The seventh paper, written by D. Idamayanti, W. Purwadi, B. Bandanadjaja, and R. Triadji, investigates the use of rice husk waste as an exothermic material for steel casting. The authors argue that a rice husk sleeve mixed with 12wt% binder extended the solidification time; the MEF of 1.69 was achieved.

The eighth paper, written by S. Attanayake, M. Okuya, and K. Murakami, evaluates the effect of spray angle on terrace-truncated nanocone structure formation. The authors argue that the best transparent conductive oxide behavior was obtained from the sample synthesized at the lowest spray angle of 15^{o} with high conductivity of $2.5\times10^{3}\ \Omega^{-1}.cm^{-1}$ and high transparency of 82% in the visible range.

The next paper, written by Yanuar, M.S.G. Putra, M. Akbar, M. Alief, and Fatimatuzzahra, and presents a numerical study on the influence of hydrofoil clearance on total drag reduction in a winged air induction pipe for air lubrication. The authors argue that the reduction of drag force increased to about 10% compared with bare plate configuration.

The tenth paper, written by M.I. Rosyidi, E.M. Widodo, T.A. Purnomo, M. Setiyo, and D.W. Karmiadji, produces a feasibility study to convert an online fleet from gasoline RON 90 to LPG. The authors argue that investment is feasible and further can assist car owners if the government provides waivers or even exempts taxes and inspection costs.

The eleventh paper, written by R. Woodhead and M.A. Berawi, presents value creation and the pursuit of multifactor productivity improvement. The authors argue that MFP calculations vary during project execution and are valuable to governments in assessing investments and the technological benefits of projects.

The next paper, written by A.S. Muntohar, W. Diana, M.Y. Tafalas, and N.R. Bimantara, investigates the behavior of the flexible plate supported with a SiCC-mortar column on expansive soil. The authors argue that the results indicated that the enlarged column head significantly improved carrying and transmitting the load to the soil.

The thirteenth paper, written by S.H. Siwi, Y.A. Yatmo, and P. Atmodiwirjo, examines the boundary formation of sacred places in Muslim dwellings. The authors argue that the agreement of inhabitants regarding the use of and requirements for the sacred place becomes a way to maintain the social sustainability of the dwelling.

The fourteenth paper, written by S.P. Pradita, P. Ongkunaruk, and T.D. Leingpibul, uses an intervention forecasting approach to improve reefer container demand forecasting accuracy. The authors argue that the adjustment could increase forecast accuracy by 42.39% and 39.42% for 20 and 40 foot containers, respectively.

The next paper, written by L. Gozali, M. Masrom, T.Y.M. Zagloel, H.N. Haron, J.A. Garza-Reyes, B. Tjahjono, A.P. Irawan, F.J. Daywin, A.F. Syamas, S. Susanto, H.K. Aliwarga, and I.A. Marie, evaluates performance factors of a successful business incubator for Indonesian public universities. The authors argue that information technology, entry criteria, government support and protection, funding and support, a mentoring networking, and university regulations support the performance of a business incubator.

The sixteenth paper, written by A. Widyanti and A. Reyhannisa, presents a human factor analysis and classification system in the evaluation of outpatient medication errors. The authors argue that the main causes of medication error are information overload and fatigue; therefore, computerized systems and the rearrangement of work shift hours are recommended to reduce the errors.

The next paper, written by H. Iridiastadi, T. Vani, and P.A.R. Yamin, presents a biomechanical evaluation of a patient-handling technology prototype**.** The authors argue that the PHT prototype resulted in a substantial reduction in compression force at the lumbar (L5/S1) joint.

The eighteenth paper, written by H. Sulistyo, D.P. Priadana, Y.W. Fitriandini, T. Ariyanto, and M.M. Azis, presents the use of glycerol by ketalization reactions with acetone to produce solketal using indion 225 Na as catalyst**.** The authors argue that a pre-exponential factor of 1.27 min^{-1}, activation energy of 17.97 kJ/mol, acetone adsorption equilibrium of 1.05, and solketal desorption equilibrium of 0.57 were obtained.

The final paper, written by D. Dhaneswara, J.F. Fatriansyah, F.W. Situmorang, and A.N. Haqoh, provides a comparative study of HCL and CH_3COOH acidification methods and variation of alkaline concentration. The authors argue that fourier transfer infrared spectra characterization shows that synthesized silica has Si-O-Si and Si-O bonds, and an XRD pattern shows that the synthesized silica has an amorphous structure.

I hope that this edition of IJTech conveys some new insights in the way we conduct our research. I am pleased to respond to any comment or enquiry you may have on the direction and content of IJTech, and I invite you to join us in this venture by sending your work for consideration.

With warmest regards from Jakarta,

Dr. Mohammed Ali Berawi
Editor in Chief

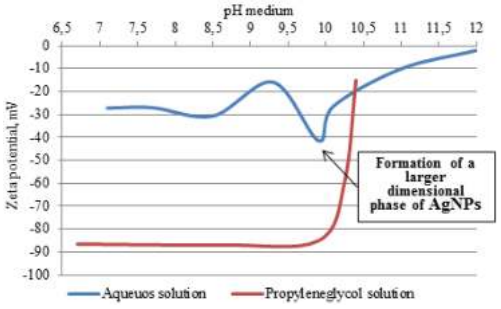
JOURNAL ISSUE

29 Jan 2020
Volume 11, Number 1

Managing Artificial Intelligence Technology for Added Value (https://ijtech.eng.ui.ac.id/article/view/3889)

Mohammed Ali Berawi

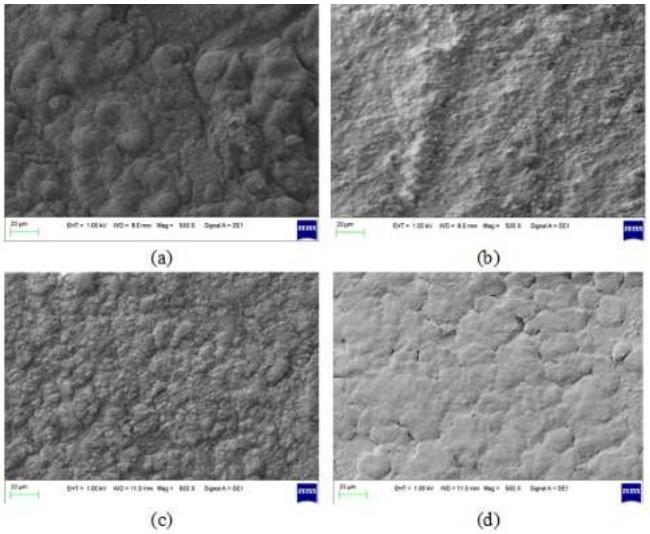
Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.3889 (https://doi.org/10.14716/ijtech.v11i1.3889)
Pages : 1-4



Creation of Biocidal Coatings using the Stabilization of Silver Nanoparticles in Aqueous Acrylic Dispersions (https://ijtech.eng.ui.ac.id/article/view/3346)

V.V. Strokova, P.S. Baskakov, A.M. Ayzenshtadt, V.V. Nelyubova

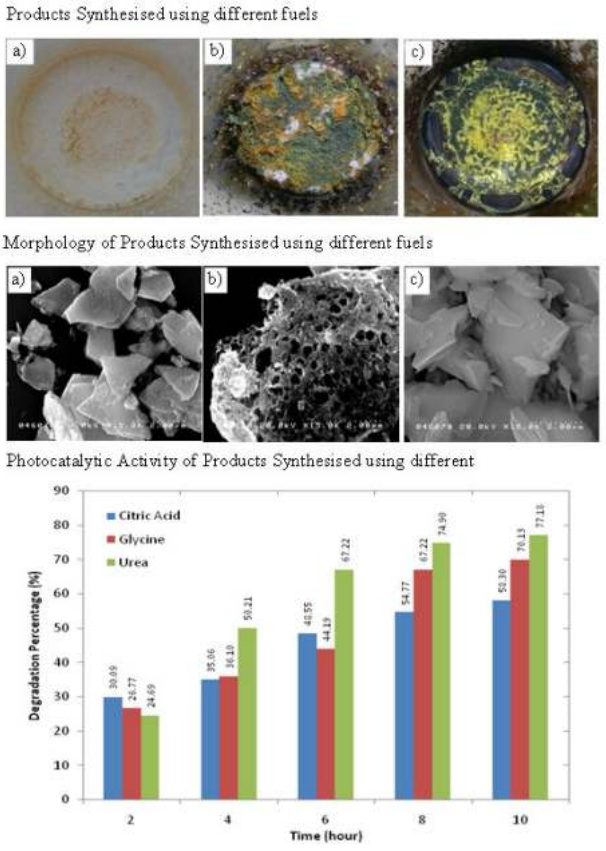
Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.3346 (https://doi.org/10.14716/ijtech.v11i1.3346)
Pages : 5-14



Deproteinized Natural Rubber Grafted with Polyacrylonitrile (PAN)/Polystirene (PS) and Degradation of its Mechanical Properties by Dimethyl Ether (https://ijtech.eng.ui.ac.id/article/view/1942)

Tuti Indah Sari, Asep Handaya Saputra, Setijo Bismo, Dadi R. Maspanger

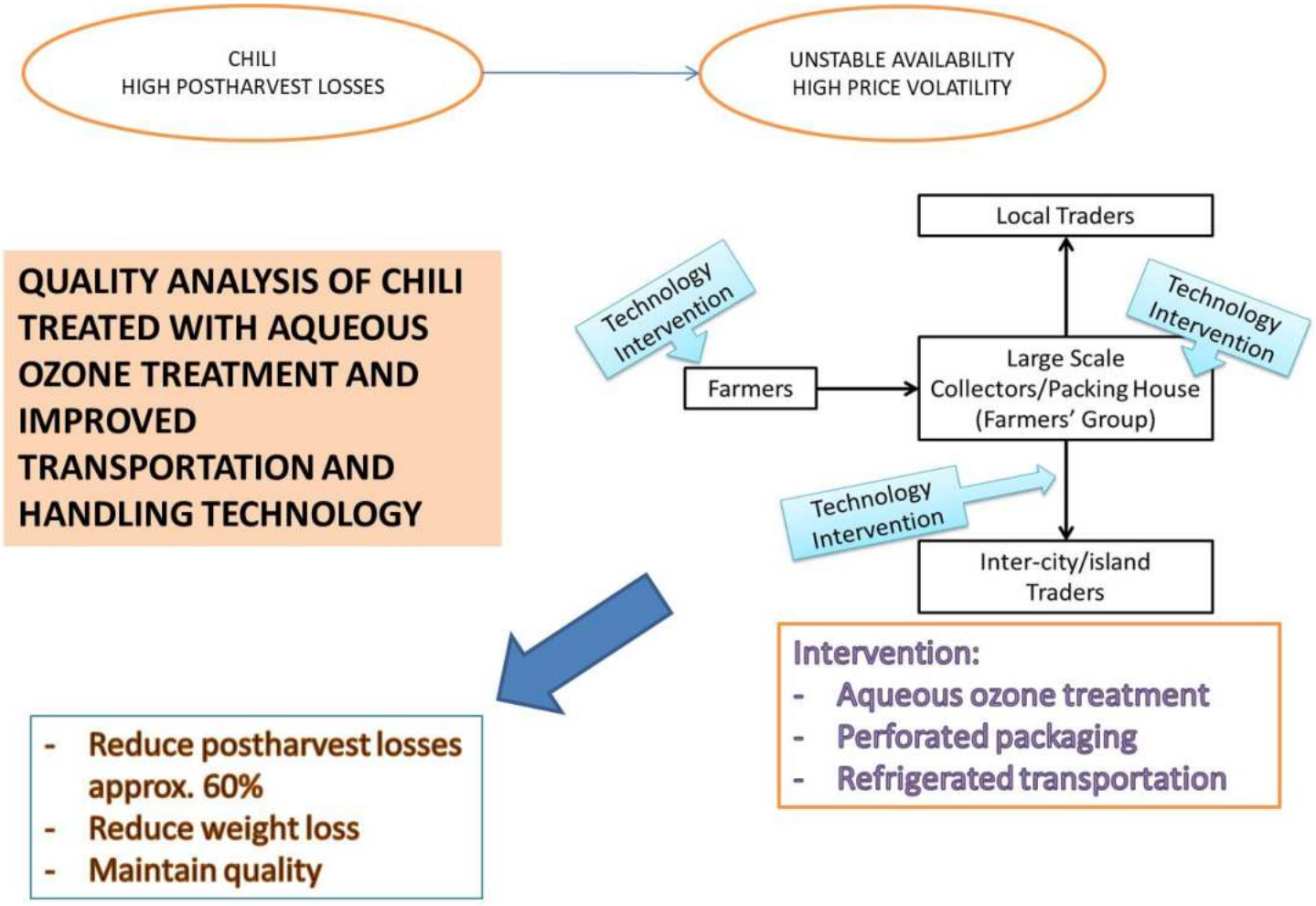
Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.1942 (https://doi.org/10.14716/ijtech.v11i1.1942)
Pages : 15-25



