THE INFLUENCE OF INDUSTRY 4.0 REVOLUTION ON THE BUSINESS PROCESS IN THE SUGAR INDUSTRY IN ASEAN COUNTRIES

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ABSTRACT

The primary goal of this article is to inspect the influence of industry 4.0 revolution on the business process in the sugar industry in ASEAN countries. The data were gather from the websites of sugar companies of ASEAN countries and database of World Bank from 2003 to 2019 and fixed effect model is used to check the hypotheses. The findings exposed that the industry 4.0 revolution has positive impact on the business process of the sugar industry in ASEAN countries. These findings provide the guidelines and suggestions to the authorities who prepared the policies that they should prepare the policies that enhance the adoption and positive effects of industry 4.0 revolution on the production and other business processes.

Keywords: Industry 4.0 Revolution, ASEAN Countries, Sugar Industry, Production Process

INTRODUCTION

Agents are the establishment of an affiliation. From this time forward, the wagers upkeep to be critical in observance of relationship on track. In order to retain the favorite blessings and techniques made arrangements for satisfying agent's requirements are executed, little spending personality in overall associations or minimal estimated firms. All things considered, affiliation would retain their work power of predefined tenure to utilize the capacities and competence to complete dominant exercises or escalate tasks (Almada-Lobo, 2015). On the other hand, study can grasp as agent upkeep such degree of task, is in any case, every now and again greater than a fundamental task and even more in a perfect world an occupation in authentic world (Barreto, Amaral & Pereira, 2017). Holding the attractive representatives is worldwide diary of business exploration and the executives useful to an organization in rising upper hand that cannot be subbed by various adversaries in respect of delivering huge assurance and realized associates that will give splendid customer assistance and boosted efficiency, such in this way carrying about contracts creating, client adherence, continuous authority advancement and improved factual study. Malaysia's preparation division has reliably been engaged by government to underscore propelled training level provided for the inhabitants (Brettel, Friederichsen, Keller & Rosenberg, 2014). Malaysia's administration of cutting edge instruction twists to make an astounding propelled instruction condition for establishment of generally forceful preparing foundations in order to help capable, talented and all around centered human resource base (Drath & Horch, 2014).

Money related masterminding Unit which revealed privatization of cutting edge instruction

associations quickens genuine disputed to organize thought for handy high capacity academicians. Additionally, the complement on continuing refreshing establishments through overall situating further powers them to focus increasingly vital stress on agent support practices (Faller & Feldmüller, 2015). In uncovering factors adding to delegate upkeep, it is essential to consider motivational theories as moved specialists will by and large stay with and affiliation longer. To outline further, an agent will be impelled to finish his action at whatever point provided satisfactory guidance through getting ready and improvement, surveyed through fruitful standard of execution and reimbursed comparably achieving standard of execution (Gilchrist, 2016). Appreciation of various definitely comprehended convincing theories, for instance, McClelland's Need theory and Maslow's Need hierarchy, we can point out the essential factors that have recommendation toward upkeep practices revolve around physical and executed needs, working condition, supervision, commitments, supervision, sensibility ad worth, laborer progression and analysis on execution (Gorecky, Schmitt, Loskyll & Zühlke, 2014). Convincing human resource the board practices for firms achievement it can be viable part (Hermann, Pentek & Otto, 2016). Human resources management further maintained on execution of business, categorically getting ready and headway, cooperation, catalyst, HR orchestrating, execution assessment and agent insurance benefit improve execution of firms business along with laborer's gainfulness, quality thing and affiliation's flexibility (Nawaz, Azam & Bhatti, 2019).

In such examination, it is intended to consider whereby agents view intention of estimation of coverage, work structure getting ready and expectation toward practically executing the officials on their upkeep (Hofmann & Rüsch, 2017). There are various support practices escalation around the glove treated routinely either by little courses of action or enormous endeavor, alike private tutoring division (Jazdi, 2014). As ascribed effectively, strong test especially in making nation like Malaysia, which has uncommon high guidance capacity, makes specialist upkeep an immense move in keeping forceful edge (Kagermann, 2015). Foundations will by and large satisfy delegate's satisfaction in their action by offering assistance to their persuasive perspectives, for instance, certainty, smugness and basic needs (Kolberg & Zühlke, 2015). The issue remains on whether how unfathomable is the effect of each point of view having toward when all is said in done laborer's upkeep. Fortifying is the strategy wherein the agents are related with fundamental administration, are esteemed and gave suitable getting ready and sponsorship (Lasi, Fettke, Kemper, Feld & Hoffmann, 2014). Nowadays, various affiliations are endeavoring to select the fundamental initiative strategy to the lower laborers. There is an immense association between agents fortifying and intend to leave. Reinforcing urge occupation of higher satisfaction amid delegated (Lee, Bagheri & Kao, 2015). At same time, a great deal of strategies for escalating this method either by providing adequate getting ready, exhibit forceful compensation or practical execution the load up.

