INNOVATIVE ENTREPRENEURSHIP MODEL FOR AGRICULTURAL PROCESSING SMES IN THAILAND'S DIGITAL AND INDUSTRIES 4.0 ERA

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ABSTRACT

Recently, the development of innovation has changed dramatically due to the advancement of digital technology. The evolution of industrial development is inevitably bound to play an important role in the operations of entrepreneurs and businesses. The agro-processing industry is one of the most valuable industries in many countries. Small and medium-sized enterprises (SMEs) are important groups in the development and promotion of economic progress. Entrepreneurs need to direct various orientations and operations to support the occurring changes in order to act auspiciously.

Entrepreneurship models in the past have studied Entrepreneurial Orientation (EO), Marketing Orientation (MO), and Learning Orientation (LO), but not the Digital Orientation (DO) and Industry 4.0 Readiness Orientation perspectives. This study explores the development of an entrepreneurship model of SMEs' which processes agriculture, which affects the firm performances of the digital and industry era by studying important factors explained in literature on priori entrepreneurial model. Two new factors were added, DO and IRO, which affects both financial and non-financial performances of the firm.

Qualitative research was conducted through in-depth interviews with 19 people, 5 experts and 14 entrepreneurs, in the agro-processing industry, to obtain a prototype of the entrepreneurial model. A quantitative study of practitioners was considered, and 340 samples were involved. The results show the importance and necessity of entrepreneurship models with 4 orientations, Entrepreneurial Orientation (EO), Market and Learning Orientation (MLO), Digital orientation and Organization Strategy (DOS) and Industries 4.0 Adaptability Orientation (IAO). The implication of the model in this study was to assess entrepreneurship for developing entrepreneurs, who will be ready for digital and industrial 4.0 in the future.

Keywords: Digital Orientation, Entrepreneurship, Entrepreneurial Orientation, Industry 4.0 Readiness Orientation, Marketing Orientation, Learning Orientation.

INTRODUCTION

The industrial sector is an important mechanism that drives the economy. This sector needs to adapt to upgrades. Particularly, the industrial revolution 4.0 requires a reform of the organization that many are not ready for. If entrepreneurs continue to operate in the same format, they will face the risk of being threatened by both existing competitors and new players. Therefore, entrepreneurs need to accelerate strategies at the organization level and quickly put these strategies into action, to be ready for industrial 4.0 operations.

Processes related to digital technology and information management are an organization's capability. It directly affects the efficiency and competitiveness of high-performing organizations by creating and using information resources better than low-performing organizations, in addition to the reinforcement of adaptability (Ghasemkhani et al., 2014).

In a competitive and rapidly changing environment, organizations need to use the human capitalized infrastructure and organizational resources to create a market advantage. This is specially the situation if resources and capabilities are valuable (rare) and difficult to emulate or replicate to provide a sustainable competitive advantage (Barney, 1991; Wiklund & Shepherd, 2003).

Organizations need to focus on different areas to gain a sustainable competitive advantage. In the past, three areas were well studied, Entrepreneurial Orientation (EO), Marketing Orientation (MO), Learning Orientation (LO) (Atuahene-Gima & Ko, 2001; Kropp et at., 2006). There is however, no studies related to Digital Orientation (DO) and Industry 4.0 Readiness Orientation (IRO). It is however expected that entrepreneurs need to support an organization's reorganization into the digital and industrial 4.0 era.

The rest of the paper is structured and organized as follows. In section 2, the literature review examines the factors of the entrepreneurial model that consists of existing factors, theEO, MO, LO and their impact on a firm's performance, including two new factors, the DO and IRO, that explains the currently proposed the research model. Section 3 presents the qualitative and quantitative research components including sample, data collection and analysis method. Section 4 illustrates the findings of this study. Finally, Section 5 leads to the conclusion, discussion on the consequent implications and limitations of the study and ideas for further research.

LITERATURE REVIEW

Hornaday (1992) argued that entrepreneurship requires innovation, which is key in creating an economic value and obtaining a return from the market in the pursuit of opportunity. In the Resources Based View (RBV), A business is interested in the organization's resources. Based on this view, an organization will have a competitive advantage, or cause resources to be considered in business operations (Barney & Wright, 1998). Dynamic Capabilities (DC) is a model that is also constructed on a resource base to integrate unique resources that are consistent with future opportunities (Teece, 2012; Teece, et al., 1997).