Effect of Fuels on the Physicochemical Properties and Photocatalytic Activity of Bismuth Oxide, Synthesized using Solution Combustion Method (https://ijtech.eng.ui.ac.id/article/view/3342)

Yayuk Astuti, Darul Amri, Didik S. Widodo, Hendri Widiyandari, Ratna Balgis, Takashi Ogi

Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.3342 (https://doi.org/10.14716/ijtech.v11i1.3342)
Pages : 26-36



Quality Analysis of Chili Treated with Aqueous Ozone Treatment and Improved Transportation and Handling Technology (https://ijtech.eng.ui.ac.id/article/view/3213)

S Joni Munarso, Sari Intan Kailaku, Abdullah bin Arif, Agus Budiyanto, Ira Mulyawanti, Kirana Sanggrami Sasmitaloka, Nurdi Setyawan, Kun Tanti Dewandari, Siti Mariana Widayanti

Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.3213 (https://doi.org/10.14716/ijtech.v11i1.3213)
Pages : 37-47

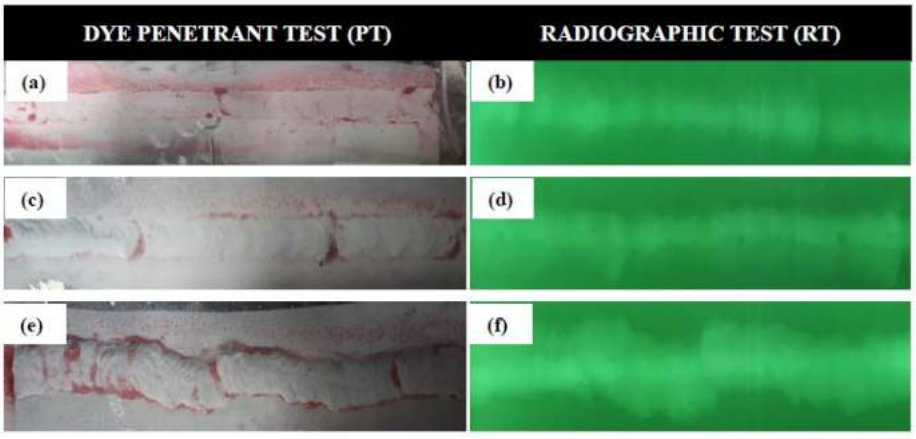
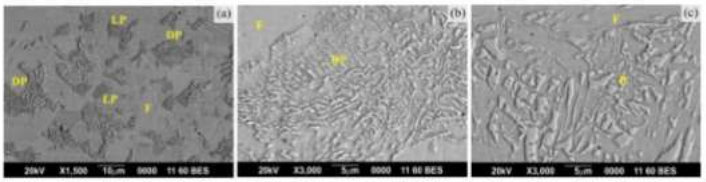


Figure 3 Penetrant and Radiographic test of weldments produced by atmospheric welding using. (a,b) 1% Mg, (c,d) 3% Mg, (e,f) 5% M

Microstructure and Mechanical Properties of Ah-36 Steel Weldment Welded using Magnesium Modified E6013 Electrode (https://ijtech.eng.ui.ac.id/article/view/2737)

Dewin Purnama, Winarto Winarto, Nofrijon Sofyan, Adhi Prihastomo, Kazuhiro Ito

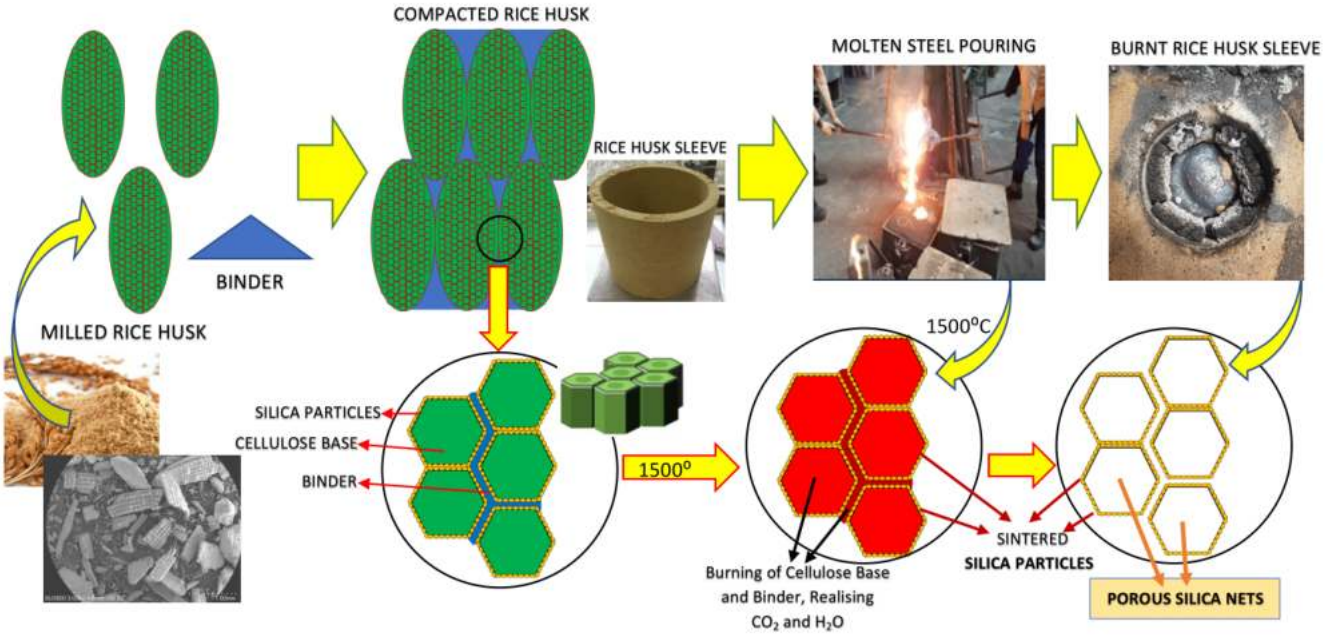
Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.2737 (https://doi.org/10.14716/ijtech.v11i1.2737)
Pages : 48-59



The Effect of Ni on the Formation of Bainite in Fe-Ni Lateritic Steels through Semi-continuous Cooling Method (https://ijtech.eng.ui.ac.id/article/view/3178)

Fatayalkadri Citrawati, Robby Dwiwandono, Leksono Firmansyah

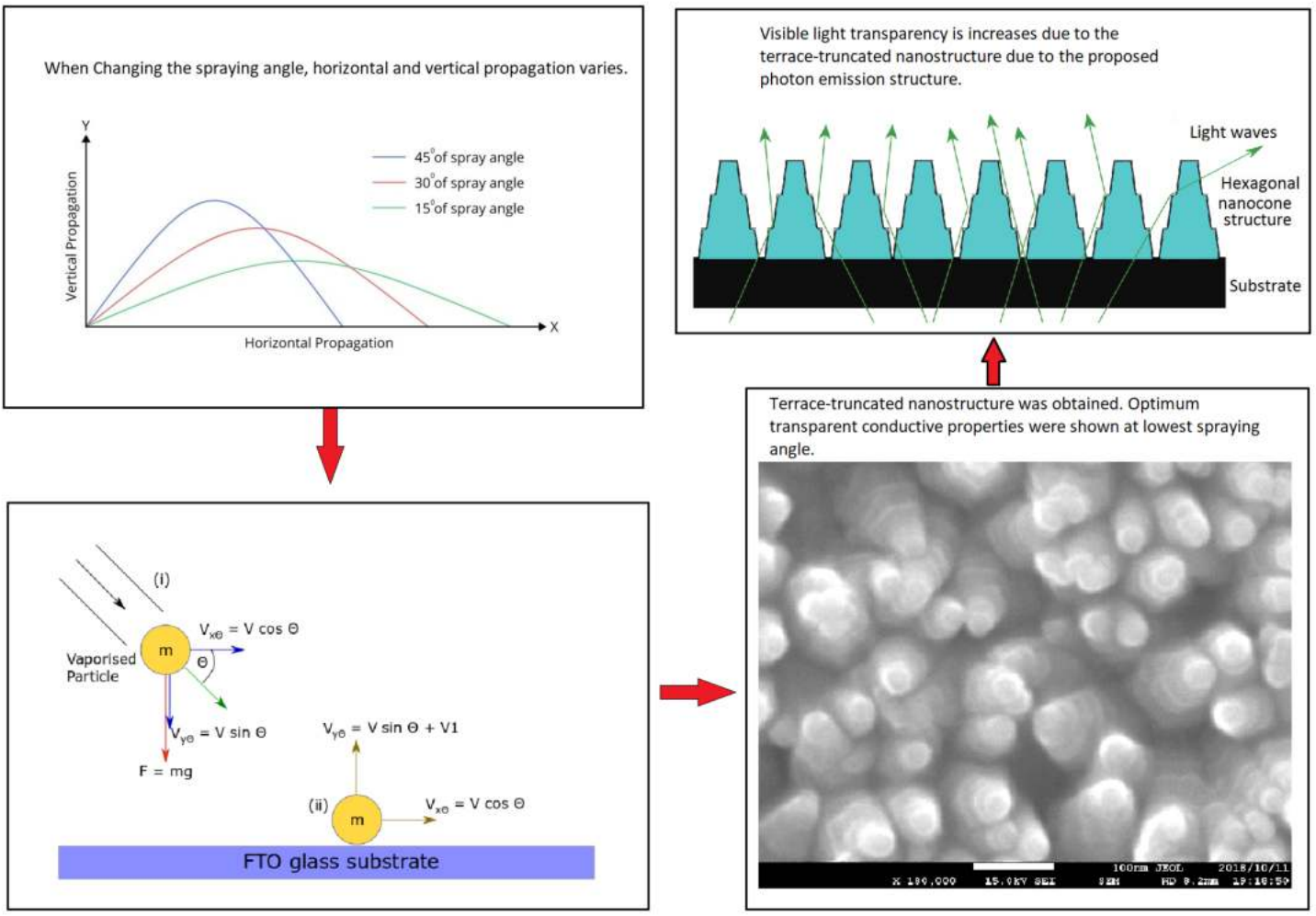
Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.3178 (https://doi.org/10.14716/ijtech.v11i1.3178)
Pages : 60-70



Rice Husk Waste as an Exothermic Material for a Riser Sleeve for Steel Casting (https://ijtech.eng.ui.ac.id/article/view/2544)

Dewi Idamayanti, Wiwik Purwadi, Beny Bandanadjaja, Rafidan Triadji

Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.2544 (https://doi.org/10.14716/ijtech.v11i1.2544)
Pages : 71-80

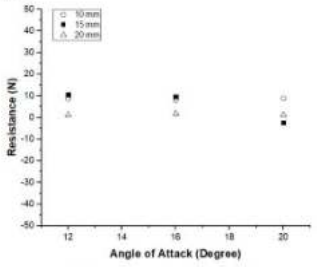


Spray Angle Dependence for the Growth of Terrace-truncated Nanocone Structure of Gallium-doped Zinc Oxide by Advanced Spray Pyrolysis Deposition Technique (https://ijtech.eng.ui.ac.id/article/view/3068)

