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Visual Decision Support System Model for Managing Unemployment by Hybrid Education

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Abstract: Hybrid education is an approach that helps in conducting face-to-face and online ddistance learning especially for formal education. However, during COVID-19 pandemic, formal education institutions including schools and universities as well as informal education tthrough the media for communities and industries are practiced by the lawmakers to manage workplace distancing. Food supply chain are experiencing unexpected disruptions due to interrelated activities that will determine supply chain performance and efficiency. This article explores the challenges faced by food industry and related sectors due to emergence impact of COVID-19 in Malaysia. Food supply chain management (FSCM) is a complex task involving interconnected activities and numerous stakeholders for a specific food product from raw materials to final product before it reaches the end customers. An overview of COVID-19 scenarios, followed by the impact of pandemic towards the activities in food supply chain, and the management issues that need to be addressed are presented. Several challenges identified are including the worldwide implication of the pandemic scenarios to food supply chain management and food supply chain activities, and indirect impact of supply chain disruption to labour force; unemployment and retrenchment. Finally, a visual decision support system (VDSS) model is developed to illustrate the main impacts of the pandemic scenario on food supply chain as well as addressing the labour management and opportunities. It has potential to provide general guidelines to educators, policy-makers, and decision-makers to deal with uncertainties after the pandemic.

Keywords: Online distance learning, visual decision support system, food supply chain management

1. Introduction

Unemployment cases had been dramatically increasing during lockdown in many countries across the globe. Food supply chain management (FSCM) that utilize online platform such as GrabFood [1] and Foodpanda [2] are surviving and hiring among these unemployed and retrenched individuals through online platform. The rise of gig-economy especially in food industry in necessary to feed the society regardless of the risks involved due to the emergence of COVID-19 pandemic. Realizing the increase of food businesses, the knowledge and skills required in FSCM can also be taught using online or virtual platforms. Education for the public is very important during the pandemic [3][4].

1.1 Scenario on the Emergence of Pandemic

The scenario is, and the needs to cope with the new situation, however, become very new to non-computer literate individuals. Food businesses and food industry from small and medium enterprises (SME) must be trained to take their businesses online. Therefore, hybrid education through face-to-face by the law enforcement and online distance learning through the mainstream media can assist to describe the real scenario and is undeniably beneficial to educate public regarding the.required standard-of-procedures.

1.2 COVID-19 Impacts into the Industry

COVID-19 had impacted the agriculture and industry [5]. According to World Health Organization, the pandemic has infected more than 78.1 million peoples and causing more than 1.7 million death worldwide across many countries in a very short time [6]. The pandemic has impacted the population and triggered major changes in socio-economic aspects leading to changes in economy perspective, policies (regionally and globally), and human social interaction (i.e. behavior and mentalities). Food industries are among the impacted sector that involve many parties and industries such as consumer due to changes in purchasing behavior and choices of food [7], health [8], trade and economic aspect [9][10], food security [10][11], manufacturer [12], and rural-urban relationship [13][14].

2. Case Study: Managing Unemployment by Hybrid Education at Workplace

The safety issues and health of the labor has been a concerned of the pandemic in supply chain, food production and distribution, retailer, operations, government bodies, and food pantries [14]. Researcher [15] studied the susceptibility and vulnerability of agricultural value chains and found that the conceptual framework from a HIV/AIDS pandemic can be used in addressing COVID-19 pandemic which consist of four main components which are related to susceptibility or chance or infection, resistance from being infected, vulnerability and resilience towards the disease and identification of factors to avoid higher infection for farm households, food enterprises and value chains.

Many countries are affected due to travel ban and lockdowns. Formal and informal education on the impact of COVID-19 pandemic is crucial for the safety. The livestock sector in Somalia and Sudan are facing the decrease of urban demand for meat, and reduction of meat exports to Arab countries during the disruption of international veterinary supply chain due to the movement restrictions. Citizens in rural areas in Zimbabwe faced shutdowns of agricultural produce markets and lack of agricultural inputs including veterinary supplies and services [16]. Effects of COVID-19 on livestock sector in the IGAD region and proposed policy/operational interventions. Nairobi: IGAD Centre for Pastoral Areas and Livestock Development. According to [17] the exports of tea, coffee, and fresh produce have been shut down due closing of auctions such as mass gatherings and decrease demand in market in East Africa.