Various relationships in Malaysia don't give steady getting ready task to their agents been less convincing in assessment by dismissing the results and systems pay not agreeable to allow the perfect honor to the researchers where lack respect and affirmation is provided as their dedication especially under current conditions of working (Lee, Kao & Yang, 2014). Such components convince agents give up their excitement to action and grade for return decisions in fact for enhance thoughts out or inside of preparing worldwide the board ad business investigation journal. What's more, the officials once in a while neglect to clarify the goals of progression and planning activities and execution of the board (Hussain, Mosa & Omran, 2017). Laborers as often as possible overwhelmed by the official's decision to complete any various leveled improvement activity as they would startled of the response of these tasks to their expert soundness or oven work prospect. Likewise, a lacking administrator may misjudge agent duty as giving requests as opposed to teaching and sponsorship in managing subordinates' presentation, from now on undermines laborer's enthusiasm for attracting essential decisions. In order to deal with this issue, the

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assessment will investigate effect of fortifying, planning, executing assessment and pay on their support with an association through investigating the school of speakers (Hussain, Mosa & Omran, 2018). The assessment result will echo the level of impact for reinforcing and various segments to researchers support with propelled instruction establishment to be explicit school in this examination. Principal reason targets to reflecting how laborer fortifying, planning, work assessment and pay impact speakers in their support with school. To be progressively express, it considers on ampleness of existing getting ready projects, agent reinforcing, work assessment and compensate in holding laborer from the researchers perception. Through social affair researcher feelings, it will somehow echo how it would be as great achievement which may overhaul the future business orchestrating and occupation progression.

BDO Survey on Industry 4.0

In agreement with a survey conducted by BDO regarding 4.0 Industry. Some highlights are given below.

	Table 1 EFFECTS OF 4.0 INDUSTRY REVOLUTION ADOPTION						
Sr	Details	Effect %					
1	Increase in Production	51					
2	Better info for Production.	47					
3	Enhance Competitiveness	46					
4	Reduce production Cost	44					
5	Increase Profit.	42					
6	Enhance Product Quality	42					
7	Enhance Process Capability	39					
8	Innovation increase	35					
9	Production life flexibility	32					
10	Production Customization.	32					
11	Staff Cost reduction	22					
12	Others	20					
13	Right. Shoring Operation.	6					

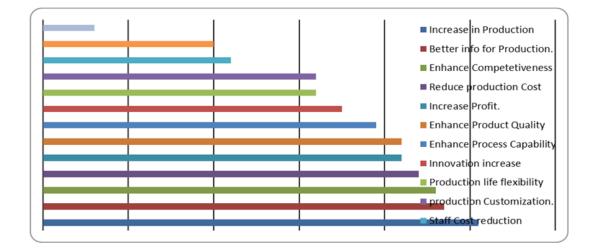


FIGURE 1 EFFECTS OF 4.0 INDUSTRY REVOLUTION ADOPTION

From the above given diagraph we can have a conclusion that 4.0 industry revolution play a keen role in production line of any organization. It cause to increase 52% production capacity of any organization. It also causes to reduce the production cost.