Entrepreneurial Orientation (EO)

Previous works have studied EO consisting of three sub-factors. 1. Innovativeness (EO1) 2. Proactiveness (EO2) and 3. Risk-taking (EO3) which is widely accepted (Covin & Slevin, 1989; Miller, 1983; Wiklund, 1999). Covin and Slevin (1989) studied the relationship between entrepreneurial orientations in hostile and benign environments as an important factor in strategic management. Lumpkin and Dess (1996) explained that EO is a format for decisions, practices, processes, and behaviours that will lead to a new target market for existing products or services, and also including the development of new products or services studied by the two sub-factors, namely Competitive aggressiveness (EO4) and Autonomy (EO5).

Marketing Orientation (MO)

Kohli and Jaworski (1990) referred to MO as a business philosophy, organizational culture and organizational behaviour. MO comprises of three parts: (1) Information gathering (MO1); (2) Dissemination (MO2); and (3) Responsiveness (MO3). Narver and Slater (1990) focused on studying MO, leading to the creation of a sustainable competitive advantage and long-term profitability consisting of three parts: (1) Customer Orientation (MO4); (2) Competitor Orientation (MO5); and (3) Inter-functional Coordination (MO6)

Learning Orientation (LO)

Baker and Sinkula (1999) stated that new knowledge often arises from questioning, which results in changes to procedures otherwise based on old practices. Organizations that encourage employees to learn or challenge them to be creative, in accordance with LO, often see positive outcomes. Calantone, Cavusgil, and Zhao (2002) studied LO, consisting of four sub-factors: (1) Learning commitment (LO1); (2) Shared vision (LO2); (3) Open-mindedness (LO3); and (4) Intra-organizational knowledge sharing (LO4).

Digital Orientation (DO)

Quinton, Canhoto, Molinillo, Pera, and Budhathoki (2018) studied the DO elements from EO, MO, and LO by introducing DO principles to implement strategic marketing theory and a management approach that promotes and enhances the efficiency of SME's in the digitalized economy. No joint study has been conducted between EO, MO, LO, and DO, and its effect on an organization's operations in a rapidly changing environment.

The factors supporting the development of DO consist of four parts:

Digital Awareness (DO1): Grönroos (2007) argued that the value of digital technology is its use to produce valuable results for the competitiveness of an organization. However, there is a risk in accepting the use of digital technology, which may have other disadvantages, such as high costs.

Cross-Functional Integration (DO2): Gebhardt, Carpenter, and Sherry Jr (2006) stated that in a digital environment, creating value and work related to various aspects, is by using digital technology, specifically to inquire about satisfaction, social media, and user access. These duties are held by the marketing and IT departments of an organization and are therefore also related to the organization's human resource (HR) in selecting the suitable personnel to work within the organization.

Organization Capability (DO3): An organization must be able to sense a weak signal from customers or competitors and to be ready of possibly changing needs. Market trial experience must be created for the staff to be flexible and capable of effectively managing real situations (Liu, Ke, Wei, Gu, & Chen, 2010). Use of external data will help to develop relationships with external agencies and open network collaborations.

Individual Characteristics (DO4): Jones and Rowley (2011) stated that an organization's employee affects the success of digital technology, whereby the level of IT knowledge is considered to be an important factor in supporting DO, as well as the attitude towards positive change.

Industries 4.0 Readiness Orientation (IRO)

IRO studies have investigated many dimensions in both processes and operations such as enterprise readiness, production readiness, software readiness and level of operational readiness (Sauser et al., 2009). Previous IRO studies are as follow 1) IMPULS – Industries4.0 Readiness by VDMA, RWTH Aachen, IW Consult (Lichtblau, 2015); (2) Empowered and Implementation Strategy for Industry 4.0 (Lanza, et al., 2016), (3) Gartner Maturity Model (Tonelli et al., 2016); (4) Maturity model (Schumacher et al., 2016); and (5) Maturity and readiness model, which is an analysis of (a) smart products and services, (b) smart business processes, and (c) strategy and organization had studies by (Akdil et al., 2018). The factors of the IRO study in this research adopt IMPULS – Industrie 4.0 Readiness, which is an holistic approach right from policy up to implementation at the firm-level. The sub-factors of the IRO composes of 1. Strategy and Organization (IRO1), 2. Smart Factory (IRO2), 3. Smart Operations (IRO3), 4. Smart Products (IRO4), 5. Data-Driven Services (IRO5) and 6. Employees (IRO6)

Firm Performances

Robbins (1990) stated that firm performance is the sum of all an organization's operational activities to improve asset management, and increase the ability to develop the value of products and services for customers. Voelker et al. (2001) argued that firm performance can be measured from financial performance and Kaplan, et al. (2004) further presented more perspectives based on non-financial performance assessments or customer views.