Education on food supply chain management is related to many critical sectors. In agricultural sector, the impact of COVID-19 has been observed in many countries in agricultural trade which involve the commercial farming and other supply chain activities. The impact can also be seen on other supply chain activities such as farming where farmer is experiencing excess stock. The vegetable trade in Ethiopia has been affected due to logistic and distribution disruption for import of fresh produce from china due to fear of virus spreading that might be originated from the fresh produce [18]. Farmers in India also faced challenges due to transportation problems of equipment for harvesting and decrease in buyers [19].
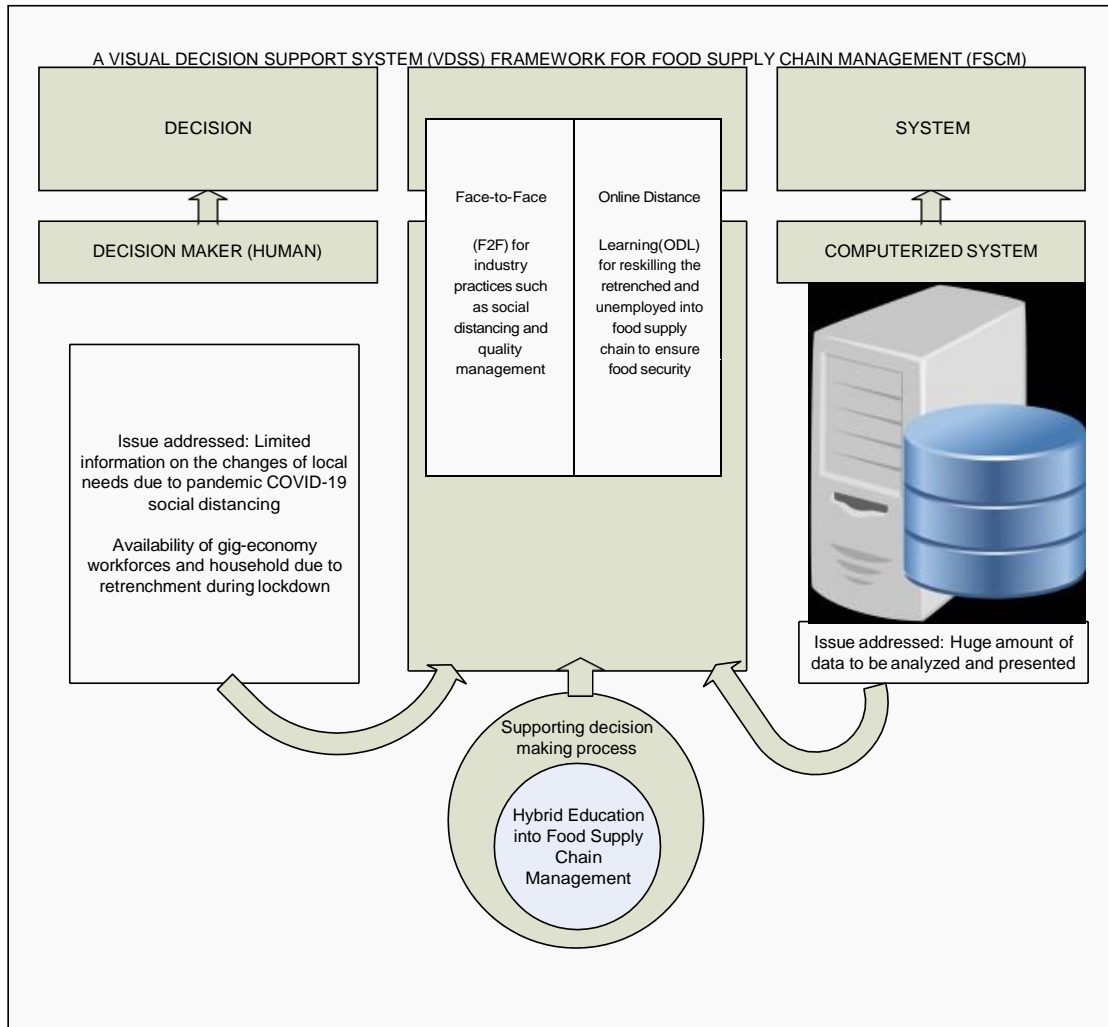
The movement restriction and border closure also had significant impact on distributor where the transportation and distribution activities where the stock are not being distributed as usual. The transportation and logistics were also attracted concerns due to the role in distribution process [12]. Some of food processing plants involving meat production in United Kingdom, the United States, Germany, Spain and France has been reported to exert a serious implication due to COVID-19 outbreaks [20]. Other than that, the retailers are experiencing the shift in customer demand and consumer panic attack, job insecurity and new norm due to movement restriction, new policies and social distancing which resulting in panic buying, household economy, choices and preferences of food. Food Supply Chain involve numerous processes and could provide many job opportunities. Data from Department of Statistics Malaysia [21] shows the scenario as depicted in Table 1.