LITERATURE REVIEW

Human resource executives carry us to the present where a fourth mechanical upset is up coming. A colossal interest for industry 4.0 as it is the first run through in history that a transformation is anticipated before it occurred rather than depicted thereafter. Top of that industry 4.0 is in most German talking nations (Li et al., 2017). Various terms for a comparable idea can be found in different nations, for instance, savvy industry in the Modern Web or Netherlands at United States of America. For this examination paper the term business 4.0 will be utilized. Which precisely is Industry 4.0? With all the intrigue picked up by the point, many definitions with each various segments included exist, yet with these definitions the term Business 4.0 turned out to be more obscured than concrete (Lu, 2017). What specialists and scholastics state it and imply the combination of modern creation and data correspondence advancements (Pamornmast, Srivakul & Jermsittiparsert, 2019; Chetthamrongchai & Jermsittiparsert, 2020). A definition which says that Industry 4.0 empowers a decentralized generation procedure of brilliant items through the correspondence between assets, individuals and machines. Additionally incorporate this perspective, yet name it Shrewd Industrial facilities (Qin, Liu & Grosvenor, 2016). They additionally go past this viewpoint and incorporate the web of things which is the combination of virtual and physical world and digital physical frameworks into their definition. To do explore on the theme of industry 4.0 in any case, a general definition is required, with the goal that all scientists have a reasonable comprehension of what the term implies. In the event that everyone has an alternate definition they work with, it is difficult to think about the outcomes (Roblek, Meško & Krapež, 2016). As there is an absence of a general definition of this exploration intends to make a typical comprehension of industry 4.0 inside Europe.

Moreover, there are two different ways of how industry 4.0 may impact human resource practices. This may from one perspective be an aberrant impact through the effect it has on the occupations implying that the human resource practices should be received or changed so as to help the laborers in carrying out their responsibility (Rüßmann et al., 2015). Then again, the impact

might be immediate using new and advanced advances. Specialist upkeep insinuates approaches and practices associations use to prevent significant agents from discovering business somewhere else. It remembers taking measures to ask laborers to remain for the relationship for the best time period (Sanders, Elangeswaran & Wulfsberg, 2016). Contracting leaned people for the action is essential for a business. Regardless, upkeep is considerably more noteworthy than obtaining. Legitimate a similar number of organizations have barely cared about costs related with turnover of key staffs (Schlechtendahl, Keinert, Kretschmer, Lechler & Verl, 2015). Expounded turnover costs can realized with issues, for instance, reference checks, confided in status, fleeting expert costs, movement costs, formal getting ready costs and acknowledgment costs. Other safe costs and covered expenses for instance, missed cutoff times, loss of definitive data, lower soul and customer negative impression of association picture may moreover occur. This is the explanation holding top capacity has become a fundamental stress for certain affiliations today. Management required to apply a lot of effort in ensuring the laborer's turnover are for each low situation, as they are expanding and extending consideration regarding which, laborers are essential to relationship since their characteristics to the affiliation are not viably rehashed (Schmidt et al., 2015).

Various essential assessment are directed to constrain the possible occasion of lack of significantly skilled delegates who packs express data to perform at raised levels, everything considered event will provoke negative condition to various affiliations who fail to hold these prevalent specialists. It would be left with an understaffed, less qualified workforce that will truly decrease their power in that particular industry (Schumacher, Erol & Sihn, 2016). To react with point of what chooses people's desire to stop, incredibly to date there has been little consistency in revelations. Along these lines, there are a couple of reasons why people quit their present work environment and switch for other affiliation (Stock & Seliger, 2016). Loosen up of the action pressure, low obligation in the affiliation and occupation dissatisfaction regularly realizes passive consent of laborers. Extensive examinations have moreover affirmed the association among satisfaction and direct points, for instance, specialist's support and spread the updates on mouth. Different assessments showed how high delegate commitment can relate to the objective of leaving an affiliation. Lacking of opportunities to learn and personal growth in the workplace can be the key for specialist frustration which prompts turnover. Various examinations moreover demonstrated that agents will hold in their relationship if the person being referred has a tolerable relationship with the people and the individual being referred to is working around with. Given affiliations are consequently proposed to give bund building openings, where association and discourse can be finished inside just as outside their working hours (Vaidya, Ambad & Bhosle, 2018). This is the explanation management today ought to managed their delegates singular opinions toward the movement and satisfaction levels from their working conditions, supervisors and companions, as these are the key to ensure specialists upkeep.

The accomplishment and survivability of affiliations is vivaciously dependent upon customer appraisals, whereby the affiliation must place effort in satisfying their delegates since the association between purchaser dedication and specialist's satisfaction are imperative. In summary, the composing upkeep as continuing with association among delegates and their affiliation and turnover as any enduring departure past various leveled limits (Varghese & Tandur, 2014). The upsides of support are saving cost for extra enlistment, less planning to be lead for new contenders, improve gainfulness, addition agent's presentation and thusly increase advantage and meet their definitive goals and targets. Underneath, we will discuss the association between all of the human resource the board practices with laborers support and delegate's turnover, which are the impacts from specialists fortifying, agent getting ready and improvement, execution assessment and specialist's compensation. Generally reinforcing is delegating the force of decision and movement to the laborers and giving more noteworthy commitment and position to complete their task. It

infers that agents have satisfactory situation to choose how they play out their assignments (Wan et al., 2016). In an increasingly broad view, fortifying recalls commitment of delegate for target setting, fundamental initiative and rousing techniques and enabling laborers to work in a participative circumstance.