From a literature review, firm performance measurements, based on EO, MO, LO, DO, and IRO can be measured both financially and non-financially. The financial dimensions consist of Market share sales (FN1) (Zehir et al., 2015), Sales growth (FN2) (Baker & Sinkula, 1999), Profit (FN3) (Alotaibi & Zhang, 2017), Revenue (FN4) (Paladino, 2009) and Return of investment (FN5) (Souchon et al., 2012). Whereas the non-financial dimension comprises of Innovativeness (NFN1) (Keskin, 2006), Customer satisfaction (NFN2) (Keskin, 2006), and Growth in an intangible asset (NFN3) (Madhani, 2012)

RESEARCH FRAMEWORK AND METHODOLOGY

Research Framework

A review of the literature led to a construct of the entrepreneurial model framework, with initially three factors, EO, MO, and LO, and by later adding two new factors, DO and IRO, that may affect the firm's performance as measured by the financial and non-financial aspects, as shown in Figure 1.

Research Methodology

This research was divided into 2 parts. Part 1 was a qualitative research conducted through 19 in-depth interviews. In order to obtain the model, the entrepreneurial model, part 2, quantitative research was conducted through an empirical approach to obtain the relationship of the entrepreneurial model in each variable.
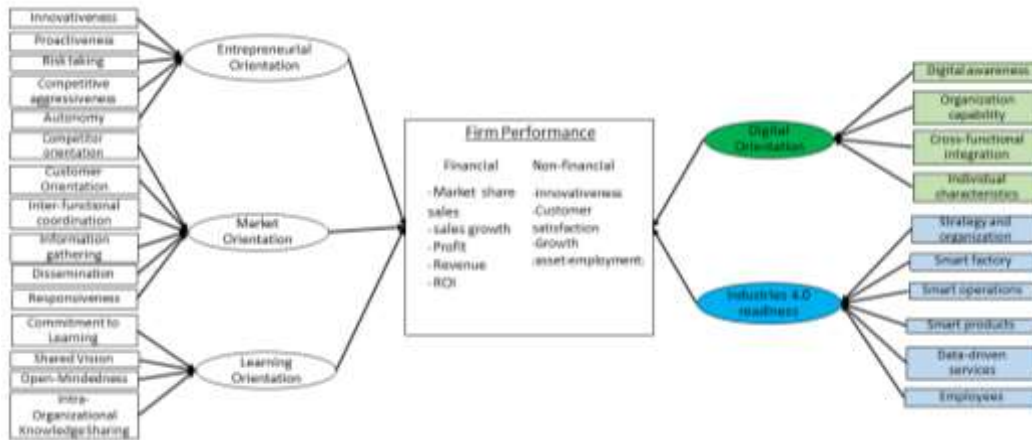
FIGURE 1
CONCEPTUAL FRAMEWORK OF ENTREPRENEURIAL MODEL FOR PROCESSED AGRICULTURE INDUSTRY IN DIGITAL AND INDUSTRIES 4.0 ERA

RESULTS AND FINDING

Qualitative Results

The purpose of this qualitative research is to present an entrepreneurial-processed agricultural model consisting of EO, MO, LO, DO and IRO. In this part, in-depth interviews by data collection from experts and agriculture processing entrepreneurs on the important and necessary factors was to confirm a model of entrepreneurship in the digital and industry 4.0 era.

The authors have collected in-depth interview data from the two following groups: (1) 5 experts involved in promoting entrepreneurship in the agro-processing industry concerning agricultural production for food or technology applications, (2) 14 entrepreneurs who are successful in doing business in the agro-processing industry relating to agricultural products for food. By purposive sampling and maximum variable, sampling was done from the industrial classification according to all types of economic activities and International Standard Industrial Classification of All Economic Activities (ISIC), Rev. 4 (Nations, 2008)

The questionnaire for the in-depth interview had thorough consideration of The Research Ethics Review Committee for Research Involving Human, Chulalongkorn University (COA No.035 / 2019). The interview duration was approximately 30-45 minutes.

Data analysis from the in-depth interviews was using content analysis methodology: (1) Examination of content from interviews with transcripts to understand the content for grouping the words and analysis of various issues including additional information from the interview; (2) Word coding from all interviews (both in the expert group and the entrepreneur group) including a review of the correct encoding of words; (3) Analysis of links to synthesize relationship patterns and compile the analysis results in both the related and unrelated sections including the frequency of reference in each element; (4) The composition obtained from the analysis was to create an entrepreneurship model.

An analysis of the 19 in-depth interviews of experts and entrepreneurs with the research framework is illustrated in Table 1, 2 and 3. The analysis is explained in 4 groups: (1) EO/MO and LO; (2) DO; (3) IRO; and (4) Firm performance.

