Metaverse; virtual world challenges and opportunities for digital business

Tippawan Meepung and Phudit Kannikar

Abstract—**Metaverse makes it more connected, transcending the constraints of the real world, doing more activities together. Metaverses are used to generate monetization benefits through activities, trade trades, exchange goods and services, or use them to connect them with others, possibly by collaborating. Learn important points, communicate, exchange and express yourself in ideas. This article would like to present new way of immersive customer experience. The aims of this research were (1) to synthesize and develop the business model canvas of Metaverse; virtual world for digital business (2) to evaluate the business model canvas of Metaverse; virtual world for digital business and (3) to study the results of implementing the model. The research process was therefore divided into 3 parts. The evaluation of the developed model was carried out by 7 experts in related fields and the implementation of the model was carried out by a sample of 48 user.**

Index Terms—**Metaverse, Digital Business, Multi-technology, Business Model Canvas.**

I. INTRODUCTION

A McKinsey survey found that gaming metaverse searches increased by 4,500% from 24 months [1]. Metaverse is an innovation that creates and integrates the real-world environment in which we live with the virtual world, becoming a "virtual world community" that can combine objects around us and environments into one. Based on AR (Augmented Reality) and VR (Virtual Reality) technology, it connects seamlessly into the same world space [2]. Metaverse uses decentralized technologies such as Blockchain, Cryptocurrency, and NFT (Non-Fungible Token), etc., allowing users to exchange products and services in Metaverse quickly and without having to go through intermediaries [3] . Metaverse uses decentralized technologies such as Blockchain, Cryptocurrency and NFT (non-fungal tokens), etc., allowing users to quickly exchange products and services in Metaverse and without having to go through intermediaries [4]. Tax policy and intellectual asset protection are another factor that encourages any innovation to happen in the country. In this Decentralized world, entrepreneurs Investors and workers, especially with digital and creative lines. You can choose which country to do business in. Whereas the person can be in any country [3].

II. LITERATURE REVIEW

A. Metaverse

Metaverse is a virtual space created by the collaboration of VR (Virtual Reality) and AR (Augmented Reality) under intermediaries like 5G [5], creating a real-world and virtual world combination in real-time. This allows you to interact with each other in the digital world. Without physical limitations [6]. Metaverse is like a 3D internet connection that may have more than just 3D glasses used to view ordinary virtual reality, but it also offers a new digital world where users can create Avatar identities to do activities in the virtual world [7]. Developing **fast-paced 5G Internet** networks to use them in real time, fast and uninterrupted.

Fig. 1. Virtual Space (by author)
https://app.spatial.io/rooms/61aef632c9bee60001433d74

B. Key Characteristics of Metaverses

The consist of Metaverses **(1) Always active** ; even if you give up entering the virtual world, but things in the virtual world continue to move and continue, **(2) Exists in real time** ; Metaverse has Timeline moments that coordinate real-world moments, **(3) Players have individual agency**; People who enter the Metaverse world do not need to interact or do activities together, but can share the virtual world together, **(4) Self-contained and Fully Functioning universe** ; Metaverse is a virtual world where users choose to create things owned, traded or invested, as well as doing real-world activities such as investing in technology blockchain to own digital property, **(5) Mix platforms**; Apply items from one game to another, **(6) User-generated content**; Users can create content in the form of User-Generated Content so that others can participate in comments and activities.

C. Metaverse for Digital Business

1) For matching the lifestyle habits of the New Normal era.

New Normal has become a lifestyle we're used to. Ordering online, meeting on screen, or even Work Form Home is a change that everyone faces and even through this crisis. But new normal lifestyle habits remain [8][9].

2) Reduce physical restrictions on business

Metaverse reduces such restrictions without worrying about location, consumer location or construction period, because in the virtual world, just having resources and knowledge to use is easy to increase business opportunities [8][9].

3) New dimensions of payment system with Smart Contract

Today, payments through 'cryptocurrencies' are soon becoming part of the business world. The main advantage of cryptocurrencies is that they can easily contract through smart contracts located on blockchain, and also reduce currency restrictions on trading. It eliminates different currency problems and gives people around the world the opportunity to use the same currency [8][9].

4) Add promotion channels with Game Marketing

The development of technology and the Internet today This gives everyone access to the game in any area around the world and makes Game Marketing another popular brand promotion channel [8][9].

5) Creating a unique immersive customer experience

Immersive experiences are caused by multiple yard interactions from individuals who provide services to service providers towards the management, system, or area of the brand. The brand designs creative experiences, stimulating feelings of doubt, freedom, and happiness between customers and employees that lead to emotional connections [10][11].

D. Augmented Reality (AR)

3D Object Simulation Technology Apply virtual objects to the real world by using visualization devices such as glasses, monitors, smartphone monitors. Combining real environments with virtual objects at the same time, virtual objects can be visual, video, audio, information processed from computers, smart mobile, tablets, or small wearables and make them possible to respond to the simulator [6][12][13][14][15].

Fig. 2. Augmented Reality (AR)
www.aware.co.th

E. Virtual Reality (VR)

Technology replicates a place into a virtual world (separate from the real world). Users can interact with the simulation location through keyboard equipment, mouse, gloves, shoes. It simulates a real environment into virtual reality. Through the perception of vision, sound, touch, even smell, it cuts us off from the current environment to access simulated images, for example, google street view location simulations[12][14][15][16].