Sameera Attanayake, Masayuki Okuya, Kenji Murakami

Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.3068 (https://doi.org/10.14716/ijtech.v11i1.3068)
Pages : 81-90

Graphical Abstract



Total drag experienced by part C

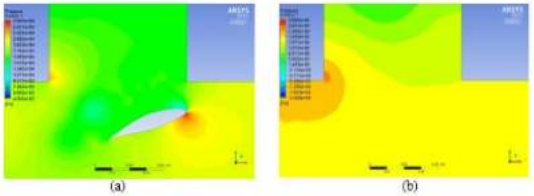
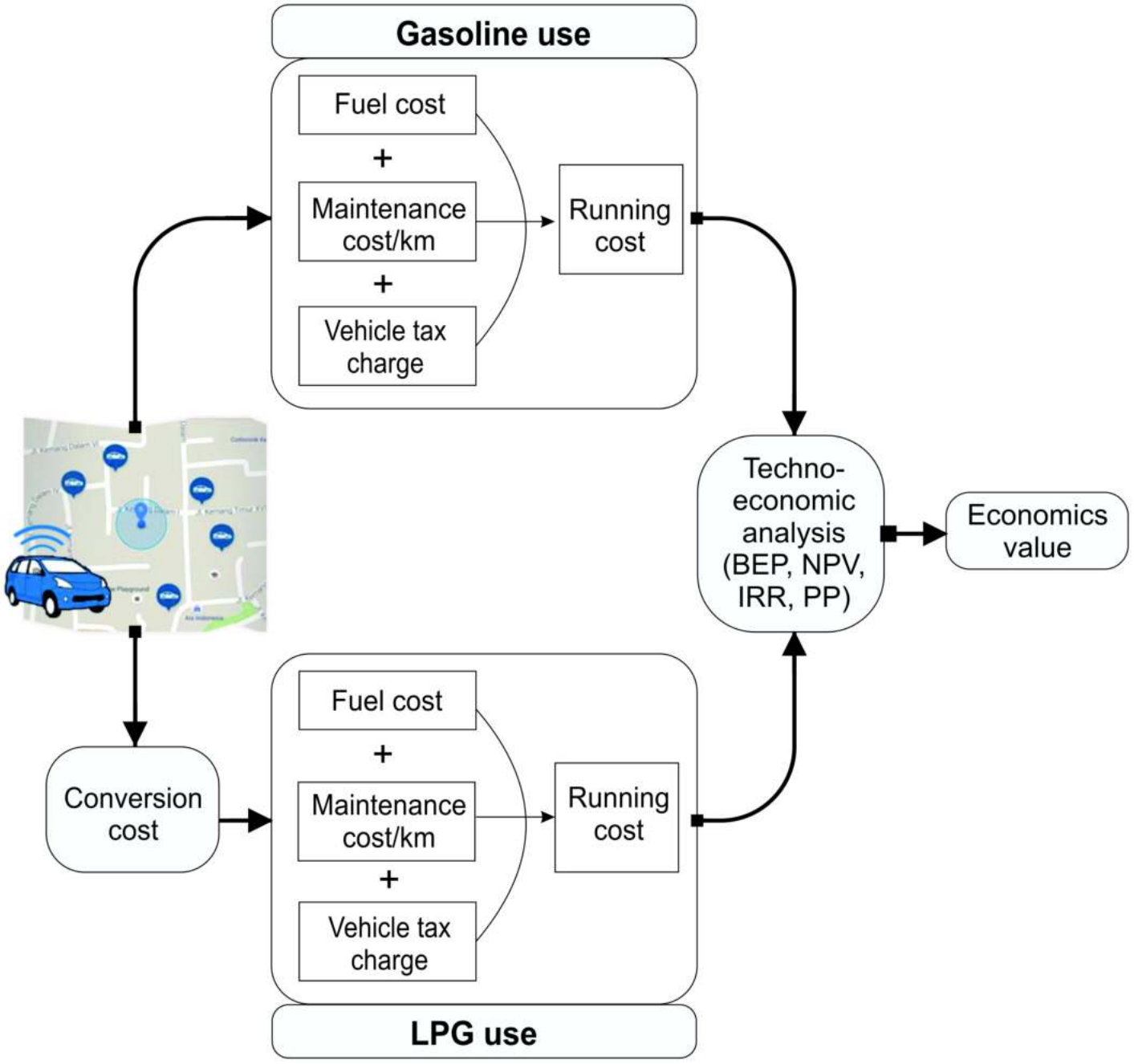


Figure (a) Contour of dynamic pressure on part B, (b) pressure contour withot foil

Numerical Study on Influence of Hydrofoil Clearance Towards Total Drag Reduction on Winged Air Induction Pipe for Air Lubrication (https://ijtech.eng.ui.ac.id/article/view/1870)

Yanuar , Made S.G. Putra, M. Akbar, Muhammad Alief, Fatimatuzzahra

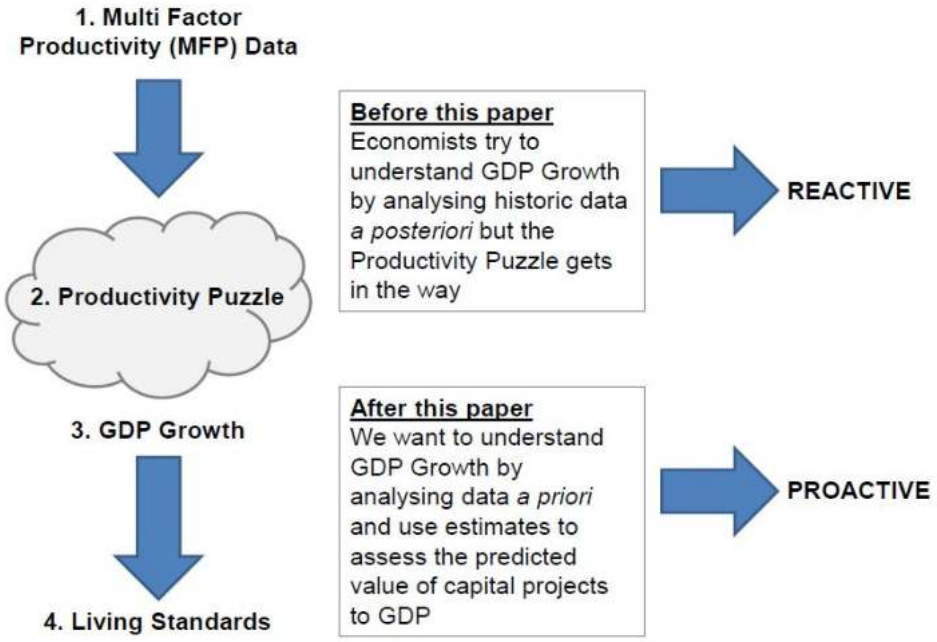
Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.1870 (https://doi.org/10.14716/ijtech.v11i1.1870)
Pages : 91-99



Converting ToD Vehicle from Gasoline to LPG in Indonesia: Cost Identification and Investment Analysis (https://ijtech.eng.ui.ac.id/article/view/2161)

Muhammad Imron Rosyidi, Eko Muh Widodo, Tuessi Ari Purnomo, Muji Setiyo, Djoko Wahyu Karmiadji

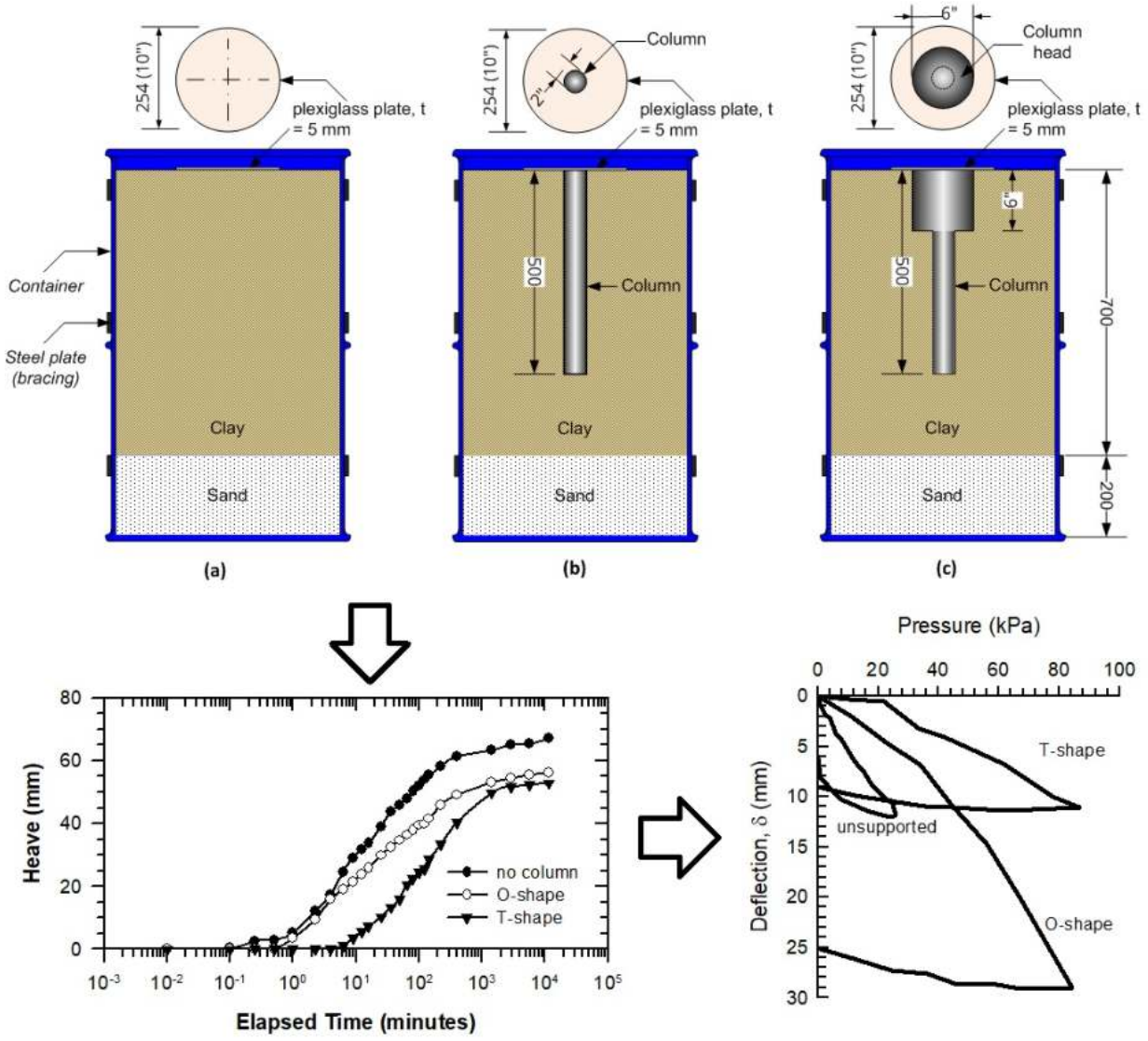
Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.2161 (https://doi.org/10.14716/ijtech.v11i1.2161)
Pages : 100-110



Value Creation and the Pursuit of Multi Factor Productivity Improvement (https://ijtech.eng.ui.ac.id/article/view/3364)

Roy Woodhead, Mohammed Ali Berawi

Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.3364 (https://doi.org/10.14716/ijtech.v11i1.3364)
Pages : 111-122



The Behavior of the Flexible Plate – Supported with SiCC-Mortar Column on Expansive Soil (https://ijtech.eng.ui.ac.id/article/view/1213)

Agus Setyo Muntohar, Willis Diana, Muhammad Yogma Tafalas, Nakosa Rafa Bimantara

Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.1213 (https://doi.org/10.14716/ijtech.v11i1.1213)
Pages : 123-132