EO/MO and LO

In terms of EO (EO1-EO5), the most important factor was Innovation (100%). Experts and entrepreneurs agreed on the importance of using innovation into business operations. For medium and large enterprises, there will be a specific research centre to develop a product and then distribute to each factory that has a facility suitable for the product.

In terms of MO (MO1-MO6), the most important aspect was information gathering (74%) and inter-functional coordination (74%). For information gathering, analysing the trends and policies before researching a product will determine the direction of the product development to keep up with market demands. Having a marketing plan, incorporating modern technology into production, and being the first mover in the market is important to control the market direction and to have an opportunity to conduct the marketing before other operators. For inter-functional coordination, experts and entrepreneurs agree that cooperation should occur both within and outside the organization. This includes market research data, whereby small business entrepreneurs may not have enough resources to develop a new product.

In terms of LO (LO1-LO4), the most important factor was the commitment to learn (68%), which is most often overlooked by the small business entrepreneurs. Meanwhile, experts and medium and large business entrepreneurs give priority to this type of commitment because of the believe that learning organization must be the culture and policy of their organization.

Table 1														
AN ANALYSIS OF THE IN-DEPTH 19 INTERVIEWS OF EXPERTS AND ENTREPRENEURS FOR EO,MO AND LO														
Code	EO1	EO2	EO3	EO4	EO5	MO1	MO2	MO3	MO4	MO5	MO6	LO1	LO2	LO3	LO4
Sum	19	13	13	9	16	14	10	13	13	11	14	13	12	11	7
%	100	68	68	47	84	74	53	68	68	58	74	68	63	58	37

DO and IRO

The DO consists of four subgroups, DO1-DO4. The most important part was digital awareness (84%). Experts and entrepreneurs agreed that there is a quite rapid change in digital technology that directly affects entrepreneurs, who then need to keep up. There are many kinds of digital technologies. The use of digital technology for product processing needs must be chosen appropriately. The technologies will be useful to entrepreneurs who may not have sufficient knowledge or expertise.

There are six sub-factors of IRO, IRO1-IRO6. The most important part was the Strategy and Organization (74%). Large enterprises have clear policies and focuses on the development of transformation in the direction of industry 4.0, with plans to modify the modernized machinery or tools. Automated machinery has also been used with the original system. SMEs have begun to see the benefits of using the technology of automated machinery to replace shortages in production labour, reducing production costs and the use robots for operations. In addition, focus on research activities with external agencies, such as universities or government agencies to achieve tangible results and reduce investment risks is key. Assets installed with various sensor-based or intelligent systems can also use the research data to plan towards improvements. Additionally, importance should be given to Supply Chain Management by using good production planning and storage systems that employ sensor-based technology on the various devices or machines, to be able to track the status of processing.

Table 2 AN ANALYSIS OF THE IN-DEPTH 19 INTERVIEWS OF EXPERTS AND ENTREPRENEURS FOR DO AND IRO									
Code	DO1	DO2	DO3	DO4	IRO1	IRO2	IRO3	IRO4	IRO5	IRO6
Sum	16	12	12	13	14	11	12	10	12	13
%	84	63	63	68	74	58	63	53	63	68

Firm Performance

Definition: Financial - Large, medium and small enterprises, with a focus on financial performance, but a large enterprise focuses on cash flow if an investment is made in a new system. **Non-Financial –** Entrepreneurs at all levels that give importance to innovation. Small entrepreneurs are not given as much importance as the growth of intangible assets.

Table 3 AN ANALYSIS OF THE IN-DEPTH 19 INTERVIEWS OF EXPERTS AND ENTREPRENEURS FOR FN AND NFN							
Code	FN1	FN2	FN3	FN4	FN5	NFN1	NFN2	NFN3
Sum	10	11	5	13	8	14	12	12
%	53	58	26	68	42	74	63	63

Quantitative Results

The questionnaire was designed and constructed with reference to literature, confirmed with qualitative method and was tested and revised with assistance from an expert. The questionnaire consisted of 4 parts. The first part is the demographic of the business. The second part seek information on the entrepreneurship of an SME, the questions in the third part were related to the firm's performance and the last part related to general information of respondents. This collection of data was obtained from entrepreneurs operating small and medium-sized SMEs with 340 informants.