Fig. 3. Virtual Reality (VR)
www.marketingoops.com

F. Mixed Reality (MR)

Mixed Reality brings together reality and digital elements, so we can interact with things and environments in the real world and virtually using touch technology and creating a new era of images. Even when interacting with virtual environments with our own hands without removing our glasses. This technology allows one foot (or hand) to be placed in the real world and placed on the other in the virtual world [14][15][16][17].
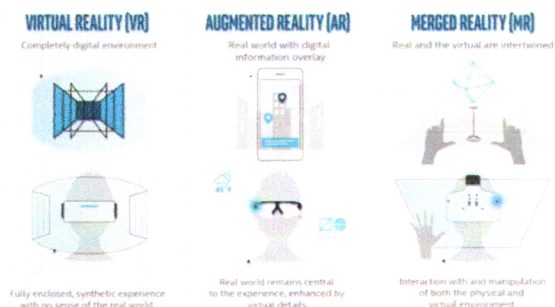

Fig. 4. VR AR MR
https://img.online-station.net

G. Extended Reality (XR)

Extended Reality or XR is a virtual reality technology that combines a wide range of dimensions, whether it's a real-world environment. Digital environments, including human-machine interactions arising from computer or wearable technology [14]. Reality technology is currently commonly used in practice for the sector and education, as it can reduce the costs and risks that can arise in training. Specifically, skill training with expensive or dangerous equipment in action [18][19].

H. Business Model Canvas

It is a tool for helping design basic business models. Make details visible of the whole business, the strength, the weaknesses. Advantages and disadvantages the main activities of the business, or even who partners, and customers are, help to see the business that goes in the same direction. As a result of business model canvas, the team can easily and quickly strengthen their strengths and adjust weaknesses as well as adjust their business marketing strategies [20][21][22] .Elements of Business Model Canvas as follow; 1. Customer Segments (CS), is the target

group of customers who will offer a service or product. Customer segmentation must be clear, 2. Value Propositions (VP) is the Value to be delivered to customers, 3. Channels (CH) is channels to reach customers which brands can use as a space to communicate, present products and connect with customers, 4.Customer Relationships (CR) is relationships with customers Either regular customers or regular customers, 5.Revenue Streams (RS) is the main income of the business, 6. Key Resources (KR) is the Business Core Resources in business, sales of products, member ,lending or renting goods and services, 7. Key Activities is Main activities that help drive business. It should focus on creating value for customer. access to customer groups Maintaining good relationships and generating income, 8.Key Partners (KP) is our partners or partners in running a business and 9.Cost Structure (CS) is total cost of business in terms of production costs to help in the matter of cost reduction various expenses.
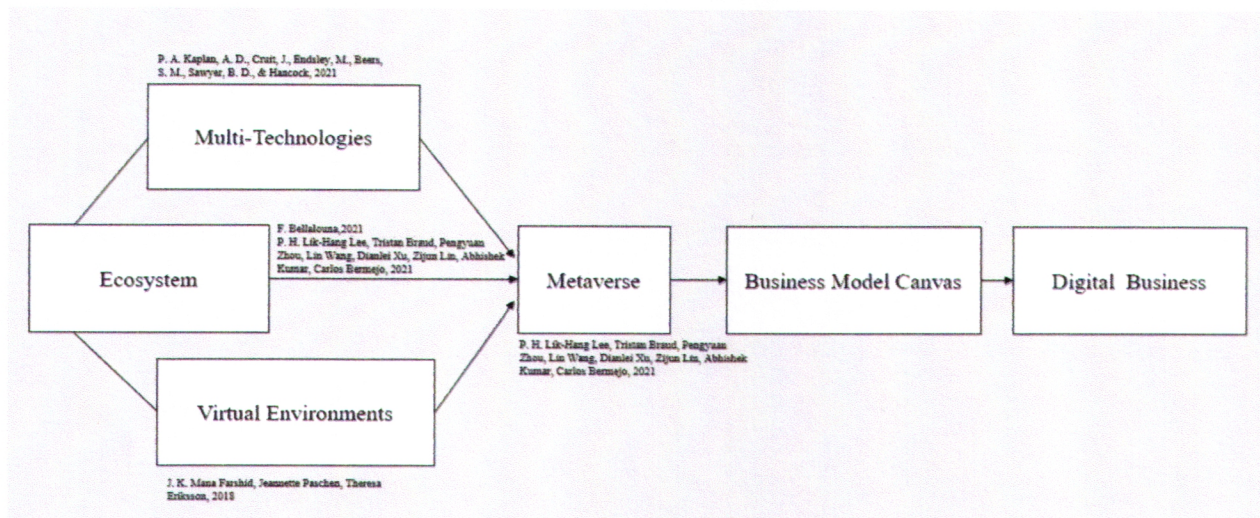

Fig.5. Research Framework

III. PURPOSE OF THE STUDY

The purpose of the study is (1) to synthesize and development of the model of Metaverse; virtual world for digital business (2) to evaluate the business model canvas of Metaverse; virtual world for digital business and (3) to study the results of implementing.

IV. METHODOLOGY

The research methodology designing Metaverse; virtual world for digital business were as follows.