Undeniably, drew in agents are perceived as mind boggling drive in affiliation's success. It is because they are dynamically moved and concentrated definitive action. Delegated fortifying can make sentiment of belongingness and ownership towards the present affiliation. Additionally empowered laborers will when all is said in done be progressively certain and endeavor to give their best to manager since they are given more noteworthy master in fundamental authority process and delegate reinforcing can me a feeling of responsibility among laborers to stay in affiliation. They will when all is said in doe be logically certain and perform well. By suggestion, it will extend organization quality and shopper devotion (Wang, Wan, Zhang, Li & Zhang, 2016). In this engaged market, holding fit and capable workforce is critical in any affiliation. High turnover rate in an affiliation may impact the reputation and image of the affiliation. Delegate substitution is perilous and extravagant in lights of the fact that the affiliation needs to set up another specialist if a practiced agent gave up. A couple of assessments have perceived where the nonappearance of occupation dissatisfaction and low level of reinforcing, Low degrees help of manager while may aggravate turnover. Human resource techniques expect a key activity in delegate support animating gifted work. Managed target setting process that incorporates specialist can redesign delegate fortifying as laborer see himself as progressively empowered knowing their movement. Subsequently, the agents will by and large remain in the relationship in any occasion, when face pressure from others that intend to leave the relationship since they feel that they are bit of the affiliation (Weyer, Schmitt, Ohmer & Gorecky, 2015).

For the most part, the mean to remain or leave the relationship among the laborers depend hands on satisfaction of agents. The individual with higher work satisfaction watches out for progressively devoted to the affiliation. They will undoubtedly remain in the affiliation. By getting ready is portrayed as the orderly acquiring and improvement of the data, capacities and auras required by agents to agreeably play out an assigned movement or undertaking to help execution in the action condition. Getting ready should give new data and capacities if the arrangement is relevant, meet laborer and legitimate needs, gainfully and suitably arranged and passed on (Wollschlaeger, Sauter & Jasperneite, 2017). When the results of getting ready reflected in updates in significant data and the acquisition of pertinent capacities, agent business execution should improve and gave that aptitudes leaned in planning move to the action. Betterment in execution, for instance, productivity, quality and organizations are the arrangement results gave that the action is purposely acclimated to the affiliation's needs. For individual, if the perfect needs of delegate were fulfilled through the planning programs gave, there is no vulnerability the perfect outcome by the affiliation, upkeep on laborers, will be come to. Referred perspective on human resource rehearses, for instance, giving planning and boss solidness by the association are critical determinants of laborer upkeep. Moreover, a couple of assessments similarly express that human resource rehearses, for instance, advantage and getting ready are decidedly related to support considering the way that the practices animate agents and lock them to their occupations which are claimed specialist upkeep (Xu, Xu & Li, 2018).

Planning is a noteworthy development for overhauling capacities and improving staff execution and that arrangement can address a bit of the parts adding to staff upkeep, for instance, saw support from the boss, the association and system. Getting ready can portray employments even more undeniably to laborers, in this way restricting occupation stress. Relationship with satisfactory planning openings ought to thusly have better quality for constancy. In any case, getting ready alone can't address the total of the factors adding to staff support, regardless, for instance, outrageous

caseloads and constrained time openings inside the workplace. It is consequently, reasonable to express that arrangement can expect an occupation in improving upkeep, yet it may not be sufficient to improve support if other productive limits are not tended to. Compensation had been portrayed in many term by various researcher, anyway in this compensation for harm, adversity or suffering, money got by a specialist from a business as a pay or do something to somebody subsequently (Zezulka, Marcon, Vesely & Sajdl, 2016). Pay isn't similarly as money, yet moreover in non-cash structure. Focal points, for instance, advantages, life and restorative inclusion and retirement plans or rewards that join association vehicles or supported transportation, address an important remuneration part in various gigantic firms.