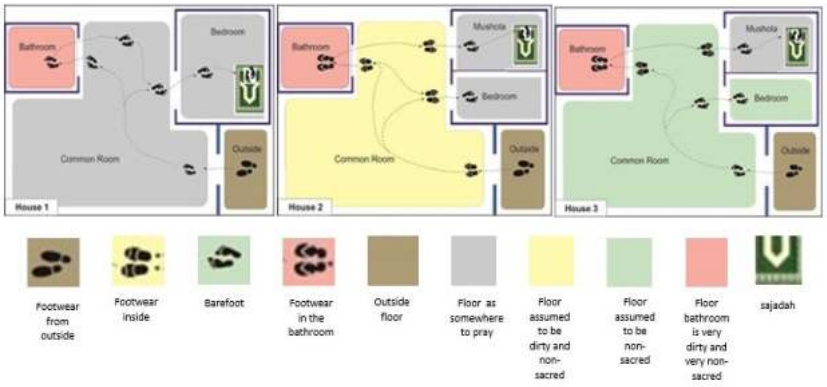


Figure 1 Journey of footwear in Houses 1, 2, 3

Maintaining Social Sustainability through the Boundary Formation of Sacred Spaces in Moslem Dwellings (https://ijtech.eng.ui.ac.id/article/view/3764)

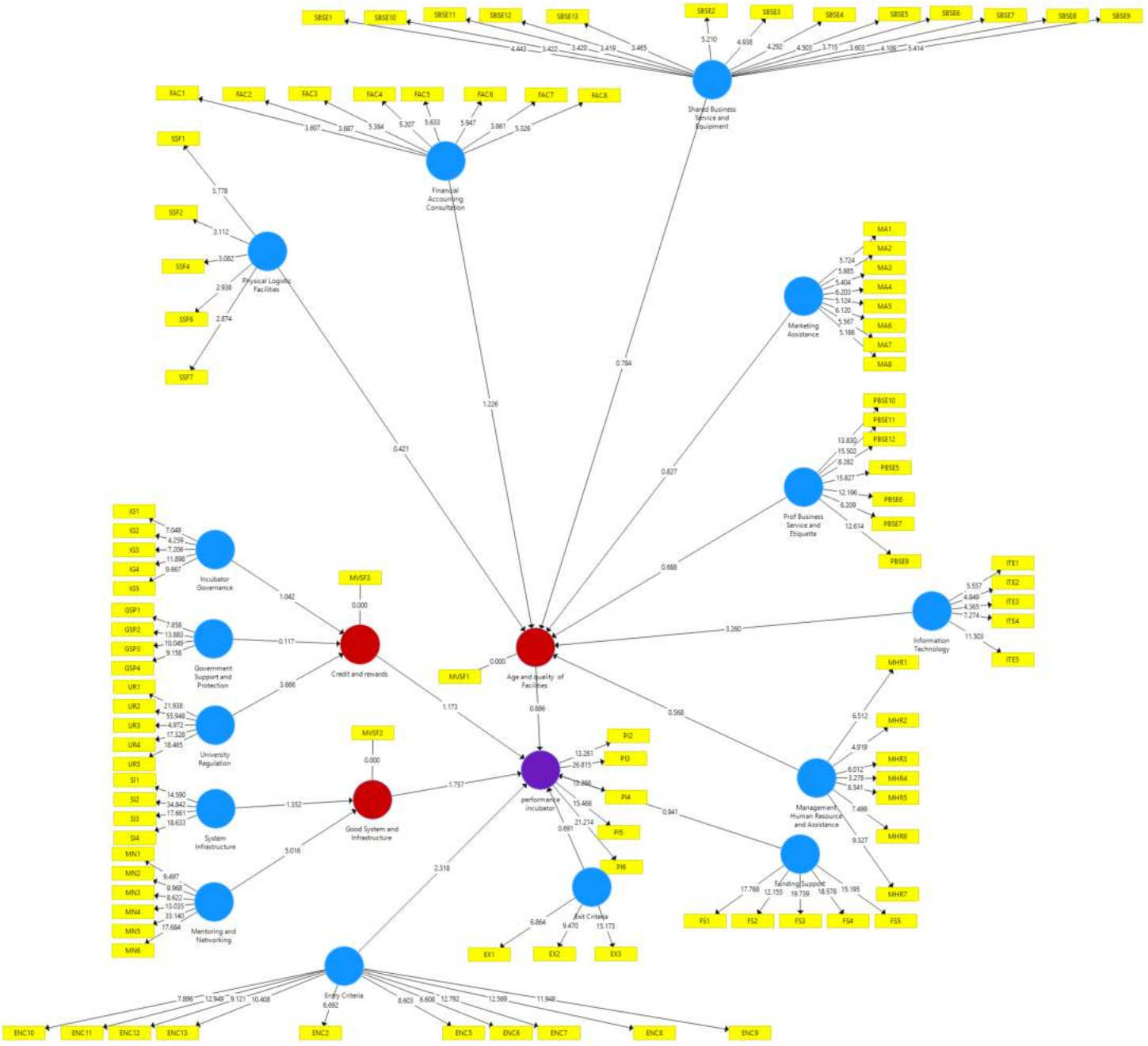
Samsu Hendra Siwi, Yandi Andri Yatmo, Paramita Atmodiwirjo

Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.3764 (https://doi.org/10.14716/ijtech.v11i1.3764)
Pages : 133-143

Utilizing an Intervention Forecasting Approach to Improve Reefer Container Demand Forecasting Accuracy: A Case Study in Indonesia (https://ijtech.eng.ui.ac.id/article/view/3220)

Sintia Putri Pradita, Pornthipa Ongkunaruk, Thaweephan Duke Leingpibul

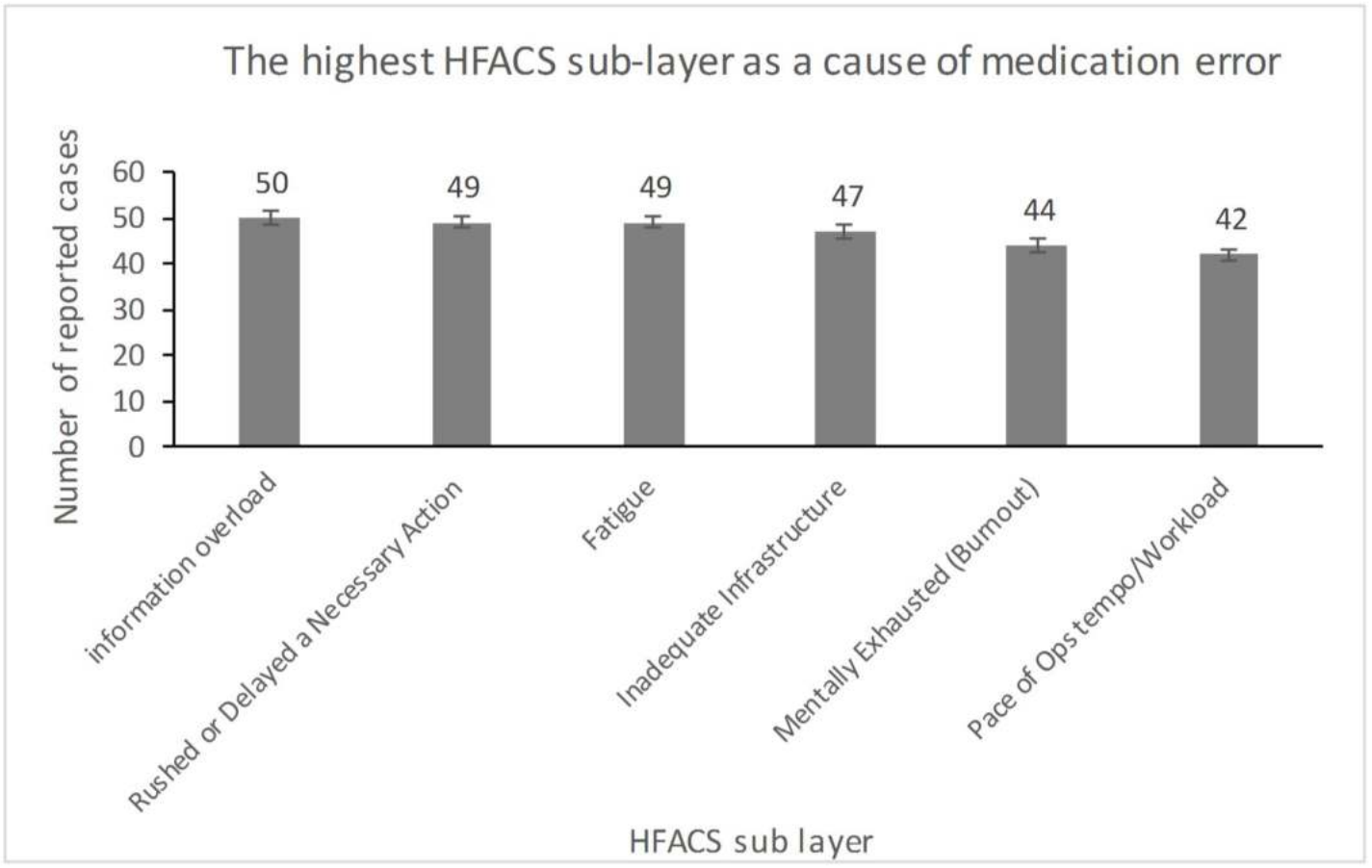
Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.3220 (https://doi.org/10.14716/ijtech.v11i1.3220)
Pages : 144-154



Performance Factors for Successful Business Incubators in Indonesian Public Universities (https://ijtech.eng.ui.ac.id/article/view/2464)

Lina Gozali, Maslin Masrom, Teuku Yuri M. Zagloel, Habibah N. Haron, Jose Arturo Garza-Reyes, Benny Tjahjono, Agustinus Purna Irawan, Frans Jusuf Daywin, Asril Fitri Syamas, Sani Susanto, Harry Kusuma Kiwi Aliwarga, Iveline Anne Marie

Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.2464 (https://doi.org/10.14716/ijtech.v11i1.2464)
Pages : 155-166



Human Factor Analysis and Classification System (HFACS) in the Evaluation of Outpatient Medication Errors (https://ijtech.eng.ui.ac.id/article/view/2278)