When the businesses were classified by their size, it was found that most of them are small businesses. Their value of fixed assets were not exceeding 50 million baht (47.06 percent), followed by medium-sized businesses with value of fixed assets 51 - 200 million baht (26.18 percent) and a minority have a start-up business or are in the process of establishing a business (26.76 percent).When the business was classified according to the food production industry, it was found most of the businesses are characterized into processing and preservation of fruits and vegetables (25.88%), followed by other food products (23.53%), and a minority were manufacturers of vegetable and animal oils and fats (6.47 percent). In addition, when businesses were classified according to the level of the production technology, it was found that most businesses operate with machinery and equipments that use electricity and require people to control the production. There are many types of machines (65.53 percent), followed by automated machines, or CNC (Computerized Numerical Control) controlled machines or robots (15.88%). A small number of machines in the production system are automated systems, which are controlled by Computer and Software and communicate and transmit information with other systems (3.82%). When the respondents were classified according to their current job positions, it was found that the majority of them had a managerial / owner positions (71.76%), followed by department heads (13.53%) and a minority with supervisory positions (4.41%).

Data normality

The analysis results in this section were done by the use of integral statistics such as Mean and Standard Deviation (SD). The normal distribution of 5 dimensions of 25 variables was tested using Skewness values. Kurtosis where the skew value was greater than 0 is the right skew and

less than 0 is the left skew. Kurtosis greater than 0 is the very high value and less than 0 is the low value. The results is shown in Table 4 and Table 5 for EO, MO, LO and DO, IRO, FN, NFN, respectively.

Table 4
THE RESULTS OF THE EXAMINATION OF THE DISTRIBUTION CHARACTERISTICS OF EO, MO AND LO (N=340).

Variable	EO1	EO2	EO3	EO4	EO5	MO1	MO2	MO3	MO4	MO5	MO6	LO1	LO2	LO3	LO4
Mean	3.48	3.44	3.35	3.34	3.55	3.44	3.35	3.29	3.28	3.35	3.43	3.41	3.41	3.49	3.44
SD	0.67	0.65	0.69	0.83	0.69	0.64	0.69	0.72	0.73	0.71	0.70	0.74	0.70	0.73	0.68
Skewness	0.30	0.36	0.17	-0.13	0.25	0.34	0.24	0.09	-0.12	0.22	0.20	-0.09	0.27	0.24	0.34
Kurtosis	-0.03	0.28	-0.09	-0.43	-0.23	-0.28	0.63	0.26	0.28	0.47	0.24	0.36	0.46	-0.19	-0.01

Table 5
THE RESULTS OF THE EXAMINATION OF THE DISTRIBUTION CHARACTERISTICS OF DO, IRO, FN AND NFN (N=340).

Variable	DO1	DO2	DO3	DO4	IRO1	IRO2	IRO3	IRO4	IRO5	IRO6	FN	NFN
Mean	3.40	3.37	3.31	3.29	3.21	3.26	2.96	3.05	2.92	2.85	3.24	3.19
SD	0.78	0.77	0.76	0.81	0.72	0.61	0.81	1.00	0.81	0.93	0.65	0.59
Skewness	0.17	0.20	0.11	0.16	0.02	0.22	-0.25	-0.28	-0.13	-0.23	0.22	0.24
Kurtosis	0.28	0.39	0.31	0.22	0.86	0.62	0.12	-0.49	0.21	-0.48	1.00	0.95

From Table x-x, considering the statistical values of each variable, it was found that skewness was between -0.281 and 0.359, and the kurtosis was between -0.501 and 1. All variables have a normal curve distribution. However, according to the suggestion of (Kline, 2005), the variable having a skew value of more than 3 is considered as an abnormal skew. Additionally, if the koi exceeds 10, it can negatively impact the analysis, however analysis of the distribution Skew found that the skew values did not exceed 10. Further analysis of the influence was then done without converting the scores, to adjust the data to be distributed in a normal curve.

Correlation between Entrepreneurial factors and Firm's performance

We first analyzed the Pearson's Product Moment Correlation coefficient between the observed variables in each measurement model, to examine how the observed variables were correlated. Table 6 shows the correlation coefficients of all observable variables used in this analysis. The shaded area shows the coefficients within the same variable. The results of the analysis showed that the correlation coefficient within the observable variable measured the same latent variable and had a relatively high correlation coefficient. The relationship of the observable variables with other latent variables was a decreasing trend. The correlation between the observable variables with a statistical significance different from zero (p <.05) amounted to 321 out of 325 pairs. For the size of the correlation, the maximum LO2 and LO3 was 0.713 at the statistical significance of (p <.01) and the least was LO4 and IRO6 at 0.095 with a statistical significance of (p <.05). The correlation coefficient between the observed variables was positive for the performance of financial and non-financial organizations.