Table 1 - Data from Department of Statistics Malaysia (2015) before COVID-19 pandemic

Sector	Value (RM)	Employment
Fisheries	RM 2,226.0 million or 3.0 per cent from total gross output ofthe agriculture sector with value added of RM747.6 million.	Job opportunities to 15,690 people with salaries & wages paid amounting RM315.0 million
Crops	RM 50,763.3 million or 68.7 per cent from total gross output of the agriculture sector with value added of RM34,309.5 million.	Job opportunities to 368,002 people with salaries & wages paid amounting RM6,125.8 million.
Livestock	RM13,312.1 million or 18.0 per cent from total gross output of the agriculture sector with value added of RM3,410.3 million.	Job opportunities to 34,805 people with salaries & wages paid amounting RM726.2 million.

3. Proposed Model

VDSS originate from field of DSS which is referring to decision support system.the letter 'V' in front of VDSS expanded from the visualization elements focused towards the utilization of information visualization (emerged from research in human-computer interaction) and data visualization (emerged from data mining, simulation, and graphs or charts from statistical analysis). VDSS models created according to the problem domain such as policy-making [33], clinical decision-making by physicians [34], and web data mining for crime data [35]. However, there is no VDSS research demonstrated in food supply chain management as far as the authors concerned, except this presented model.the decision-makers and lawmakers can utilize the proposed VDSS model in this study as a guideline to reskill the unemployed or retrenched workers through systematic hybrid education as shown in Fig. 1.

Fig. 1 - The Model of a Visual Decision Support System (VDSS): managing unemployment using hybrid education

Researchers [26] had identified five risk assessment associated with food supply chain uncertainty to help supply chain manager to control unexpected situation due to supply chain shocks. The types of risk that need to be considered when dealing when supply chain are; (i) known knowns, (ii) unknown knowns, (iii) known unknowns, (iv) unknown unknowns (v) unknowable unknowns) to address food security issues through a risk management system. Urgent actions using technology adoption need to be taken where the current graduates need to be trained with the new technologies to ensure their competitiveness including Internet-of-Things (IoT) and big data analytics. The lack of tools shows that it is a chance for the computerized system software implementation in future [27]. Education aspects especially computer science, information technology, agro-business and management are crucial to mitigate unemployment and retrenchment during post- COVID-19 pandemic.

Fig. 1 shows a VDSS model for FSCM. This proposed model is expected to assist decision-makers in determining the priority of the criteria identified and taking the action plan towards the operational and management tasks required. This proposed model can also be categorized under general architecture in Fig. 3 compared to classical architecture as in Fig. 2. In Fig. 2, the technologies that common in previous decade are including but not limited to point-of-sale

(POS) system and e-Commerce applications to facilitate FSCM. However, since COVID-19 pandemic and the acceleration of efforts towards industry revolution (IR4.0), new emerging technologies are being considered such as drone-as-a-service (DaaS) [30], Internet-of-Things (IoT) [31] and Blockchain [32] for FSCM. FSCM can be facilitated by integration with VDSS and these emerging technologies.

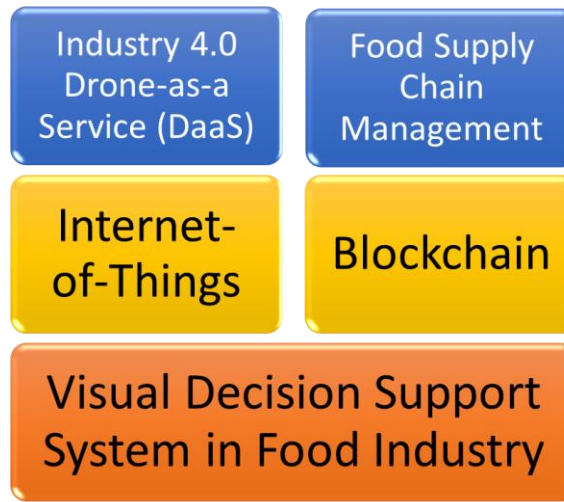**Fig. 2 - Classical architecture of FSCM**

Fig. 3 - New Architecture of FSCM with VDSS

4. Discussions

The development of VDSS model for this case study is currently ongoing towards a robust design and prototyping. There are opportunities for the new businesses model especially involving food supply chain due to food security issues during post-COVID-19 pandemic. FAO has implemented an array of tools to support policy analyses and assess the impact of COVID-19 on food and agriculture, value chains, food prices, food security across the globe. Online food businesses are expected to rise during pandemic due to inability to move freely like before pandemic.

Closure of businesses due to COVID-19 pandemic had impacted society especially for those with limited digital skills and resources for online food businesses in FSCM. The burden of the parents is increasing because they need to struggle not only to provide at home but also to perform on their jobs which are either working remotely from home or facing retrenchment. Upskilling and reskilling of individuals at least for supporting FSCM is the necessary training due to the mass retrenchment and unemployment.