Part 1: Synthesize and Development

This involved combining the complete a review of related literatures on the Metaverse; virtual world for digital business. (1) Sysnthesize documents and develop Metaverse model; virtual world for digital business and (2) Create conceptual framework of the model. Next step was to develop a model focused on Metaverse; virtual world for digital business, Multi-Technology, Ecosystem and Virtual Environments. (3) Assessment of suitability was analyzed using means ($\bar{x}$) and standard deviation (S.D.) in accordance with the following criteria: 1.00-1.80 mean lowest, 1.81-2.60 mean low, 2.61-3.40 mean medium, 3.41-4.20 mean high, and 4.21-5.00 mean highest (4) Develop the business model canvas of Metaverse; virtual world for digital business.

Part 2: Evaluation the Business Model Canvas

To evaluate the business model canvas of Metaverse; virtual world for digital business by 7 experts in related fields in digital business the suitability of the model using the questionnaire. The data were then used to calculate the means and standard deviation. The results were used to develop and improve the model which was then presented in the form of a diagram.

Part 3: Study the results of Metaverse; virtual world for digital business

To study the results model of Metaverse; virtual world for digital business applied and carried out by 48 undergraduate students in IS field. Evaluation was measured on a pass and failed. The activity was carried to the steps in applying the Metaverse; virtual world from spatial.io the first for develop and design step 1) to Create Virtual Landscape, 2) Create Avatar, 3) Create Content for Business (example ecommerce web sites, AR for more information by seller), 4) Create Security & Privacy and 5) Create Trust & Accountability. and reflecting and improving. The Metaverse; virtual world for digital business was then evaluated by their teacher or coach.

V. RESULT

Part 1: Synthesize and Development

The document synthesis in the factor of Metaverse; Virtual World and Multi-technology for Business, following show in Table 1

TABLE 1: SYNTHETIC THE METAVERSE; VIRTUAL WORLD FOR DIGITAL BUSINESS.

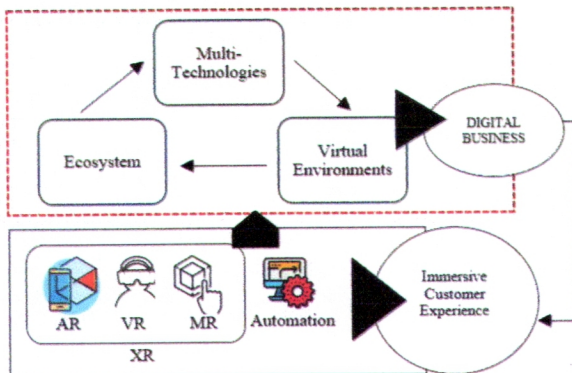| Factors	Digital Business							
	[5]	[12]	[13]	[6]	[7]	[15]	[16]	[17]
Multi-Technologies								
Artificial Intelligence	✓	✓	✓	✓	✓	✓	✓	✓
Cryptocurrencies	✓	✓	✓	✓	✓	✓		✓
Blockchain	✓	✓	✓	✓	✓	✓		
Computer Vision	✓			✓	✓			✓
Network (5G)	✓	✓	✓	✓	✓		✓	✓
Edge Computing	✓					✓		
User Interactivity	✓	✓	✓		✓	✓	✓	✓
IoT & Robotics	✓							
Augmented Reality	✓	✓	✓	✓	✓	✓	✓	✓
Virtual Reality	✓	✓	✓	✓	✓	✓	✓	✓
Mixed Reality	✓	✓	✓	✓	✓	✓	✓	✓
Extended Reality	✓	✓	✓	✓	✓	✓	✓	✓
Automation+Human	✓	✓		✓		✓		✓
Ecosystems								
Avatar	✓	✓	✓	✓	✓	✓	✓	✓
Content Creation	✓	✓	✓	✓	✓	✓	✓	✓
Virtual Economy	✓	✓	✓	✓	✓	✓	✓	✓
Social Acceptability	✓	✓	✓		✓	✓		✓
Security & Privacy	✓		✓	✓			✓	
Trust & Accountability	✓		✓	✓	✓	✓		✓
Virtual Environments								
Text	✓	✓	✓	✓	✓	✓	✓	✓
Image	✓	✓	✓	✓	✓	✓	✓	✓
VDO Game		✓	✓	✓	✓	✓	✓	✓
Camera	✓	✓	✓	✓	✓	✓	✓	✓
Smart Mobile	✓	✓	✓	✓	✓	✓	✓	✓
Personal Computer	✓	✓	✓	✓	✓	✓	✓	✓
Accessory	✓	✓	✓	✓	✓	✓	✓	✓

Fig. 6. Metaverse; Virtual World and Multi-technology for Business

Part 2: Evaluation the Business Model Canvas

To evaluate the business model canvas of Metaverse; virtual world for digital business by 7 experts in related fields in digital business the suitability of the model using the questionnaire and found to be at the highest appropriate level, as shown in Table 2.