Table 6
THE CORRELATION COEFFICIENTS OF ALL OBSERVABLE VARIABLES

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
EO1																										
EO2	**.682****																									
EO3	**.495****	**.560****																								
EO4	**.380****	**.469****	**.551****																							
EO5	**.463****	**.516****	**.462****	**.411****																						
MO1	.481**	.487**	.557**	.432**	**.512****																					
MO2	.456**	.538**	.521**	.469**	**.459****	**.633****																				
MO3	.468**	.411**	.461**	.303**	**.447****	**.615****	**.495****																			
MO4	.459**	.470**	.491**	.375**	**.437****	**.592****	**.583****	**.605****																		
MO5	.471**	.459**	.480**	.360**	**.470****	**.621****	**.559****	**.592****	**.680****																	
MO6	.423**	.482**	.483**	.412**	**.514****	**.595****	**.566****	**.607****	**.579****	**.651****																
LO1	.493**	.440**	.435**	.326**	.494**	.488**	.477**	.561**	.525**	.521**	**.575****															
LO2	.498**	.484**	.425**	.363**	.574**	.508**	.509**	.589**	.558**	.585**	**.606****	**.700****														
LO3	.470**	.497**	.401**	.360**	.570**	.531**	.488**	.497**	.459**	.487**	**.576****	**.580****	**.713****													
LO4	.407**	.397**	.446**	.312**	.494**	.578**	.537**	.586**	.503**	.524**	**.629****	**.616****	**.708****	**.702****												
DO1	.455**	.449**	.465**	.307**	.431**	.472**	.423**	.445**	.427**	.488**	.520**	.518**	.577**	.559**	**.497****											
DO2	.446**	.438**	.461**	.346**	.396**	.492**	.421**	.433**	.469**	.410**	.490**	.419**	.468**	.539**	**.439****	**.633****										
DO3	.420**	.419**	.427**	.374**	.388**	.494**	.408**	.460**	.502**	.438**	.492**	.477**	.525**	.536**	**.480****	**.546****	**.667****									
DO4	.385**	.359**	.420**	.330**	.371**	.440**	.367**	.405**	.394**	.436**	.444**	.484**	.525**	.486**	**.461****	**.617****	**.615****	**.679****								
IRO1	.417**	.383**	.385**	.369**	.415**	.487**	.418**	.444**	.522**	.504**	.494**	.519**	.520**	.474**	.444**	.500**	.530**	.612**	**.590****							
IRO2	.416**	.362**	.327**	.298**	.343**	.449**	.400**	.469**	.478**	.431**	.518**	.500**	.526**	.459**	.462**	.455**	.474**	.536**	**.516****	**.583****						
IRO3	.205**	.220**	.238**	.195**	.087	.207**	.256**	.314**	.405**	.273**	.201**	.307**	.248**	.192**	.218**	.243**	.300**	.391**	**.368****	**.479****	**.548****					
IRO4	.232**	.169**	.214**	.214**	.012	.178**	.242**	.199**	.329**	.266**	.176**	.296**	.223**	.118*	.155**	.282**	.231**	.317**	**.404****	**.459****	**.453****	**.530****				
IRO5	.244**	.208**	.237**	.193**	.099*	.218**	.207**	.255**	.359**	.282**	.193**	.317**	.296**	.176**	.200**	.246**	.225**	.337**	**.376****	**.437****	**.470****	**.669****	**.583****			
IRO6	.138*	.105*	.196**	.171**	-.030	.107*	.089*	.206**	.317**	.171**	.143**	.202**	.152**	.049	.095*	.134**	.184**	.229**	**.277****	**.338****	**.361****	**.619****	**.477****	**.647****		
FP	.376**	.349**	.395**	.379**	.347**	.413**	.406**	.388**	.450**	.400**	.366**	.305**	.337**	.321**	.323**	.305**	.315**	.341**	.371**	.401**	.411**	.261**	.214**	.187**	**.194****	
NFP	.398**	.418**	.427**	.394**	.350**	.461**	.431**	.399**	.560**	.503**	.475**	.459**	.469**	.400**	.422**	.377**	.435**	.519**	.484**	.558**	.488**	.423**	.404**	.403**	.380**	.508**

Remark : * $p < 0.05$ and ** $p < 0.01$

Factor analysis

A Principal Component Analysis (PCF) was done using IBM's SPSS (version 22), employing a Varimax (orthogonal) rotation of 25 variables of Likert scale questions from this survey questionnaire, as gathered from 320 participants. An examination of the Kaiser-Meyer Olkin measure of sampling adequacy suggested that the sample was factorable (KMO=0.0.948) and reached statistical significance of $p <.05$. A total of 25 variables were factored into a 4-factor solution with 65.738% of variance in the data. The results of an orthogonal rotation of the solution are shown in Table 7 When loadings were less than 0.50, they were excluded, and the analysis yielded a 4-factor solution with a simple structure (factor loadings of >.50).