Besides, for charge central focuses and economies of size of getting that make it fiscally gainful for the firm to give those parts, the compensation are continually considered points of interest to be gadgets for attracting and holding needed agents. Many research shows that agent position and length of business were for the most part that chose compensation in numerous organizations. Additionally, there are amounts of research explained with confirmation show that compensation satisfaction has a critical impact in agent support. Many researches had shown that agent position and length of business were for the most part what chose compensation in numerous associations (Zhong, Xu, Klotz & Newman, 2017). Additionally, there are amounts of research explained with confirmation show that compensation satisfaction has a critical impact in agent support. The duty and significant effort stick model of motivation to find how cheerfulness delegates are awakened. They found that nonfinancial compensation or the idea of working environment affected agent turnover desires. Associations are in danger of making an unsatisfactory work environment if there is no any compensation orchestrating (Zhou, Liu & Zhou, 2015). If laborers are content with how the association functions and bestows its compensation procedures, they remained concentrated on the affiliation. An affiliation's prize system can impact the introduction of the delegate and their aching to remain used. In like manner amounts of expert show that there is a ton of between solitary differences in understanding the centrality of money related prizes for agent support.

Hypothesis: Industry 4.0 having a positive impact on production process in the sugar industries in ASEAN countries.

RESEARCH METHODS

The main ambition of this article is to check the influence of industry 4.0 revolution on the business process in the sugar industry in ASEAN countries. The data were gather from the websites of sugar companies of ASEAN countries and database of World Bank from 2003 to 2019 and fixed effect model is used to check the hypotheses. The variable for instance industry 4.0 is measured as the Increase In Output (INO) (due to technology adoption), Decrease In Wastage (DEW), Decrease In Cost (DEC), Decrease In Time Frame (DETF) while business process is measured by the (ROA) while size of the industry is taken as control variable and is measured by Logarithm Of Total Assets (LNTA). Therefore, this study developed the following equation:

 $ROA_{it} = \beta_0 + \beta_1 INO_{it} + \beta_2 DEW_{it} + \beta_3 DEC_{it} + \beta_4 DETF_{it} + \beta_5 LNTA_{it} + e_{it}$

FINDINGS

The findings consist upon the description of the variables, correlation matrix regarding relationship among the variables, all the assumptions such as normality, homoscedasticity, multicollinearity and autocorrelation, Hausman test for appropriateness among the fixed and

Table 2 **DESCRIPTIVE ANALYSIS** Variable Obs. Mean Std. Dev. Min Max ROA 170 1.618 .567 -.179 3.437 INO 170 1.191 .205 .021 1.771 170 DEW .249 .256 0 .846 DEC 170 .158 .214 0 .983 DETF 170 4.974 .841 6.399 2.862 170 10.541 .214 201.212 **LNTA** 321.025

random model and regression analysis with fixed model. The descriptive statistics include the minimum values of all the constructs, maximum values, means values and standard deviation for the variables. The descriptive statistics is shown in Table 2 given as under:

The second analysis regarding the correlation matrix show the positive correlation among the INO and ROA while other predictors have negative correlation with ROA and also indicated that no multicollinearity issue in the variables because values are less than 0.90. Table 3 provided below regarding the correlation matrix.

Table 3 CORRELATION MATRIX								
VariablesROADEWINODECDFTFLNTA								
ROA	1							
DEW	-0.173	1						
INO	0.099	0.241	1					
DEC	-0.054	0.005	0.064	1				
DETF	0.013	0.179	0.161	-0.106	1			
LNTA	0.249	0.137	-0.405	-0.363	-0.09	1		

The multicollinearity assumption show that the variables are not highly correlated and the statistics show that the VIF values are less than 5 that mean no multicollinearity issue among the variables. Table 4 provided below regarding the VIF.

Table 4 VARIANCE INFLATION FACTOR (VIF)						
	VIF	1/VIF				
INO	1.579	.633				
DEW	1.241	.806				
DEC	1.217	.822				
DETF	1.169	.855				
LNTA	1.096	.912				
Mean VIF	1.26					

The normality assumption show that the data are normally distributed and the statistics show that the probability values are less than 0.05 that means data has abnormality issues but these issues does not affected the results. Table 5 provided below regarding the Skewness and Kurtosis test.