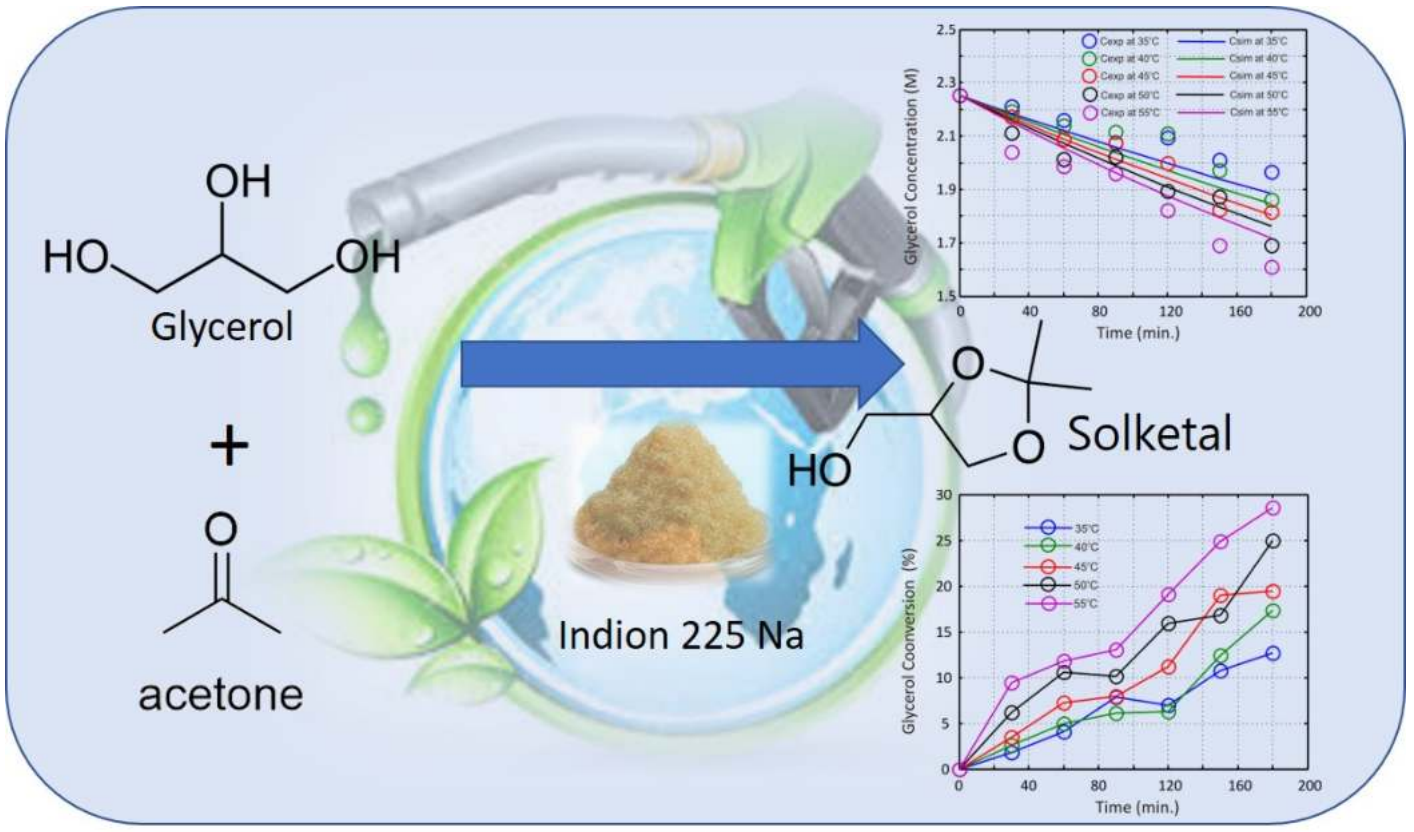
Ari Widyanti, Assyifa Reyhannisa

Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.2278 (https://doi.org/10.14716/ijtech.v11i1.2278)
Pages : 167-179

Biomechanical Evaluation of a Patient-Handling Technology Prototype (https://ijtech.eng.ui.ac.id/article/view/1332)

Hardianto Iridiastadi, Theodora Vani , Putra Alif Ramdhani Yamin

Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.1332 (https://doi.org/10.14716/ijtech.v11i1.1332)
Pages : 180-189



Utilization of Glycerol by Ketalization Reactions with Acetone to Produce Solketal using Indion 225 Na as Catalyst (https://ijtech.eng.ui.ac.id/article/view/3093)

Hary Sulistyo, Didan Prasiasda Priadana, Yasinta Wahyu Fitriandini, Teguh Ariyanto, Muhammad Mufti Azis

Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.3093 (https://doi.org/10.14716/ijtech.v11i1.3093)
Pages : 190-199

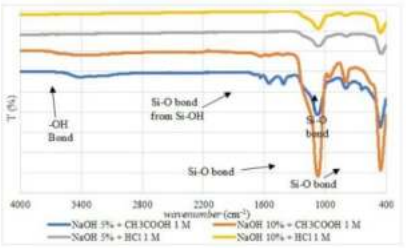


Fig. 1. FTIR Spectrum of Silica

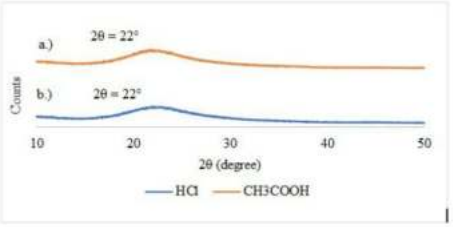


Fig. 2. XRD Patterns of Silica a.) CH_3COOH acid acidification, b.) HCl acid acidification.

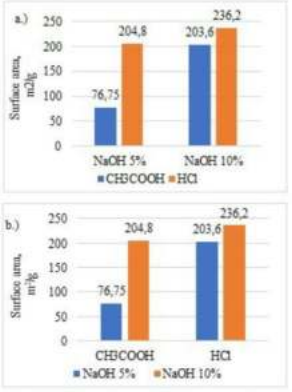


Fig. 3. The effects of concentration of alkaline solution and acidification methods on surface area of silica, a.) the effects of acidification methods, b.) the effects of concentration of alkaline solution.

Table 1. Elements in Silica Extracted from RHA with various of concentration of NaOH and Acidification Methods.

Elements %	NaOH 125. 10^{-3} M + CH_3COOH 1 M	NaOH 25.10^{-4} M + CH_3COOH 1 M	NaOH 125. 10^{-3} M + HCl 1 M	NaOH 25.10^{-4} M + HCl 1 M
Si	35.07	48.30	46.69	46.72
O	64.10	51.69	53.03	53.18
K	0.83	-	0.28	0.1

Table 2. BET surface area of silica produced from RHA.

Sample	BET Surface area, m^2/g	Total pore volume, cm^3/g	Average pore diameter, nm
Silica produced from RHA using NaOH 125. 10^{-3} M + CH_3COOH 1 M	76.75	0.287	15
Silica produced from RHA using NaOH 25.10^{-4} M + CH_3COOH 1 M	204.8	0.43	8.4
Silica produced from RHA using NaOH 125. 10^{-3} M + HCl 1 M	203.6	0.643	12.6
Silica produced from RHA using NaOH 25.10^{-4} M + HCl 1 M	236.2	0.539	9

Synthesis of Amorphous Silica from Rice Husk Ash: Comparing HCl and CH3COOH Acidification Methods and Various Alkaline Concentrations (https://ijtech.eng.ui.ac.id/article/view/3335)

Donanta Dhaneswara, Jaka Fajar Fatriansyah, Frans Wensten Situmorang, Alfina Nurul Haqoh

Publication Date (Online):
Jan 29, 2020
DOI: https://doi.org/10.14716/ijtech.v11i1.3335 (https://doi.org/10.14716/ijtech.v11i1.3335)
Pages : 200-208

LIST OF REVIEWERS CONTRIBUTING IN THIS ISSUE (https://ijtech.eng.ui.ac.id/reviewer/61)

About the Journal

- Editorial Board (https://ijtech.eng.ui.ac.id/people)
- Focus and Scope (https://ijtech.eng.ui.ac.id/about/5/focus-and-scope)
- Online Submissions (https://ijtech.eng.ui.ac.id/about/3/online-submission)
- Publication Policy (https://ijtech.eng.ui.ac.id/about/11/publication-policy)
- Publication Ethics and Policy (https://ijtech.eng.ui.ac.id/about/10/policy)
- Author Guidelines (https://ijtech.eng.ui.ac.id/about/4/author-guidelines)
- List of Reviewers (https://ijtech.eng.ui.ac.id/about/12)

- Most downloaded papers (https://ijtech.eng.ui.ac.id/home/mostdownloadedpapers)
- Most cited papers (https://ijtech.eng.ui.ac.id/about/14)

Login

Username

ligoz

Password

••••••••••••••••

Not as user?
Register (https://ijtech.eng.ui.ac.id/register)

LOGIN

IJTech

p-ISSN : 2086-9614
e-ISSN : 2087-2100

Journal Metrics

(https://www.scimagojr.com/journalsearch.php?q=21100235612&tip=sid&exact=no)

Metrics by SCOPUS 2018
CiteScore 2018: **1.06**
CiteScoreTracker 2019: **1.18**
Source Normalized Impact per Paper (SNIP): **1.395**

IJTech is indexed in

SCOPUS (http://www.scopus.com)

(http://www.ebsco.com/index.asp)

(http://www.doaj.org)

(http://www.scimagojr.com)

(http://www.indexcopernicus.com)

(http://www.crossref.org)

(https://scholar.google.co.id/scholar?q=site%3Ahttp%3A%2F%2Fijtech.eng.ui.ac.id)

(http://ip-science.thomsonreuters.com/cgi-bin/jrnlst/jlresults.cgi?PC=EX&Full=international%20journal%20of%20technology)

(http://info.flagcounter.com/AoS7)

IJTech secretariat, Engineering Center Bld., 2nd Fl.
Faculty of Engineering, Universitas Indonesia
Depok 16424, Indonesia.

International Journal of Technology 11(1) 156-166 (2020)
Received March 2019 / Revised May 2019 / Accepted September 2019

International Journal of Technology

http://ijtech.eng.ui.ac.id

Performance Factors for Successful Business Incubators in Indonesian Public Universities

Lina Gozali[1*], Maslin Masrom[2], Teuku Yuri M. Zagloel[3], Habibah Norehan Haron[2], Jose Arturo Garza-Reyes[4], Benny Tjahjono[5], Agustinus Purna Irawan[6], Frans Jusuf Daywin[1], Asril Fitri Syamas[7], Sani Susanto[8], Harry Kasuma Kiwi Aliwarga[9], Iveline Anne Marie[10]

[1]*Department of Industrial Engineering, Faculty of Engineering, Universitas Tarumanagara, Jl. S. Parman No 1, Jakarta 11440, Indonesia*
[2]*Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, Kuala Lumpur 54100, Malaysia*
[3]*Department of Industrial Engineering, Faculty of Engineering, Universitas Indonesia, Kampus UI Depok, Depok 16424, Indonesia*
[4]*Centre for Supply Chain Improvement, Derby Management School, University of Derby Kedleston Road, Derby, DE22 1GB, United Kingdom*
[5]*Centre for Business in Society, Coventry University, Priory St, Coventry CV1 5FB, United Kingdom*
[6]*Department of Mechanical Engineering, Faculty of Engineering, Universitas Tarumanagara, Jl.S Parman no 1, Jakarta 11440, Indonesia*
[7]*Association of Indonesian Business Incubator, Jl. Jenggala 2 no.9, Kebayoran Baru, Jakarta 12110, Indonesia*
[8]*Department of Industrial Engineering, Faculty of Industrial Technology, Universitas Katolik Parahyangan Jl. Ciumbuleuit No. 94, Gedung 8, Bandung, Indonesia 40141*
[9]*UMG IdeaLab Indonesia, Jl. Tangkas Baru Komplek Polri Blok E/2, Karet Semanggi, Setiabudi, South Jakarta, Jakarta, Indonesia 12930*
[10]*Department of Industrial Engineering, Faculty of Industrial Technology, Universitas Trisakti, Jl. Kyai Tapa No. 1, Jakarta 11440, Indonesia*

Abstract. Measuring the performance of business processes is already a main concern for both faculty and enterprise players, since organizations are motivated to reach the productivity stage. Employing a performance achievement framework for the relationship between business incubator success factors will guarantee connection with commercial schemes, which support a high level of performance indicators in successful business incubator models. This research employs a quantitative approach, with the data analyzed using the IBM SPSS version 23 and Smart PLS version 3 statistical software packages. Employing a sample of 95 incubator managers from 19 universities which geographically located in Indonesia, it is shown that the image of business incubator factors has a positive effect on incubator performance. The study investigates the relationship between incubator performance and business incubator success factors in Indonesia. It was found that IT, as part of the business incubators' facets/abilities, partially supports their performance; that the entry criteria directly support the performance of the incubators; that mentoring networks also support the performance, with good infrastructure systems as a moderating factor; that funding supports the performance of business incubators, also with good infrastructure systems as a moderating factor; and that university regulations and government support and protection enhance the performance of business incubators, with credits and rewards as a moderating factor. In addition,

*Corresponding author's email: linag@ft.untar.ac.id, Tel.: +62-857-81219980
doi: 10.14716/ijtech.v11i1.2464

a variety of indicators from the local context affiliate positively to promote a community that highlighted the incubators' strategies.

Keyword: Incubator performance factors; Indonesian public universities; Successful business incubator

1. Introduction

Commercialization passage such as "If you cannot measure it, you cannot manage it" or "What is measured, improves" (Drucker, 2006) are occasionally challenged as they are not measurable to a significant extent (Ryan, 2014). Nevertheless, that passage help incubator managers to measuring their company's performance and successful factor (such as gapping from quantitative to qualitative and from financial to non-financial), that can support the study of the business activity performance dimension (Van Looy and Shafagatova, 2016). However, a performance framework to support the business process strategy and performance factors needs to be selected and employed (Shah et al., 2012).