TABLE 2: RESULT OF EVALUATION THE BUSINESS MODEL CANVAS

9 Elements	($\bar{x}$)	S.D.	Suitability
1. Value Propositions	5.00	0.00	Highest
2. Customer Segment	4.71	0.49	Highest
3. Channels	4.86	0.38	Highest
4. Customer relationship	5.00	0.00	Highest
5. Revenue Streams	4.71	0.49	Highest
6. Key Resources	5.00	0.00	Highest
7. Key Activities	5.00	0.00	Highest
8. Key Partners	5.00	0.00	Highest
9. Cost Structure	5.00	0.00	Highest
Total	4.92	0.15	Highest

From the table 2, the suitability criteria are 1.00 - 1.80 mean lowest, 1.81 - 2.60 mean low, 2.61- 3.40 mean medium, 3.41 - 4.20 mean high, and 4.21- 5.00 mean highest. The separate suitability of each input factor for

Element 1: Value Propositions ($\bar{x}$=5.00, S.D.=0.00) consist of Connect with your customer B2C, Discover & Learn Experience Reach, Relevance, Immersive Customer Experience use multi-Technologies, personalized and social experiences social distribution payments.

Element 2: Customer Segment ($\bar{x}$=4.71, S.D.=0.49) consist of 15-45 years as primary are segmentation, Internet User, Developers and Advertisers and Marketers.

Element 3: Channels ($\bar{x}$=4.86, S.D.=0.38) consist of online website, eCommerce, eMarketplace, social media, Mobile app and VDO Game.

Element 4: Customer relationship ($\bar{x}$=5.00, S.D.=0.00) consist of Maintaining seller relationship with seller zone service, Maintaining buyer relationship with promotion event 24 hours customer service, warranty of payment system.

Element 5: Revenue Streams ($\bar{x}$=4.71, S.D.=0.49) consist of Revenue from seller commission, Ad Revenues, Payment Revenues.

Element 6: Key Resources ($\bar{x}$=5.00, S.D.=0.00) consist of Multi-Technology, Augmented Reality (AR), Virtual Reality (VR), Mixed Reality (MR), Extended Reality (XR), Automation Human, Physical Assets.

Element 7: Key Activities ($\bar{x}$=5.00, S.D.=0.00) consist of Platform, Development, Data Center, Operations Mgmt, Marketing and Promotion Strategy and Customer Service.

Element 8: Key Partners ($\bar{x}$=5.00, S.D.=0.00) consist of Vender, Seller, Supplier, Media Partners, Delivery, Payment and Connection for reliance on distribution or public relations.

Element 9: Cost Structure ($\bar{x}$=5.00, S.D.=0.00) consist of Data Center Costs, General and Administrative, Marketing and Sale Cost, Research and Development and Employee Cost.
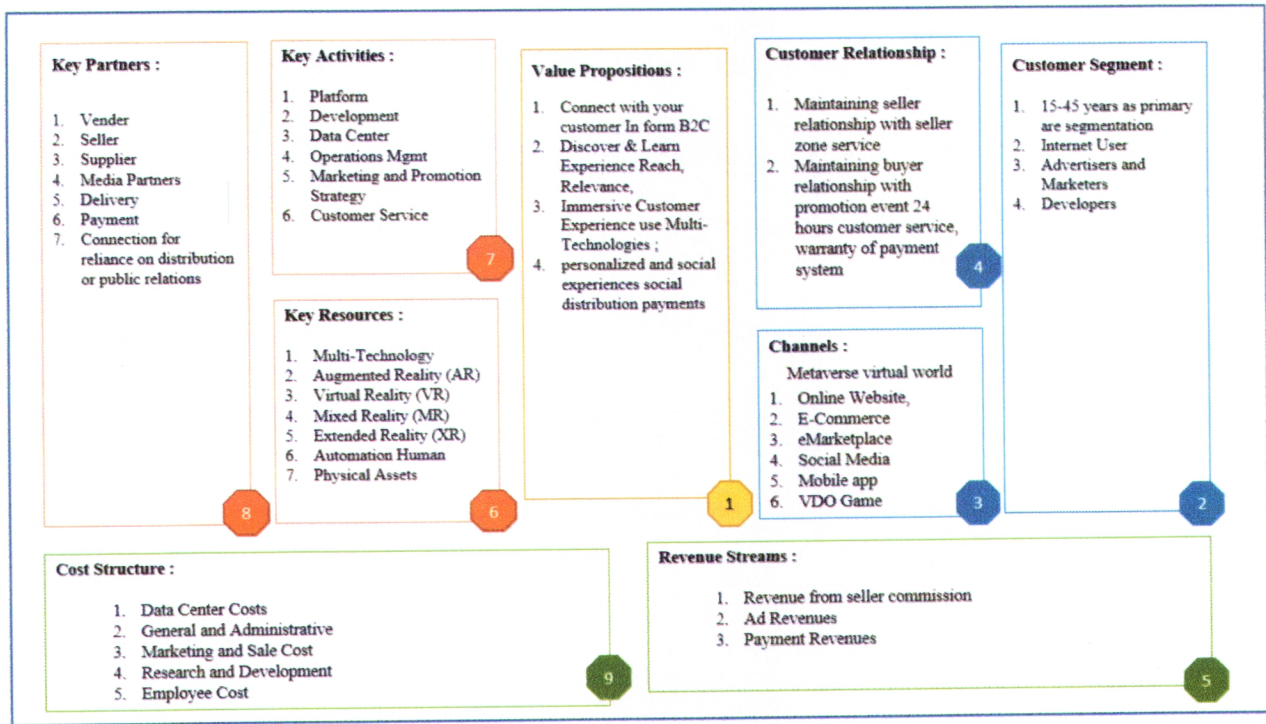
Fig. 7. Business Model Canvas for Business Online (by author)