Table 5 SKEWNESS AND KURTOSIS TEST									
Variable	Prob>chi2								
ROA	170	0.311	0.036	5.42	0.066				
INO	170	0.208	0	27.66	0				
DEW	170	0	0.002	26.13	0				
DEC	170	0	0	64.41	0				
DEFT	170	0	0.003	20.61	0				
LNTA	170	0	0		0				

The homoscedasticity assumption show that the variation in the error terms is constant and the statistics show that the probability value is more than 0.05 that means data has heteroscedasticity issues and these issues does not affected the results because this study use the fixed effect model. In addition, the autocorrelation assumption show that there is no correlation among the lag values and the statistics show that the probability value is more than 0.05 that means data has auto-correlation issues and these issues does not affected the results because this study use the fixed effect model. Moreover, the present studies firstly run both the models to check the appropriate model among them. Table 6 provided below regarding the fixed effect model.

Table 6 FIXED EFFECT MODEL								
ROA	Coef.	S.E.	t-values	P>t	L.L.	U.L.	Sig	
INO	1.037	0.128	8.07	0	0.754	1.32	***	
DEW	0.438	0.231	1.9	0.044	0.647	0.372		
DEC	-0.951	0.21	-4.54	0.001	-0.49	-1.413	***	
DETF	-0.668	0.217	-3.078	0.002	-0.844	-0.109	***	
LNTA	0.014	0.003	4.53	0.001	0.007	0.021	***	
Constant	1.909	0.547	3.49	0.001	0.832	2.987	***	
R-squared 0.46 prob>F 0								
*** p<.01,	** <i>p</i> <.05, *	* p<.1						

The present study firstly runs both the models to check the appropriate model among them by applying Hausman test. Table 7 provided below regarding the random effect model.

Table 7 RANDOM EFFECT MODEL									
ROA Coef. S.E. t-value p-value L.L. U.L. Sig									
INO	.95	.188	5.06	.000	.582	1.319	***		
DEW	039	.201	-0.19	.846	433	.355			
DEC	.597	.197	3.03	.002	.211	.983	***		
DETF	032	.062	-0.51	.611	154	.091			
LNTA	.015	.002	8.50	.000	.012	.019	***		
Constant	.357	.436	0.82	.413	498	1.212			
Overall r-squared 0.312 Prob>chi2 0.000									
*** p<.01, ** p<.05, * p<.1									

The Hausman test given below in Table 8 show that the probability value is less than 0.05 that means fixed effect model is appropriate because it reject the null hypothesis of random is appropriate.

Table 8 HAUSMAN TEST						
	Coef.					
Chi-square test value	11.743					
P-value	.038					

The regression analysis show that positive link of INO with ROA while negative link of DEW, DEC and DEFT with ROA because negative sign linked with beta values. In addition, regression analysis show that significant link of INO, DEW, DEC and DEFT with ROA because t-values and p-values are in accordance with the standards. Table 9 shows the fixed effect regression results.

Table 9 REGRESSION ANALYSIS (FIXED EFFECT MODEL)									
ROA	ROA Coef. S.E. t-values P>t L.L. U.L.								
INO	1.037	0.128	8.070	0.000	0.754	1.320			
DEW	-0.438	0.231	-1.900	0.044	-0.647	-0.372			
DEC	-0.951	0.210	-4.540	0.001	-0.490	-1.413			
DETF	-0.668	0.217	-3.078	0.002	-0.844	-0.109			
LNTA	0.014	0.003	4.530	0.001	0.007	0.021			
_cons	1.909	0.922	2.070	0.039	0.340	4.159			

DISCUSSIONS

The prime objective related to the article is to examine the influence of industry 4.0 revolution on the business process in the sugar industry in ASEAN countries. The data were gather from the websites of sugar companies of ASEAN countries and database of World Bank from 2003 to 2019 and fixed effect model is used to check the hypotheses. The findings exposed that the industry 4.0 revolution has positive impact on the business process of the sugar industry in ASEAN countries. When the industries implement the 4.0 industry revolution their processes improved ad perform more than the previous processes such as the sugar industry of ASEAN countries implement the industry 4.0 and their production increases while wastage and time frame decreases that ultimately increases the profitability of the industry.

POLICY RECOMMENDATIONS

These findings provide the guidelines and suggestions to the authorities who prepared the policies that they should prepare the policies that enhance the adoption and positive effects of industry 4.0 revolution on the production and other business processes.