Sometimes, the optimized performance measurement framework used is the balanced scorecard (BSC) developed by Kaplan and Norton (2001), which provides four measurement methods of business performance: (1) the financial perspective; (2) customer perspective; (3) internal business process perspective; and (4) learning and growth perspective.

The role of performance factors in successful business incubators has received increased attention across several disciplines in recent years. During the last decade, the performance of business incubators has been at the center of much attention. Many are currently trying to achieve the best performance in the intense competition to be successful. The purpose of this research is to assess the extent to which these performance factors are important for success in business incubators in Indonesian public universities. The research will greatly help incubators to achieve their best performance so that they can help their tenants to perform.

2. Literature Review

Service innovation has been widely accepted as part of the strategy to generate more advantages for business players, particularly SMEs. Therefore, it is safe to conclude that business players which employ and apply the latest innovations and activities as part of their routine actions will have greater chances of significantly upgrading their performance at company level. This will consistently equip them with the basic economic and financial resources needed to maintain the growth of their service innovation. By generating new assistance, which may have not recently existed in the business, SMEs can obtain the urge conditions to employ extreme innovations. In this way, they can beat their main business rivals, as well as significantly improving their business performance.

Research by Aerts et al. (2007) on the relationship between the filtering process of incubators and performance found coherence between filtering based on activities set with higher tenant survival rate. While this is an important indication for incubator managers to understand the filtering process, it does not demonstrate the application of incubator support, as the filtering process introduces heavy selection factors compared to incubators which are not filtered.

Peters et al. (2004) emphasize the effect of incubator services, including infrastructure, mentoring and networks, and on the percentage level of graduation of incubates. They found that simple comparison of types of services offered was not enough to highlight the differences in graduation rates among incubators. Instead, they conclude from investigation

that screening activities as well as literate resources are needed through networks, and that the relationship between co-tenants are the important factors in establishing incubator performances in terms of graduation rates.

Mian (1997) advises that performance evaluations also support program development and sustainability, tenant's firm survival and growth, implication to the University's mission sponsor and the environmental impacts should be noticed into account in order to measure incubator performance. The findings on technology business incubator performance can be observed by studying the incubation process, including the knowledge-sharing process, diffusion of innovation and individual creativity, which is vital for the developmental process of new ventures (Binsawad et al., 2019).

The lack of perception from incubatees of the future challenge led Chan and Lau (2005) to propose an adjusted model to understand the implication of technology firms through their business operation. Using previous research, they found a set of indicators to compare performance from the incubatees' perception. The nine elements consisted of pooling criteria, sharing facilities, coaching and mentoring services, public impress, networking, clustering, geographic proximity, finance, and funding support. They identified that the tenants' level of improvement affected the influences of each incubator characteristic on the tenants.

It has also been identified that the capability to connect start-ups to specific financial sources improves the factors important for incubators for increase their investments (Van Rijnsoever et al., 2017). It has also been found that participating in network events, engaging in referral services and the sheer fact of being linked to a reputable incubator puts the start-ups in a beneficial position, while supporting actions directly targeted at gaining more funding (such as pitch training) have less influence. In spite of that, it does not mean that the supporting actions correlated to hit-making, such as coaching, mentoring or workshops, are all in vain. The performance indicators related to raising funding are primarily applicable to new business players (Eveleens et al., 2017).

The important factor in incubation is the capability of the incubators to link the networks to the incubatees (Sherman and Chappell, 1998; Colombo and Delmastro, 2002; Haapasalo and Ekholm, 2004; Pena, 2004; Bøllingtoft and Ulhøi, 2005; Chan and Lau, 2005; Hughes et al., 2007). One of the important performance factors in incubation is the process of governing the incubatees' affiliations. Public business incubators, which consist of regional offices and universities, represent most of the business facilitators activated within the observed context. Universities and the local government play a key role in the development of public policies and contribute to research funding, agreements between universities, incubators and the regional entrepreneurial systems to aid and promote entrepreneurship, economic development and innovation (Corsi and Di Berardino, 2014). Finally, the researchalso finds the 'learning' factor to be the foundation of performance (Messeghem et al., 2018).

This research has arisen because previous papers, for example Vanderstraeten and Matthyssens (2012). O'Neal (2005), Voisey et al. (2006), Löfsten and Lindelöf (2002), Mian (1997) and Bigliardi et al. (2006), have not used any processed data. Only Lalkaka (2003) indicates five factors, namely public policy, which stimulates entrepreneurial businesses and provides a business infrastructure; private sector partnerships for mentoring and marketing; the knowledge base of learning and research; professional networking, nationally and globally; and community involvement to promote entrepreneurism and cultural change. Stefanović and Stanković (2014) found that usually the model developed to measure business incubator performance was only one that measured financial

statements. This research seeks to develop a model that measures the performance factors of business incubator in public universities in Indonesia.

3. Structural Model, Performance Indicators, and Hypotheses

The factors studied in this research include the abilities of business incubators (Smilor, 1987; Costa-David et al., 2002; Verma, 2004), incubator governance (Campbell, 1989; Hannon, 1995; Verma, 2004), entry criteria (Campbell, 1985; Smilor and Gill, 1986; Campbell, 1989; Costa-David et al., 2002; Verma, 2004; Hackett and Dilts, 2004; Hutabarat, 2014), exit criteria (Costa-David et al., 2002; Verma, 2004), mentoring and networking (Campbell, 1985; Costa-David et al., 2002; Verma, 2004; Hackett and Dilts, 2004; Aerts et al., 2007), funding and support (Campbell, 1985; Costa-David et al., 2002; Verma, 2004), government support and protection (Smilor, 1987; Mian, 1997; Lee et al., 1999; Chandra and Chao, 2011; Wilson, 2012; Wolf 2017), university regulations (Smilor, 1987; Gibson, 1988; Mian, 1997; Carayannis et al., 2006; Chandra and Chao, 2011; Wonglimpiyarat, 2016), and system infrastructure (Hackett and Dilts, 2004; O'Neal, 2005; Carayannis et al., 2006). A structural model of all the factors to be assessed from the performance of successful business incubators in public universities in Indonesia is shown in Figure 1.

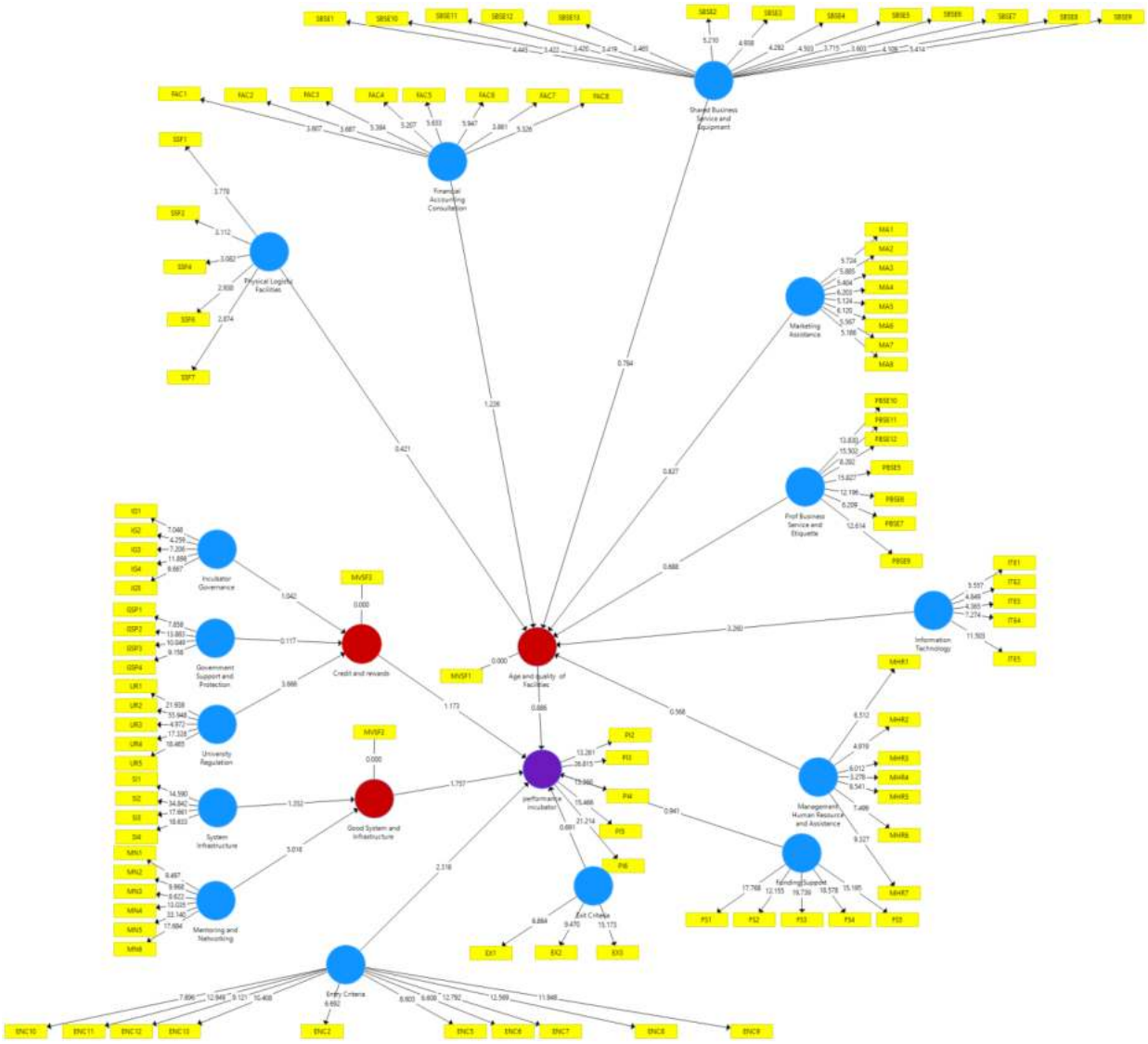


Figure 1 Structural model of the performance of business incubators in Indonesian public universities

The incubator performance framework section explained that the incubator performance framework should typically determine different performance approaches from which performance measurement could be further defined. However, we should observe that performance measurement and (key) performance measurements as phrasing (Dumas et al., 2013).

H1: The greater the focus on the performance of business incubators moderated by the quality of facilities, the more likely the business incubator is to be performed due to good quality of facilities.

H2: The better the incubator's governance, as moderated by credit and reward, the more likely it is to be performed.

H3: The stronger the enforcement of tenant entry criteria, the higher the probability of the business incubator performing well.

H4: The stronger the enforcement of tenant exit criteria, the higher the probability of the business incubator performing well.

H5: The better the mentoring and networking of the business incubator, moderated by a good infrastructure system, the more likely the business incubator is to be performed.

H6: The better the funding and support of the business incubator for its tenants is moderated by good system of infrastructure, the more likely the business incubator is to be performed.

H7: The better the support and protection from the government, moderated by credit and reward, the more likely the business incubator is to be performed

H8: The better the university regulations are moderated by credit and rewards, the better the initiative programs and projects for business incubator performance.

H9: The better the system and infrastructure are moderated by a good infrastructure system, the more likely the of the business incubator performance

4. Methodology

Using a mixed method approach, the research involves sequential timing in the use of several different methods. One approach is first employed, and the conclusion used to select the sample to establish the instrument, and to write the analysis for the subsequent approaches. Other applications were used to establish the designs of the differing approaches of equal weight and sequence. The second method involved data collection and procedure; first, a qualitative study, followed by a quantitative study. The weight between the qualitative and quantitative studies should be equal, although in practice one approach is used more than the other.

The decision on choosing an appropriate approach for a study hinges upon the goals of the research, and should be determined by the study questions (Marshall, 1996). The mixed-method approach incorporates mixed-methods design, employing both quantitative and qualitative studies. This approach has been utilized in many fields of study, including social, behavioral and health sciences (Yin, 2003). Tashakkori and Creswell (2007) define mixed-methods as research in which the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or program of inquiry. Johnson and Onwuegbuzie (2004) advocate the use of mixed-methods research as the third research paradigm in educational research, and recognize the importance and usefulness of both types of study.