Part 3: Study the results of Metaverse; virtual world for digital business

TABLE 3: RESULTS OF IMPLEMENTATION

Subject	Pass	Failed	Percent
Avatar	40	8	79.17
Content Creation	38	10	72.92
Virtual Economy	35	13	83.33
Social Acceptability	40	8	70.83
Security & Privacy	34	14	75.00
Trust & Accountability	36	12	79.17

(N=48)

From the table 3, carried out by 48 undergraduate students to create Metaverse; virtue world using Spatial.io. Evaluation was measured on a pass and failed and implementation on a scoring rubric. The sample was able to successfully create Avatars 79.17%, Create Content Creation successfully 72.92%, Create Virtual Economy successfully 83.33%, Create Social Acceptability successfully 70.83%, Create Security & Privacy successfully 75% and Create Trust & Accountability successfully 79.17%.
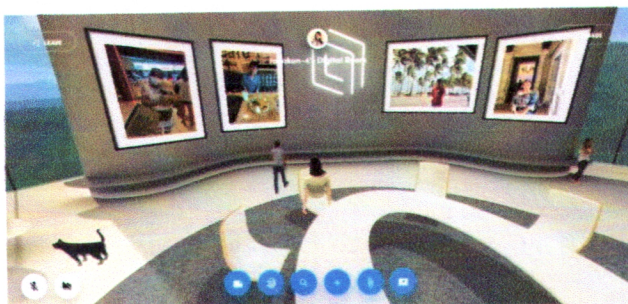
Fig. 8. Activity Create Metaverse, virture world

VI. DISCUSSION

Lik-Hang Lee, Tristan Braud, Pengyuan Zhou, Lin Wang, Dianlei Xu, Zijun Lin, Abhishek Kumar, Carlos Bermejo, Pan Hui [5] published research on the subject " All One Needs to Know about Metaverse: A Complete Survey on Technological Singularity, Virtual Ecosystem, and Research Agenda" They found that showed The Six Pillars of Metaverse Ecosystem. Huansheng Ning, Hang Wang, Yujia Lin, Wenxi Wang, Sahraoui Dhelim, Fadi Farha, Jianguo Ding, Mahmoun Daneshmand [23] Construction characteristics of Metaverse use Multi-technology, Social, Hyper Spatiotemporal on as a virtual world in conjunction with 5G and 6G future [23]. A new analytical framework was therefore derived from theoretical perspectives, and this represents a new direction for digital business in research. Research should now focus on the most important outcomes of digital business, creating an immersive customer experience affects business. such as Metaverse; virtual world challenges and opportunities for digital business, deep understanding According to customer's requirements create an exciting experience freedom to spend money at any time you want.

VII. CONCLUSIONS

Based on the results of the study, Metaverse; virtual world challenges and opportunities for digital business by using Business Model Canvas for business online. The results of the evaluation of experts in the digital business field. Total of 48 user is a test implement Metaverse; virtual world using Spatial.io. It is popular remote collaboration platform support technology 3D NFT AR VR interactive environment. Flexible multiple operating systems. Those

who come to platform can buy products as if they came to the real place. Supports business or working many ways which users can design and develop their own stores according to the format to be consistent with the business model that can be done as well Nowadays, artists who have paintings bring their own paintings to sell more widely. In conjunction with NFT technology, the sale of paintings, images have various copyrights. Trading with Cryptocurrency Technology, MetaMask, Coinbase wallet. Metaverse; virtual world to improve the business online and immersive customer experience. in future it is necessary to constantly monitor or collect data and analyze results from customers who are in Metaverse; virtual world, to analyze the purchase behavior. Usage Habits Data access behavior in the virtual world by tools and methods of virtual technology. They may develop systems that exchange information with digital platform from industry experts for digital business automation.
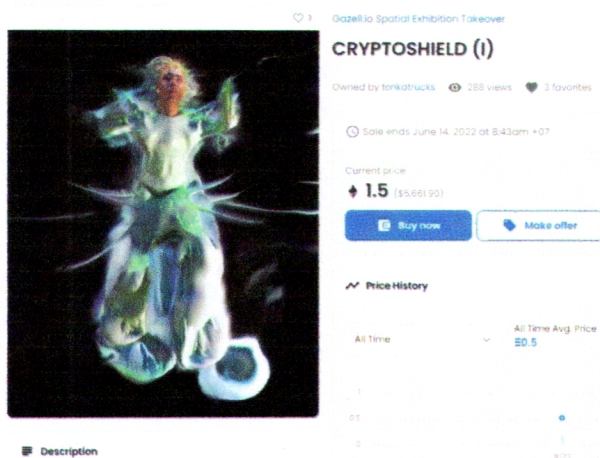
Fig. 9. OpenSea is the world's first and largest NFT marketplace
https://opensea.io/

Understand and prepare for this big change seriously. It may be a new important opportunity. to some businesses and it could be a serious crisis for some businesses as well if they can't adapt in time. Businesses have almost the same direction, which is to increase convenience for users. Create a virtual world and Ecosystem or various ecosystems to prepare for the world of Metaverse. It combines the real world with the virtual world by using technology. Develop into a virtual community through Mobile & Web Platform, Digital & Virtual Commerce, Chatbot, Interactive & Retail Innovation.