Hybrid education is the approach suitable to educate industries and communities on the importance and the real value of food security either in terms of health, well-being, or money. Value added of fisheries sub-sector recorded an annual growth rate of 10.2 per cent in five years period. In 2015, number of establishments involved in the fisheries sub-sector was 1,229 establishments. Gross output value was RM2,226.0 million or 3.0 per cent from total gross output of the agriculture sector with value added ofRM747.6 million. This sub-sector also provides job opportunities to 15,690 people with salaries & wages paid amounting RM315.0 million. The number of establishments involved in the crops sub-sector was 8,029 establishments. Gross output value was RM50,763.3 million or 68.7 per cent from total gross output of the agriculture sector with value added of RM34,309.5 million. This sub-sector also provides job opportunities to 368,002 people with salaries & wages paid amounting RM6,125.8 million. In 2015, the number of establishments involved in the livestock sub-sector was 1,604 establishments. Gross output value was RM13,312.1 million or 18.0 per cent from total gross output of the agriculture sector with value added of RM3,410.3 million. This sub-sector also provides job opportunities to 34,805 people with salaries & wages paid amounting RM726.2 million [21].

Nation's estimated 741, 600 unemployed persons, however, unemployment rate Malaysia stays at 4.7% [22]. The current unemployment crisis is very different from previous unemployment periods. Underemployment and underpaid may also occurs due to the inability of the job market to cope with the graduation of students in post-pandemic scenario. United Nations Educational, Scientific and Cultural Organization stated that more than 100 countries executed nationwide closures which is also directly impacting over half of the world's student population. International Labour Organization stated the impact of COVID-19 to the labour market and society is large [23].

The benefits of the proposed model in the form of framework and architectures for integration with VDSS in case study FSCM has high potential for new and hybrid approach in formal education (university) and informal education (public). The performance of the proposed VDSS model in FSCM is yet to be determined. The rise of webinars instead of F2F courses by the government and private sectors show that this field is getting high attention in education and online businesses and therefore suggested for future employment trends.

5. Conclusions

Hybrid education can help to solve many current and real problems in industry as well. It is also important to make sure the graduated students from education systems get employed, and the retrenched employers get back to reskill through hybrid education (F2F and ODL). Employment in food supply chain include numerous jobs and effort related to production, trading related to crops and livestock products, food supply and commodities balance for crops, livestock and fish primary equivalent. The food security issues can be determined based on several indicators from surveys for household. Other concern in food supply chain are the prices for producer and consumer, inputs that being used such as fertilizers, pesticides, and land used, population, investment for machinery, government expenditure, and Foreign Direct Investment (FDI). In production areas involve crops, crops processed, live animals, livestock primary, livestock processed, production indices and value of agricultural production. The impacts to food supply chain during COVID-19 pandemic and the rise of the related job opportunity for food security are getting more important.

Food security issues had arisen and attracted international concern and affecting agricultural sector, ban of export activities and increment in price that leads to food security issues in country that depending in exportation source such as in China. The establishment of framework must be done based on the problems identified. The scenario that had took place upon the global scale which is the pandemic shows the need of early warning and monitoring system to support decision-making processes when the disaster hit. Food supply chain management (FSCM) can consider utilizing a visual decision support system (VDSS) to assist in food distribution safely and effectively.

Although, human labor issues are significant and high unemployment rate has been occurred since the emergence of pandemic, there is still lack of research in addressing the unemployment issues especially due to COVID-19 in Malaysia [24]. VDSS is a type of decision support system (DSS) which original structure consists of database, model base and user interface [28][29]. Knowledge-based is an optional component in a DSS. Furthermore, business intelligence (BI) engine using dashboard built from multiple information visualization techniques provide an additional component that made a VDSS suitable to support decision-makers in their crucial decision-making processes during emergency scenario.

The manufacturer or food processor also experiencing some delay in their processing due to packaging delay, insufficient raw materials and human labor issues such as health and safety concern and retrenchment. Food services in tourism are mainly affected but food supply chain and manufacturing are maintained to feed the citizen.The best practice criteria for retrenchment [25] had taken place if they have reasonable criteria. There is also consultancy service on retrenchment exercise due to the COVID-19 pandemic that had severely impacted businesses around the world. This happen because employers need to focus on managing the businesses effectively while maintaining cost-cutting to ensure its sustainability.

Technically, visualization method such as visual analytics [36] can provide analytical reasoning, synthesize information as well as derive insights. Therefore VDSS model can incorporate visual analytics which is the science of analytical reasoning with the support of interactive visual interfaces can encourage researchers to develop more integration of tools such as image processing, data mining, and word processing engines. Education about FSCM has becoming a critical area which involved a cross-functional and interrelated organization at the primary value chain and the support activities from raw materials, processing of raw materials into finished goods, and the movement of finished goods reach the end consumer. In the supply chain management, two mains related to the population are food security and safety issues that derived from inadequate supply due to strict movement control, border closure, trade restriction and nature of work. The pandemic has affecting income not only at country level, but also at household level need to be addressed.

Acknowledgement

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