Consequently, the use of qualitative and quantitative methods was considered suitable for this research. The study first seeks to examine the indicators and success factors for business incubators in Indonesian public universities, second investigates these factors, and finally examines the research framework performance through statistical analysis.
Based on various literature reviews, the survey questionnaire was constructed and developed into a consolidated survey questionnaire consisting of different measurement scales and questions. Each related success factor was measured using a 1 to 5 Likert scale, which was incorporated into the questionnaire, and respondents were requested to indicate the importance of factors relative to others.

The objective of the study is to distinguish those factors which have a relatively higher score. It then continues with the quantitative method using reliability and validity tests, in which all the success factors are valid and reliable (Gozali, 2018), research hypothesis tests, and a structural model test. Case studies are used as part of the qualitative method to study the differences between public university business incubators in Indonesia.

The qualitative study was adapted from the literature reviews, in which business incubator success factors were identified. The survey questionnaire was constructed and developed from face-to-face interviews with Indonesian public university business incubator experts. The survey questionnaire was then validated by ten professors from six countries (i.e. the USA, Scotland, Finland, Australia, Malaysia and Indonesia) (Gozali, 2018). After validation of the questionnaire and completion of the correction process, the final survey questionnaire was circulated to respondents via e-mail or conducted face-to-face. The Cronbach's alpha value obtained from the 95 respondents gave a value of 0.98, which shows that the reliability of the results is quite high.

The quantitative study was supported by data from in-depth, one-to-one interviews. The reliability of the quantitative factors in the study was assumed to be higher than the qualitative ones, since the interviews with the experts were originated on empirical data which had been previously collected (Graff, 2016). The main approach is to utilize questionnaires on a large sample in the form of quantitative data collection, hence the creation of the survey for the purpose of this research (Denscombe, 2007).
This research examined the results to identify the performance of business incubators using the survey questionnaire developed for the study and the business incubator success framework (Gozali, 2016).

5. Research Locations and Research Sample

5.1. Research Location

The 95 respondents consisted of business incubator managers from Indonesian public universities, chosen from the following institutions: Institut Teknologi Bandung, Institute Teknologi Sepuluh November, Andalas University, Institut Pertanian Bogor, Diponegoro University, University of Indonesia, Samratulangi University, Brawijaya University, Airlangga University, Riau University, Udayana University, Gorontalo University, Sebelas Maret University, Jambi University, North Sumatera University, Bandung Technopark, Padjajaran University and Yogyakarta State University.

5.2. Research Sample

The sample used for the study consisted of business incubator managers in Indonesian public universities involved in the day–to-day operations of the incubators and the graduated tenant companies. In their role as sample or respondents, the business incubator managers would have the necessary insights and experience of managing incubators, with a relationship between the incubators and tenant firms. The sample for this research

consisted of 95 respondents, all of whom were business incubator managers from Indonesian public universities.

6. Results and Discussion

The research employs the mixed method approach, and the data are analyzed using the IBM SPSS version 23 and Smart PLS version 3 statistical software packages. After data collection and analysis, the results are shown in Table 1.

Table 1 Structural model measurement for the performance of business incubators

Hypothesis	Construct relationship	t stat	p value
H1	Information Technology → Quality of Facility	4.374	0.000
H2	Incubator Governance → Credit and Rewards	0.461	0.645
H3	Entry Criteria → Business Incubator Performance	2.125	0.034
H4	Exit Criteria → Business Incubator Performance	0.997	0.319
H5	Mentoring and Networking → Good System Infrastructure	2.686	0.007
H6	Funding and Support → Business Incubator Performance	3.535	0.000
H7	Government Support and Protection → Credit and Rewards	2.309	0.021
H8	University Regulation → Credit and Rewards	3.515	0.000
H9	System Infrastructure → Good System Infrastructure	1.486	0.138

Lalkaka (2003) proposed five factors, government support, mentoring networking, infrastructure, community support and sharing knowledge, which will increase business incubator performance. Stefanović and Stanković (2014) developed a model by only measuring financial statements. Sutama et al. (2018) state that business incubator performance depends on office space, tenant rooms, discussion room 1 and a tenant production display room, with a minimum time requirement for the incubation process. Grapeggia et al. (2011) state that incubator governance, marketing assistance and infrastructure are important for increasing business incubator performance in Brazil. Binsawad et al. (2019) state that the performance of technology business incubators is influenced by sharing knowledge and incubator governance, while Zibarzani and Rozan (2017) state that mentoring networking and sharing knowledge greatly influences business incubator performance in supporting start-ups. Xie et al. (2011) explain that incubation funding can improve incubator performance but not directly influence the tenants' income.

Van Looy and Shafagatova (2016) show that the performance indicators from quantitative to qualitative methods and from financial to non-financial factors, almost similar to Kaplan and Norton (2001), who take a four-dimensional approach to organizational performance, from the: (1) financial perspective; (2) customer perspective; (3) internal business process perspective; and (4) learning and growth perspective. Learning is a key indicator for performance, as stated by Messeghem et al. (2018), Mian (1997) and Binsawad et al. (2019).

Aerts et al. (2007) developed screening criteria, or entry criteria. Corsi and Di Berardino (2014) emphasizes the roles of university regulations and collaborations in investment and public policies. Van Rijnsoever et al. (2017) and Eveleens et al. (2017) recommend funding and support. Van Rijnsoever et al. (2017), Bøllingtoft and Ulhøi (2005), Chan and Lau (2005), Colombo and Delmastro (2002), Haapasalo and Ekholm (2004), Hughes et al. (2007), Pena (2004) and Sherman and Chappell (1998) acknowledge the relationship between mentoring and networking. All the above theories and models support the factors within the findings of this analysis.

Table 2 Results of performance hypothesis testing

Hypothesis	Description	Result
H1	The greater the focus is on the performance of business incubator moderated by the quality of the facilities, the more likely the business incubator to perform due to good quality of facilities.	Partially Supported (Information Technology and E-com Assistance)
H2	The better the incubator's governance is moderated by credit and reward, the more likely the business incubator to perform	Not Supported
H3	The stronger the enforcement of tenant entry criteria, the higher the probability of business incubator to perform	Directly Supported
H4	The stronger the enforcement of tenant exit criteria, the higher the probability of business incubator to perform	Not Supported
H5	The better the mentoring and networking of the business incubator moderated by good system of infrastructure, the more likely the business incubator to perform	Supported
H6	The better the funding and support of the business incubator for its tenants is moderated by good system of infrastructure, the more likely the business incubator to perform	Supported
H7	The better the support and protection from the government moderated by credit and reward, the more likely the business incubator to perform	Supported
H8	The better the university regulation is moderated by credit and rewards, the better the initiative programs and projects for business incubator on the performance (university regulation).	Supported
H9	The better the system and infrastructure are moderated by a good system of infrastructure, the more likely the performance of the business incubator to increase	Not Supported

The results of the hypothesis analysis shown in Table 2 demonstrate that information technology (Grapeggia, 2011; Lalkaka, 2003), as part of the abilities of a business incubator, partially supports their performance and that entry criteria (Campbell, 1985; Smilor and Gill, 1986; Campbell, 1989; Costa-David et al., 2002) directly support performance. Mentoring networking (Lalkaka, 2003; Zibarzani and Rozan, 2017) supports the performance of business incubator, with good infrastructure systems as a moderating factor and funding (Xie et al., 2011; Van Looy and Shafagatova, 2016; Van Rijnsoever et al., 2017; Eveleens et al., 2017) also supports performance, with good infrastructure systems also as a moderating factor. Finally, university regulation (Corsi and Di Berardino, 2014) supports the performance of business incubators, with credits and rewards as a moderating factor.

7. Conclusions

This research has been conducted to measure the factors that are critical to incubator performance. The research design employed the mixed methods approach. To conclude, it can be said that comprehensive skimming of references has provided us with numerous factors which account for the success of incubation performance. An important finding from the paper is that information technology, entry criteria, government support and protection, funding and support, mentoring networking and university regulation support the performance of business incubators.

References

Aerts, K., Matthyssens, P., Vandenbempt, K., 2007. Critical Role and Screening Practices of European Business Incubators. *Technovation*, Volume 27(5), pp. 254–267

Bigliardi, B., Dormio, A.I., Nosella, A., Petroni, G., 2006. Assessing Science Parks' Performances: Directions from Selected Italian Case Studies. *Technovation*, Volume 26(4), pp. 489–505

Binsawad, M., Sohaib, O., Hawryszkiewycz, I., 2019. Factors Impacting Technology Business Incubator Performance. *International Journal of Innovation Management*, Volume 23(01), pp. 1–30

Bøllingtoft, A., Ulhøi, J.P., 2005. The Networked Business Incubator–leveraging Entrepreneurial Agency? *Journal of Business Venturing*, Volume 20(2), pp. 265–290

Campbell, C. Kendrick, R., Samuelson, D., 1985. Stalking the Latent Entrepreneur. *Economic Development Review*, Volume 3(2), pp. 43–48

Campbell, C., 1989. Change Agents in the New Economy: Business Incubators and Economic Development. *Economic Development Review*, Volume 7(3), pp. 56–57

Carayannis, E.G., Popescu, D., Sipp, C., Stewart, M., 2006. Technological Learning for Entrepreneurial Development (TL4ED) in the Knowledge Economy (KE): Case Studies and Lessons Learned. *Technovation*, Volume 26(4), pp. 419–443

Chandra, A., Chao, C.A., 2011. Growth and Evolution of High-technology Business Incubation in China. *Human Systems Management*, Volume 30(1–2), pp. 55–69

Colombo, M.G., Delmastro, M., 2002. How Effective Are Technology Incubators? Evidence from Italy. *Research Policy*, Volume 31(7), pp. 1103–1122

Corsi, C., Di Berardino, D., 2014. Assessing the Business Incubator' Performance Referring the Local Development in Italy. *European Scientific Journal (ESJ)*, Volume 1, pp. 323–334

Costa-David, J., Malan, J., Lalkaka, R., 2002. Improving Business Incubator Performance through Benchmarking and Evaluation: Lessons Learned from Europe. *Materiały*, Volume 16, pp. 28–04

Chan, K.F., Lau, T., 2005. Assessing Technology Incubator Programs in the Science Park: The Good, the Bad, and the Ugly. *Technovation*, Volume 25(10), pp. 1215–1228

Drucker, P.F., 2006. *Classic Drucker: Essential Wisdom of Peter Drucker from the Pages of Harvard Business Review*. Harvard Business Press, Boston

Dumas, M., La Rosa, M., Mendling, J., Reijers, H.A., 2013. *Fundamentals of Business Process Management*. Berlin: Springer

Denscombe, M., 2007. *The Good Research Guides*. 3rd Edition, Berkshire. England: McGraw-Hill Education

European Commission Enterprise Directorate General, 2002. Benchmarking of Business Incubators. Center for Strategy and Evaluation Services

Eveleens, C.P., van Rijnsoever, F.J., Niesten, E.M., 2017. How Network-based Incubation Helps Start-up Performance: A Systematic Review Against the Background of Management Theories. *The Journal of Technology Transfer*, Volume 42(3), pp. 676–713

Gibson, L.J., 1988. *The Old and the New*. Economic Development Review, 1, 7

Gozali, L., Masrom, M., Zagloel, T.Y.M., Haron, H.N., 2016. A Framework of Successful Business Incubators for Indonesian Public Universities. *International Journal of Technology*, Volume 7(6), pp. 1086–1096

Gozali, L., Masrom, M., Zagloel, T.Y.M., Haron, H.N., Tjahjadi, E., 2018. A Framework Toward Successful Business Incubator for Indonesian Public Universities: A Pilot Review. *In:* Proceedings of the International Conference on Industrial Engineering and Operations Management Volume 2018-March, 2018, pp 869–883