VIII. FUTURE WORKS

The future researchers are recommended to using immersive technology for Marketing Technology or Digital Marketing Automation for Active Campaign, Email Marketing Automation or Customer chat.

ACKNOWLEDGMENT

REFERENCES

[1] Bangkok Post, "Metaverse promises a boon for businesses," 2021. [Online]. Available: https://www.bangkokpost.com/business/2211519/metaverse-promises-a-boon-for-businesses.

[2] A. Hill, "How business can make the most of the metaverse," 2021. [Online]. Available: https://www.ft.com/content/61ce8588-5233-44d0-aa12-ce9ed60fb314.

[3] T. Trends, "메타버스 비즈니스 모델 및 생태계 분석," no. 2017, 2021.

[4] Bernard Marr, "The Enterprise Metaverse: What It Means for Businesses," 2021. [Online]. Available: https://bernardmarr.com/the-enterprise-metaverse-what-it-means-for-businesses/.

[5] P. H. Lik-Hang Lee, Tristan Braud, Pengyuan Zhou, Lin Wang, Dianlei Xu, Zijun Lin, Abhishek Kumar, Carlos Bermejo, "All One Needs to Know about Metaverse: A Complete Survey on Technological Singularity, Virtual Ecosystem, and Research Agenda," 2021.

[6] F. Bellalouna, "The Augmented Reality Technology as Enabler for the Digitization of Industrial Business Processes: Case Studies," *Procedia CIRP*, vol. 98, pp. 400–405, 2021.

[7] F. A. R. Ekmeil, M. S. S. Abumandil, M. I. Alkhawaja, I. M. Siam, and S. A. A. Alaklouk, "Augmented reality and virtual reality revolutionize rusiness transformation in digital marketing tech industry analysts and visionaries during Coronavirus (COVID 19)," *J. Phys. Conf. Ser.*, vol. 1860, no. 1, 2021.

[8] T. F. T. L. 2021, "How business can make the most of the metaverse," 2021. [Online]. Available: https://www.ft.com/home-beta.

[9] F. Company, "Three Insights On the Business Opportunity for the Metaverse," 2021. [Online]. Available: https://about.facebook.com/.

[10] VentureBeat, "Immersive experiences are driving customer loyalty," 2021. [Online]. Available: https://venturebeat.com/2021/09/17/how-immersive-experiences-are-driving-customer-loyalty/.

[11] Premio, "5 Ways to Create an Immersive Customer Experience for your eCommerce Store," 2021. [Online]. Available: https://premio.io/blog/customer-experience-for-ecommerce-store/.

[12] J. K. Mana Farshid, Jeannette Paschen, Theresa Eriksson, "Go boldly!: Explore augmented reality (AR), virtual reality (VR), and mixed reality (MR) for business, Business Horizons," *Bus. Horiz.*, vol. 61, no. 5, pp. 657–663, 2018.

[13] E. Cranmer and T. Jung, "Augmented Reality (AR) : Business Models in Urban Cultural Heritage Tourist Destinations," *12th APacCHRIE Conf.*, 2014.

[14] P. A. Kaplan, A. D., Cruit, J., Endsley, M., Beers, S. M., Sawyer, B. D., & Hancock, "The Effects of Virtual Reality, Augmented Reality, and Mixed Reality as Training Enhancement Methods: A Meta-Analysis," *Hum. Factors Inf. Technol.*, vol. 63, no. 4, pp. 706–726, 2021.

[15] A. Inc, "Here are just a few great ways to experience AR," 2021. [Online]. Available: https://www.apple.com/augmented-reality/.

[16] G. Zhylkybay, S. Magzhan, Z. Suinzhanova, M. Balaubekov, and P. Adiyeva, "The Effectiveness of Using the Project Method in the Teaching Process," *Procedia - Soc. Behav. Sci.*, vol. 143, pp. 621–624, 2014.

[17] K.-J. K. Kim, Kyeng-Jin, Moon-Ji Choi, "Effects of Nursing Simulation Using Mixed Reality:A Scoping Review," *Healthcare*, vol. 9, no. 8, p. 948, 2021.

[18] A. O. J. Kwok and S. G. M. Koh, "COVID-19 and Extended Reality (XR)," *Curr. Issues Tour.*, vol. 24, no. 14, pp. 1935–1940, 2021.

[19] Å. Fast-Berglund, L. Gong, and D. Li, "Testing and validating Extended Reality (xR) technologies in manufacturing," *Procedia Manuf.*, vol. 25, pp. 31–38, 2018.

[20] Y. Erlyana and H. Hartono, "Business model in marketplace industry using business model canvas approach: An e-commerce case study," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 277, no. 1, 2017.

[21] J. L. Michael Hamwi, Iban Lizarralde, "Demand response business model canvas: A tool for flexibility creation in the electricity markets," *J. Clean. Prod.*, vol. 282, 2021.

[22] C. R. & J. M. Tachia Chin, Yi Shi, "Confucian business model canvas in the Asia Pacific: a Yin-Yang harmony cognition to value creation and innovation," *Asia Pacific Bus. Rev.*, vol. 27, no. 3, pp. 342–358, 2021.