Eleven components were loaded into Factor 1. It was noticed that it was a variable group that came from the original MO. LO with a variable named EO5 was added as one variable, so this factor was named "Market and Learning Orientation" (MLO).

Factor 2 consisted of all original DO with IRO1 added as one variable, so this factor was named variables in terms of "Digital orientation and Organization Strategy" (DOS).

Component	Factor 1	Factor 2	Factor 3	Factor 4
Table 7 **OBLIQUELY ROTATED COMPONENT LOADINGS FOR 25 VARIABLES***				
LO4	0.769	0.325		
MO3	0.73			
LO2	0.728	0.403		
MO6	0.706			0.303
MO5	0.684			0.352
LO1	0.669	0.325		
LO3	0.626	0.507		
MO4	0.626		0.357	0.379
MO1	0.603			0.472
MO2	0.546			0.543
EO5	0.521			0.43
DO4		0.748		
DO2		0.727		0.319
DO3		0.701		
DO1	0.359	0.672		
IRO1	0.365	0.505	0.438	
IRO5			0.828	
IRO6			0.822	
IRO3			0.818	
IRO4			0.739	
IRO2	0.432	0.407	0.5	
EO4				0.73
EO2				0.724
EO3				0.72
EO1	0.326			0.597
Eigenvalues	11.366	2.659	1.274	1.135
Percentage of total variance	45.464	10.637	5.095	4.542
Cumulative percentage	45.464	56.102	61.196	65.738
Number of the components	11	5	5	4
*Loading=>.05				

Five items were loaded onto Factor 3, by noticing that it is a group of variables that come from original the IRO, particularly only IRO1 which was classified in factor 2 and then named "*Industries* 4.0 *Adaptability Orientation*" (IAO).

Factor 4 was loaded with 4 items from the original EO. IRO5 factor was classified into factor 1 and then named "*Entrepreneur Orientation*" (EO).

Factor analysis classifies all variables, which create the new Entrepreneurial model as shown in Figure 2.

FIGURE 2
THE NEW ENTREPRENEURIAL MODEL

Identifying the Influence of the new Entrepreneurial Model components towards Firm's Performance

A multiple regression was carried out to investigate whether MLO, DOS, IAO and EO could significantly predict Firm's Performance. Outcome of this analysis is shown in Table 8.

Table 8 THE INFLUENCE OF THE NEW ENTREPRENEURIAL MODEL COMPONENT TOWARDS THE FIRM'S PERFORMANCE							
Model	**Unstandardized Coefficients**		**Standardized Coefficients**		**P-Value**	**T**	**VIF**
	B	**Std. Error**	**Beta**	**t**			
(Constant)	0.757	0.108		7.034	0.000		
MLO	0.315	0.047	0.379	6.675	0.000	0.355	2.821
DOS	0.153	0.042	0.195	3.611	0.000	0.392	2.552
IAO	0.147	0.027	0.215	5.433	0.000	0.728	1.373
EO	0.129	0.039	0.161	3.305	0.001	0.478	2.092
R	0.618						
R^2	0.613						
F	135.310						
Durbin-Watson	1.827						
SE	0.281						

The four new Entrepreneurial Model components: MLO, DOS, IAO and EO have influence on Firm's Performance at a significant level of 0.05. The results of the regression indicated that the model explained 61.3% of the variance and was a significant predictor of the Firm's Performance, $F(4,335) =135.310$, p = .000. In addition, the four independent variables showed a positive linear relationship to the Firm's Performance.

In this regard, the examination of multiple linear relationships to examine if each trend has a Multicollinearity problem was determined by the variable inflation factor (VIF) or the tolerance (Tolerance: T). Here, VIF values should not exceed 4,and if the values were more than 4, this meant that the variables are related (Miles & Shevlin, 2001). On another hand, the T value should not be less than 0.2 (Pedhazur, 1997). If the T value was less than 0.2, the variable has a relationship. From Table X, it was found that VIF was the most at 2.821, which was less than 4, and T was the minimum of 0.355, which was not less than 0.2. Therefore, the Therefore, there were no relationship between the independent variables.