Graff, J.C., 2016. *Mixed Methods Research: Evidence-Based Practice*, Volume 47

Grapeggia, M., Ortigara, A.A., Bastos, R.C., Juliatto, D.L., Lezana, A.G.R., 2011. Analysis by Clustering Factor Performance Business Incubators, *RAI*, Volume 8(1), pp. 64–91

Hackett, S.M., Dilts, D.M., 2004. A Real Options - Driven Theory of Business Incubation. *The Journal of Technology Transfer*, Volume 29(1), pp. 41–54

Haapasalo, H., Ekholm, T., 2004. A Profile of European Incubators: A Framework for Commercializing Innovations. *International Journal of Entrepreneurship and Innovation Management*, Volume 4, pp. 248–270

Hannon, P.D., 1995. Hey, I'm an Entrepreneur Too! The Dichotomous Role of Incubator Managers and their Impact on the Entrepreneurial Process. *In:* Proceedings of the International Ent95 Conference, Burbury

Hughes, M., Ireland, R.D., Morgan, R.E., 2007. Stimulating Dynamic Value: Social Capital and Business Incubation as a Pathway to Competitive Success. *Long Range Planning*, Volume 40(2), pp. 154–177

Hutabarat, Z., Pandin, M., 2014. Absorptive Capacity of Business Incubator for SME's Rural Community Located in Indonesia's Village. *Procedia - Social and Behavioral Sciences*, Volume 115, 373–377

Johnson, R.B., Onwuegbuzie, A.J., 2004. Mixed Methods Research: A Research Paradigm Whose Time has Come. *Educational Researcher*, Volume 33(7), pp. 14–26

Kaplan, R.S., Norton, D.P., 2001. Transforming the balanced scorecard from performance measurement to strategic management: Part I. *Accounting horizons*, Volume 15(1), pp. 87–104

Lalkaka, R., 2003. Business Incubators in Developing Countries: Characteristics and Performance. *International Journal of Entrepreneurship and Innovation Management*, Volume 3(1–2), pp. 31–55

Lee, J. J., Kim, J.S., Chun, H.K., 1999. A Study on the Management and Financial Independence of University Technology Business Incubators (UTBIs) in Information and Telecommunication Industry. *Korean Small Business Review*, Volume 21(2), pp. 185–206

Löfsten, H., Lindelöf, P., 2002. Science Parks and the Growth of New Technology–based Firms–Academic–Industry Links, Innovation and Markets. *Research Policy*, Volume 31(6), pp. 859–876

Marshall, M.N., 1996. Sampling for Qualitative Research. *Family Practice*, Volume 13(6), pp. 522–526

Messeghem, K., Bakkali, C., Sammut, S., Swalhi, A., 2018. Measuring Nonprofit Incubator Performance: Toward an Adapted Balanced Scorecard Approach. *Journal of Small Business Management*, Volume 56(4), pp. 658–680

Mian, S.A., 1997. Assessing and Managing the University Technology Business Incubator: An Integrative Framework. *Journal of Business Venturing*, Volume 12(4), pp. 251–285

O'Neal, T., 2005. Evolving a Successful University-based Incubator: Lessons Learned from the UCF Technology Incubator. *Engineering Management Journal*, Volume 17(3), pp. 11–25

Pena, I., 2004. Business Incubation Centers and New Firm Growth in the Basque Country. *Small Business Economics*, Volume 22(3–4), pp. 223–236

Peters, L., Rice, M., Sundarajan, M., 2004. The Role of Incubators in the Entrepreneurial Process. *Journal of Technology Transfer*, Volume 29(1), pp. 83–91

Ryan, L., 2014. *If You Can't Measure It, You Can't Manage It: Not True.* Forbes

Shah, L., Etienne, A., Siadat, A., Vernadat, F., 2012. (Value, Risk)-based Performance Evaluation of Manufacturing Processes. *In:* INCOM Proceedings of the 14th Symposium on Information Control Problems in Manufacturing, 23–25 May 2012. Bucharest, Romania, pp 1586–1591

Sherman, H., Chappell, D.S., 1998. Methodological Challenges in Evaluating Business Incubators Outcomes. *Economic Development Quarterly*, Volume 12(4), pp. 313–321

Smilor, R.W., Gill Jr., M.D., 1986. *The New Business Incubator: Linking Talent, Technology, Capital, and Know How*. Lexington: Lexington Books

Smilor, R.W., 1987. Managing the Incubator System: Critical Successful factors to Accelerate New Company Development. *IEEE Transactions on Engineering Management EM–34*, Volume (4), pp. 146–156

Sutama, I.K., Pasek, I.K., Mudana, I.G., 2018. Business Incubators Support College Performance. *SOSHUM: Jurnal Sosial dan Humaniora (Journal of Social Science and Humanities)*, Volume 8(1), pp. 33–42

Stefanović, S., Stanković, M., 2014. Enterpreneurial Model of Franchising. *In:* Proceedings of the International Symposium SymOrg, Faculty of Organizational Sciences, pp. 560–567, Zlatibor

Tashakkori, A., Creswell, J.W., 2007. Exploring the Nature of Research Questions in Mixed Methods Research. *Sagepub*, pp. 207–211

Vanderstraeten, J., Matthyssens, P., Van Witteloostuijn, A., 2012. *Measuring The Performance of Business Incubators*: *A Critical Analysis of Effectiveness Approaches and Performance Measurement Systems.* Academia

Van Looy, A., Shafagatova, A., 2016. Business Process Performance Measurement: A Structured Literature Review of Indicators, Measures and Metrics. *SpringerPlus*, Volume 5(1), pp. 1–24

Van Rijnsoever, F.J., Van Weele, M.A., Eveleens, C.P., 2017. Network Brokers or Hit Makers? Analyzing the Influence of Incubation on Start-up Investments. *International Entrepreneurship and Management Journal*, Volume 13(2), pp. 605–629

Verma, S., 2004. *Successful Factors for Business Incubators: An Empirical Study of Canadian Business Incubators*. Eric Sprott School of Business, Carleton University, Ottawa, Ontario

Voisey, P., Gornall, L., Jones, P., Thomas, B., 2006. The Measurement of Success in a Business Incubation Project. *Journal of Small Business and Enterprise Development*, Volume 13(3), pp. 454–468

Wilson, T., 2012. *Review of HE-Business Collaboration.* Department for Business, Innovation and Skills. London

Wolf, G., 2017. Entrepreneurial university: A Case Study at Stony Brook University. *Journal of Management Development*, Volume 36(2), pp. 286–294

Wonglimpiyarat, J., 2016. Government Policies Towards Israel's High-tech Powerhouse. *Technovation*, Volume 52, pp. 18-27

Yin, R.K., 2003. *Case Study Research: Design and Methods, Applied Social Research Methods Series.* Thousand Oaks, CA: Sage Publications, Inc.

Xie, F., Wu, W. Q., Zhao, L.M., 2011. Co-integration Analysis between Performance of Business Incubator and Incubation Fund. *In:* 2011 IEEE 18th International Conference on Industrial Engineering and Engineering Management, pp. 2028–2031

Zibarzani, M., Rozan, M.Z.A., 2017. The Role of Knowledge Sharing in Business Incubators Performance. *In:* International Conference of Reliable Information and Communication Technology, pp. 719–727, Springer, Cham

Appendix A

The content of the Questionnaire

1. The following criteria relate to the ability of the business incubator to provide PHYSICAL OR LOGISTICAL FACILITIES: Office Space, Workshop Space, Laboratory, Computers, Conference Room, Meeting Room, Furniture and Equipment Rental, Telephone Equipment, Canteen, Shipping and Receiving, Logistic.
2. The following criteria relate to the ability of the business incubator to provide SHARED BUSINESS SERVICES AND EQUIPMENT: Audio Visual Equipment, Mail Service, Photocopy, Electricity, Water, Filling, Clerical Service, Receptionist, Office Hours Answering, Air Conditioner, Cleaning, Maintenance, Custodial Services.
3. The following criteria relate to the ability of the business incubator to provide FINANCIAL AND ACCOUNTING CONSULTATIONS: Business Taxes, Risk and Management Units, Government Grants and Loans, Government Procurement Process, Government Contract Preparation, Equity and Debt Financial Agreement, Export Development Assistance, Writing Financial Report.
4. The following criteria relate to the ability of the business incubator to provide MARKETING ASSISTANCE. Market Research, Advertising and Media Promotion, Customer Service Training, Pricing Strategy, Product and Image Development, Selling and Distribution Strategy, Business Events, Conferences and Exhibitions, Network to other business support, agencies, and potential clients.
5. The following criteria relate to the ability of the business incubator to provide PROFESSIONAL BUSINESS SERVICES AND BUSINESS ETIQUETTE: Pre-Incubation Services, Legal Counseling, Legal Representation, Patent Assistance, Accounting, Computing and Information Services, Book Keeping, Introduction to Seed and Venture Capitalist, Business Angel Network.
6. The following criteria relate to the ability of the business incubator to provide MANAGEMENT AND HUMAN RESOURCE ASSISTANCE: Business Planning Skill, Budgeting Skill, Employee or Human Relations Skill, Controlling Skill, Renumeration Packages, Career Path Planning, Public Speaking and Presentation Skill, Training Package for Human Development.
7. The following criteria relate to the ability of the business incubator to provide INFORMATION TECHNOLOGY AND E-COMMERCE ASSISTANCE: E Business or E commerce, E business or E Commerce, Computer & Software Skill, Network Provider, Web Admin, Accessibility.
8. The following criteria relate to the INCUBATOR GOVERNANCE: An Experienced Incubator Manager, A Key Board of Directors, A Noted Advisory Council, Concise Program Milestones with Clear Policies and Procedures, Dynamic and Efficient Business Operation, Good System Operation Procedure of Business Incubator, Vision, Mission, Value and Culture of Business Incubator.
9. The following criteria relate to the ability of the business incubator to screen tenants for admission to the incubator (ENTRY CRITERIA). Ability to Create Jobs, Ability to Present a Written Business Plan, Have a Unique Opportunity, Ability to The Firm to be Owned Locally, Advanced Technology Related Firm, Ability of Firm to Present Its Space Needs, Complementary to Existing Firms, New Start Up Firm, Age of Firm, Affiliated with University, Be Able to Pay Operating Expenses, Business Must Have an Innovative Project, Business Must Demonstrate The High Growth Potential, Social Impact.
10. The following criteria relate to the ability of the business incubator to decide when tenants should leave the incubator (EXIT CRITERIA): Time Limit of Tenancy, Space Requirements, Achieved Business Target and Objectives, Fail to Achieved Business target and Objectives, Need More Support that Incubator Cannot Offer.
11. The following criteria relate to the ability of the business incubator to provide MENTORING AND NETWORKING: Entrepreneurial Network, Entrepreneurial Education, Tie to a University, Community Support, Affiliation with Key Institutions, Finding the Strategy and Expertise Partner.
12. The following criteria relate to the ability of the business incubator to obtain GOVERNMENT SUPPORT AND PROTECTION: Grant or Funding, Good Regulation, Tax Holiday or Protection, Special Stock Market for Startup Company.
13. The following criteria relate to the ability of the business incubator to obtain FUNDING AND SUPPORT: Financing Arrangement, Organizational Arrangement, Good Supporting Data, Intellectual Property Protection, Help with Regulatory Compliance
14. The following criteria relate to the ability of the business incubator to obtain UNIVERSITY REGULATION: Good University Regulation for Entrepreneurship, Good Entrepreneurship Programs, appointed a Good Business Incubator Manager, Give Credit and Rewards for Business Incubator, Manager, Mentor and Counselor, Evaluation System for Business Incubator Services and social impacts
15. The following criteria relate to the ability of the incubator to provide SYSTEM INFRASTRUCTURE. Integrate Clients in the Largest, Technology Development System, Good Service Provider, High Speed Broadband Internet, Technology Support
16. The management use the following criteria to monitor the PERFORMANCE OF THE BUSINESS INCUBATOR itself. Incubator Occupancy Rates, Number of Companies Graduating from Incubator, Job Created by Tenant/Graduate Companies, Turnover of Tenant/Graduate Companies, Financial Performance of Incubator Itself, Business Incubator Contribution to Society or Local Development