[23] M. D. Huansheng Ning, Hang Wang, Yujia Lin, Wenxi Wang, Sahraoui Dhelim, Fadi Farha, Jianguo Ding, "A Survey on Metaverse : the State-of-the-art, Technologies, Applications, and Challenges," *Cornell Univ.*, 2021.

Tippawan Meepung is a lecturer at the Faculty of Business Administration and Information Technology Rajamangala University of Technology Tawan-Ok Chakrabongse Bhuvanarth Campus, Thailand. She is research interests include Digital Marketing, Digital Business and Digital Technology.

Phudit Kannikar is a lecturer at the Faculty of Business Administration and Information Technology Rajamangala University of Technology Tawan-Ok Chakrabongse Bhuvanarth Campus, Thailand. He is research interests include Digital Technology and Digital Publishing.

แบบขออนุมัติรางวัลแก่นักวิจัยที่มีผลงานวิจัยตีพิมพ์ในวารสารวิชาการ
ระดับชาติและระดับนานาชาติ

ชื่อการประชุมวิชาการ/วารสารวิชาการ The 7th International Conference on Digital Arts, Media and Technology (DAMT) and 5th ECTI Northern Section Conference on Electrical, Electronics, Computer and Telecommunications Engineering (NCON)

ชื่อบทความ (ไทย) ปัญญาประดิษฐ์เพื่อการดำเนินธุรกิจดิจิทัล

ชื่อบทความ (อังกฤษ) Artificial Intelligence for Digital Business Performance

ประเภทบทความ ☑ การประชุมวิชาการ วันที่จัดการประชุม 26-28 มกราคม 2565

นำเสนอใน session ที่ 2 เวลา 10.00-10.15 น. วันที่ 28 มกราคม 2565

    ☐ เทคนิคการรายงานวารสารปริทัศน์

    ☐ วารสารวิชาการที่ปรากฏในฐานข้อมูล

        ☐ TCI 1   ☐ TCI 2   ☐ SCOPUS (Q1,2) ☐ SCOPUS (Q3,4) ☐ ISI

    ☐ อนุสิทธิบัตร   เลขที่อนุสิทธิบัตร_____

    ☐ สิทธิบัตร   เลขที่สิทธิบัตร_____

ระดับบทความ   ☐ ระดับชาติ   ☑ ระดับนานาชาติ

ตีพิมพ์เผยแพร่   IEEE   ISBN: 978-1-6654-9510-3

ลำดับที่	ชื่อผู้แต่ง / ผู้ร่วมแต่ง	จำนวนเงิน (บาท)	ลายมือชื่อ
1	นางสาวทิพวรรณ มีพึ่ง	3,000	*(ลายเซ็น)*
2	นายภูดิท กรรณิการ์	-	*(ลายเซ็น)*
3			
รวมเป็นเงิน (ตัวหนังสือ) (สามพันบาทถ้วน)			

_____ ผู้ยื่นเรื่อง
(นางสาวทิพวรรณ มีพึ่ง   )
วันที่ _____/_____/_____

_____ รองคณบดีฝ่ายวิชาการฯ
(นางสาวสุมาลี สมนึก   )
วันที่ 23 / สค / 65

_____ หัวหน้าสาขาวิชา
(นายสุทธิรักส์ ศุขเขษม   )
วันที่ _____/_____/_____

_____ คณบดี
(นางสาวละอองศรี เหนี่ยงแจ่ม   )
วันที่ 24 / มีนาคม 2565

ผู้อำนวยการสถาบันวิจัยและพัฒนา (เลขานุการคณะกรรมการ)	ผลการพิจารณาของอธิการบดี/ผู้รับมอบอำนาจ (ประธานคณะกรรมการ)
	☐ อนุมัติ ☐ ไม่อนุมัติ
_____ ( ) วันที่ _____/_____/_____	_____ ( ) วันที่ _____/_____/_____

The. 7th International Conference on Digital Arts, Media and Technology (DAMT)
and 5th ECTI Northern Section Conference on Electrical, Electronics,
Computer and Telecommunications Engineering (NCON)

School of Computer and Information Technology
Chiang Rai Rajabhat University

26-28 JANUARY 2022

Artificial Intelligence for Digital Business Performance

1st Tippawan Meepung
*Faculty of Business Administration
and Information Technology
Rajamangala University of
Technology Tawan-OK*
Bangkok, Thailand
tippawan_me@rmutto.ac.th

2nd Phudit Kannikar
*Faculty of Business Administration
and Information Technology
Rajamangala University of
Technology Tawan-OK*
Bangkok, Thailand
phudit_ka@rmutto.ac.th

Abstract— Unique and different consumer behaviors that are important for the decision to purchase products or services of the business, as well as how data is collected and used for effective marketing. Digital marketing tools, including understanding customer journey, affect digital marketing in different ways. Learn consumer behavior and customer journey, as well as how to use digital marketing tools for effective marketing. For marketing around the world, the ability to use AI and machine learning to help with marketing is getting clearer, and there are many marketing technology tools that bring AI and machine learning capabilities to the application of marketing in an interesting way. It saves time searching for information, getting faster results. It can be used to create content like follower to increase sales, followers, and engagement a lot more, or for businesses with websites, it uses AI to track consumer behavior and help segment people who visit your website. Use data to increase sales and connect to other businesses.