CONCLUSION

Finally, it is included in the conclusion the when the industries implement the 4.0 industry revolution their processes improved ad perform more than the previous processes such as the sugar industry of ASEAN countries implement the industry 4.0 and their production increases while

wastage and time frame decreases that ultimately increases the profitability of the industry.

LIMITATIONS AND FUTURE DIRECTIONS

This study has future direction for upcoming researchers that is the limitations for the present study. For instance, present study conducted only on the sugar industry and further study should include other business in their analysis. The time frame of the current study is very small and upcoming literature must add more years in their evaluation.

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REFERENCES

- Almada-Lobo, F. (2015). The Industry 4.0 revolution and the future of Manufacturing Execution Systems (MES). *Journal of Innovation Management*, 3(4), 16-21.
- Barreto, L., Amaral, A., & Pereira, T. (2017). Industry 4.0 implications in logistics: An overview. *Procedia Manufacturing*, 13, 1245-1252.
- Brettel, M., Friederichsen, N., Keller, M., & Rosenberg, M. (2014). How virtualization, decentralization and network building change the manufacturing landscape: An Industry 4.0 Perspective. *International Journal of Mechanical, Industrial Science and Engineering*, 8(1), 37-44.
- Chetthamrongchai, P., & Jermsittiparsert, K. (2020). Ensuring environmental performance of pharmaceutical companies of Thailand: Role of robotics and AI awareness and technical content knowledge in industry 4.0 era. *Systematic Reviews in Pharmacy*, 11(1), 129-138.
- Drath, R., & Horch, A. (2014). Industrie 4.0: Hit or hype? [Industry forum]. Sage Open, 8(2), 56-58.
- Faller, C., & Feldmüller, D. (2015). Industry 4.0 learning factory for regional SMEs. Procedia Cirp, 32, 88-91.
- Gilchrist, A. (2016). Industry 4.0: The industrial internet of things: A press. Journal of Industrial Information Integration, 2(1), 21-25.
- Gorecky, D., Schmitt, M., Loskyll, M., & Zühlke, D. (2014). Human-machine-interaction in the industry 4.0 era. *Computers in Industry*, 5(1), 24-29.
- Hermann, M., Pentek, T., & Otto, B. (2016). Design principles for industrie 4.0 scenarios. *Journal of Innovation Management*, 5(2), 24-39.
- Hofmann, E., & Rüsch, M. (2017). Industry 4.0 and the current status as well as future prospects on logistics. *Computers in Industry*, 89, 23-34.
- Hussain, M.S., Mosa, M.M., & Omran, A. (2017). The mediating impact of profitability on capital requirement and risk taking by Pakistani banks. *Journal of Academic Research in Economics*, 9(3), 433-443.
- Hussain, M.S., Mosa, M.M., & Omran, A. (2018). The impact of owners behaviour towards risk taking by Pakistani Banks: Mediating role of profitability. *Journal of Academic Research in Economics*, 10(3), 455-465.
- Jazdi, N. (2014). Cyber physical systems in the context of Industry 4.0. *Journal of Industrial Information Integration*, 9(5), 33-43.
- Kagermann, H. (2015). Change through digitization—Value creation in the age of industry 4.0 management of permanent change. *Journal of Industrial Information Integration*, 9(7), 33-35.
- Kolberg, D., & Zühlke, D. (2015). Lean automation enabled by industry 4.0 technologies. *IFAC-PapersOnLine*, 48(3), 1870-1875.
- Lasi, H., Fettke, P., Kemper, H.-G., Feld, T., & Hoffmann, M. (2014). Industry 4.0. Business & Information Systems Engineering, 6(4), 239-242.
- Lee, J., Bagheri, B., & Kao, H.A. (2015). A cyber-physical systems architecture for industry 4.0-based manufacturing systems. *Manufacturing Letters*, 3, 18-23.
- Lee, J., Kao, H.A., & Yang, S. (2014). Service innovation and smart analytics for industry 4.0 and big data environment. *Procedia Cirp*, 16, 3-8.