From Table X, the relationship can be described as follows: MLO has the highest correlation with Firm's Performance at 0.315, followed by DOS and IAO at correlation levels 0.153 and 0.147, respectively and with EO having the least correlation at level 0.129. From the current research, the following equation as structured from the new Entrepreneurial Model, predicts the Firm's performance:

$$\text{Firm's Performance} = 0.757 + 0.315*MLO + 0.153*DOS + 0.147*IAO + 0.129*EO$$

DISCUSSION AND RECOMMENDATION

The aim of this research was to study the important factors that affect a firm's performance of agricultural processing entrepreneurs in the digital and industrial 4.0 era. Additionally, in creating an entrepreneurship model through literature review and examining entrepreneurial models through in-depth interviews with 19 experts and entrepreneurs, and an empirical study with -320 participants.

From the result of the in-depth interview, EO, MO and LO are found to be important factors to entrepreneurs; this is consistent with a previous study (Lonial & Carter, 2015). In regard to MO, resource constraints for small entrepreneurs also hinder market research activities in developing new products. This results inthe products being unable to meet the needs of many customers. Therefore, MO has a positive effect on the firm's performance. In terms of LO, the importance of an organization's policy or culture in giving importance to learning is an important factor driving organizational learning and progress. LO can enable the organization to achieve goals to enter new markets or increase operational results (McCann, 1991; Zahra et al., 2000). As far as the DO is concerned, small business entrepreneurs emphasize the benefits of digital technology in terms of bringing the products to the market and reaching customers. Small-based entrepreneurs can use the existing platform as a convenient and rapid tool. However, it is important to reduce the wastage of limitedly available resources by selecting the appropriate digital technology for a specific business, as reported by Grönroos (2007). For the IRO, the Government policy to encourage agricultural processing entrepreneurs to use automated machinery to assist in the production process, is a major adjustment for the agricultural operators. This especially applies to industries that use traditional processing methods and would like to newly venture into using automation and technology.

From the quantitative research through the factor analysis approach, 5 to 4 variables were grouped by the new variable components, while little has changed. The components were also structurally similar to that obtained in the qualitative research, whereby EO is an important part of entrepreneurship. EO was found to be a necessary characteristic by the entrepreneurs which also is in accordance with previous studies (Covin & Slevin, 1986; Hult et al., 2003; Lee et al.,

2001; Wiklund & Shepherd, 2003). If there is a high EO, the performance of the organization will be high too.

In terms of MLO had the greatest influence on the Firm's Performance. Entrepreneurs who can access useful information through linkages with various technologies or social media, such as up-to-date large data on market trends, and customer needs, may find these data useful. Additionally, many small-sized business entrepreneurs do not yet have a systematic knowledge management system. . However, the continued use of the knowledge management system remains a problem in both SMEs and large enterprises. As for DOS, it was the second main influencer of Firm's Performance using digital technology to deliver valuable results for the organization. It is key to develop an organization with competitive potential.

Moreover, sudden environmental change, such as the coronavirus pandemic (COVID-19) are catalysts for the use of digital technology. Therefore, an entrepreneur must make a sudden adjustment. If there is no preparation for the use of digital technology, business opportunities will be lost, as explained in a study by Javaid et al. (2020). As for IOA, the third highest influence, but close to DOS, medium and large-scale business entrepreneurs already have awareness and preparation in this regard. There are plans to adjust in terms of investment, research, and development. Small business entrepreneurs in the processed agricultural groups, such as meat processing, and aquaculture processing, are planning to adapt to support the development of Industry 4.0. For small-scale agricultural entrepreneurs who have uncomplicated processing, there is still insufficient emphasis on preparing to join the industry 4.0, and this corresponds to a study by Temur et al. (2018) which found that small-scale organizations still lacks development plans and human resource management when entering Industry 4.0 related to external agencies and the education sector. The integration of the new system to be compatible with the old system remains a challenge for entrepreneurs of all sizes. In terms of employee development, experts and entrepreneurs give priority to the development of additional Reskill, Upskill and Newskill to support the supplementary skills.

From the foundation of the goal of conducting business and passing value to consumers, it is not only the operational sector that will have to make a major change. Every employee needs to be involved in adapting to industry 4.0 which also encompasses cultural changes to the personnel and the entire organization. These adaptations will increase the capacity of an organization to compete in the era of fierce competitiveness. The current study was based on an entrepreneurial model that affects the operations in the processed agricultural industry in Thailand.

Research Limitations and Recommendations for Future Research

This study is a research in the context of processed agricultural entrepreneurs in Thailand which demonstrated that factors affecting the performance, may change if studied in other areas. This is due to the difference of digital readiness and the level of innovation technology. For future research this Entrepreneurial Model can be used to evaluate real entrepreneurs. In addition, the model can be adapted for use in other manufacturing or processing industries to enable entrepreneurs to operate effectively in the digital and industry 4.0 era.

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