- Li, X., Li, D., Wan, J., Vasilakos, A.V., Lai, C.F., & Wang, S. (2017). A review of industrial wireless networks in the context of industry 4.0. *Wireless Networks*, 23(1), 23-41.
- Lu, Y. (2017). Industry 4.0: A survey on technologies, applications and open research issues. *Journal of Industrial Information Integration*, 6, 1-10.
- Nawaz, M.A., Azam, M.A., & Bhatti, M.A. (2019). Are natural resources, mineral and energy depletions damaging economic growth? Evidence from ASEAN countries. *Pakistan Journal of Economic Studies*, 2(2), 15-28.
- Pamornmast, C., Sriyakul, T., & Jermsittiparsert, K. (2019). Can lean manufacturing and 4.0 industry enhance the financial performance of pharmaceutical industries of Thailand? Mediating role of waste reduction behavior. *Systematic Reviews in Pharmacy*, 10(2), 318-327.
- Qin, J., Liu, Y., & Grosvenor, R. (2016). A categorical framework of manufacturing for industry 4.0 and beyond. *Procedia Cirp*, 52, 173-178.
- Roblek, V., Meško, M., & Krapež, A. (2016). A complex view of industry 4.0. Sage Open, 6(2), 215-225.
- Rüßmann, M., Lorenz, M., Gerbert, P., Waldner, M., Justus, J., Engel, P., & Harnisch, M. (2015). Industry 4.0: The future of productivity and growth in manufacturing industries. *Proceedia Manufacturing*, 9(1), 54-89.
- Sanders, A., Elangeswaran, C., & Wulfsberg, J.P. (2016). Industry 4.0 implies lean manufacturing: Research activities in industry 4.0 function as enablers for lean manufacturing. *Journal of Industrial Engineering and Management* (*JIEM*), 9(3), 811-833.
- Schlechtendahl, J., Keinert, M., Kretschmer, F., Lechler, A., & Verl, A. (2015). Making existing production systems Industry 4.0-ready. *Production Engineering*, 9(1), 143-148.
- Schmidt, R., Möhring, M., Härting, R.C., Reichstein, C., Neumaier, P., & Jozinović, P. (2015). Industry 4.0-potentials for creating smart products: Empirical research results. *Journal of Innovation Management*, 9(2), 43-53.
- Schumacher, A., Erol, S., & Sihn, W. (2016). A maturity model for assessing Industry 4.0 readiness and maturity of manufacturing enterprises. *Proceedia Cirp*, 52, 161-166.
- Stock, T., & Seliger, G. (2016). Opportunities of sustainable manufacturing in industry 4.0. Procedia Cirp, 40, 536-541.
- Vaidya, S., Ambad, P., & Bhosle, S. (2018). Industry 4.0-a glimpse. Procedia Manufacturing, 20, 233-238.
- Varghese, A., & Tandur, D. (2014). Wireless requirements and challenges in Industry 4.0. Journal of Industrial Information Integration, 2(3), 33-43.
- Wan, J., Tang, S., Shu, Z., Li, D., Wang, S., Imran, M., & Vasilakos, A.V. (2016). Software-defined industrial internet of things in the context of industry 4.0. *IEEE Sensors Journal*, 16(20), 7373-7380.
- Wang, S., Wan, J., Zhang, D., Li, D., & Zhang, C. (2016). Towards smart factory for industry 4.0: A self-organized multi-agent system with big data based feedback and coordination. *Computer Networks*, 101, 158-168.
- Weyer, S., Schmitt, M., Ohmer, M., & Gorecky, D. (2015). Towards industry 4.0-standardization as the crucial challenge for highly modular, multi-vendor production systems. *IFAC-PapersOnLine*, 48(3), 579-584.
- Wollschlaeger, M., Sauter, T., & Jasperneite, J. (2017). The future of industrial communication: Automation networks in the era of the internet of things and industry 4.0. *Journal of Industrial Information Integration*, 11(1), 17-27.
- Xu, L. D., Xu, E. L., & Li, L. (2018). Industry 4.0: State of the art and future trends. International Journal of Production Research, 56(8), 2941-2962.
- Zezulka, F., Marcon, P., Vesely, I., & Sajdl, O. (2016). Industry 4.0-An Introduction in the phenomenon. *IFAC-PapersOnLine*, 49(25), 8-12.
- Zhong, R. Y., Xu, X., Klotz, E., & Newman, S.T. (2017). Intelligent manufacturing in the context of industry 4.0: A review. *Engineering*, *3*(5), 616-630.
- Zhou, K., Liu, T., & Zhou, L. (2015). Industry 4.0: Towards future industrial opportunities and challenges. International Journal of Business and Management Invention, 1(1), 3-4.