Keywords— Artificial Intelligence, Digital Business Performance, AI for Marketing.

I. INTRODUCTION

McKinsey Global Institute revealed that organizations including businesses are using AI and machine learning to improve marketing and develop sales by up to $1.4 to $2.6 billion over the next three years. The New Normal is an era. Artificial intelligence (AI) has become more active in everyday life and work than ever before. Business used AI to operate electrical appliances via mobile. AI in digital marketing is a tool for online marketing to be more efficient. facebook ads uses AI for Search audience insight. Analyze your target audience at an accurate point. save time searching for information, get faster results Bring information to create content to your heart's content. follower to increase sales followers and engagement a lot more. Use data to increase sales and build on other businesses [1]. AI allows the machine to learn from experience and adapt to new information. AI can help with analysis, marketing planning and can increase revenue for businesses. AI is behind and a key helper of marketers and continues to grow in the future, the ability to use AI and machine learning to help market is becoming visually visible, and there are many marketing technologies tools that apply AI and machine learning capabilities for interesting marketing purposes. In addition to the ai approach to marketers, there are examples of well-known businesses adapting and investing in AI in enhancing the efficiency and effectiveness of their businesses [2][3]. AI is used in many industries. Learn customer insights with tailored communication. create an online shopping experience over competitors save time, manage the stock of online stores.

II. LITERATURE REVIEW

A. Artificial Intelligence (AI)

Artificial Intelligence has been in the spotlight for some time now. It is a complex and broad subject. defining AI may be challenging to do because of its nature [4]. As you know, we live in an era where AI has a lot of capabilities, whether it's automated processes or even many of the tools we use today, such as google search, google map, Siri, all using AI and machine learning capabilities. AI capabilities include:

- improves accuracy
- AI analyzes data to gain valuable insights
- with use smart algorithms
- AI is also adapted to new inputs
- automatically simplify

B. Key Drives of Artificial Intelligence (AI)

1) Big Data

Big data contains customer information, product information. Buyers' behavior and many more are changing rapidly. Big Data analytics makes possible to know about customers feel on products, helping businesses reach new audiences to create more leads [5][6].

1. Customer data helps marketers understand their target audience. Businesses can use customer information that includes shopping habits to plan and recommend products to customers appropriately in the future. It enables understanding of customer journeys from shopping. Buying decisions and after purchase use that information to improve customer relationships.

2. Financial data helps you measure performance and operate more efficiently. Planning to allocate the most potential budget for the big data marketing team will help you allocate your budget to the best of ability.

2) Machine Learning

Is a subset of artificial intelligence. Being able to learn on system of the sales processes. Smart tools can greatly boost digital marketing results. Businesses will be able to handle big data. The learning process classification consists of two

main categories of supervised and unsupervised learning. Supervised technology is based on training the machine on the known set of input and output data to teach to predict the outcomes of the unknown data sets. As a result of obtaining the classification technique, the technology determines the group to which the new data belongs and adjusts the future actions accordingly [8] . Working with the data ranges, and numerical outputs are two main cases for the use of the tool. The technique has powered the possibility for predictions of such outcomes as potential leads [7][9].

C. Artificial Intelligence (AI) for Digital Marketing

Marketing, especially Digital Marketing, would be the area that will have the most leverage of Artificial Intelligence [4]. AI is often used where speed plays an important role and is essential in marketing efforts. To best communicate with customers [10]. Marketers find strategies for market share by creating the right strategy. study customer needs to plan or define marketing strategies and analyze consumer data effectively. AI capabilities are as follows: 1) promote products and services; analyze the feedback from advertising sales increases for improve the next promotion, 2) identify your target audience quickly and accurately; AI performs a record function. remember, analyze, and automate marketing send images of adverts of that product to websites, platforms, applications, social media, or digital media. To stimulate the demand for consumers to eventually cut their purchasing decisions and 3) create good relationships between business and consumers ; respond to customers all the time helps to recommend find the right answers, including customer support in all kinds of ways. [11][12][13].

1) Content Marketing

AI makes content creation easy and appealing to readers because AI algorithms can create articles with simple content themselves. Evaluate content or insights and can also create articles as videos. AI capabilities to support present content marketing strategy, create images and ad content to communicate with target customers and increase sales for your business [14].

2) Ads Optimization

AI promotes products and makes ads effective. AI can analyze and help make advertising decisions and analyze results to more accurately tailor them to consumer audiences and behaviors, also known as retargeting. Collect customer information to provide information for future extensions. Make people know the brand a lot and turn people who used to buy into customers again. AI predicts the performance of upcoming creative Ads. AI helps find in-depth analysis or analyze on groups of text ads we should use. Using budget downgrade capabilities based on Ads performance [15].

3) Personalization Experience

AI enables target communication, relevance, and offers the right time for service products or discounts. Machine learning personalization is suitable for businesses with tens of thousands of products inventory that cannot be fully rules-based for each product [14].

4) Search Engine Optimization

AI makes SEO (Search Engine Optimization) or search engine optimization easy, helping websites or webpages to be ranked at the top of searches. SEO managers play many technical and content roles, but moving forward, role positions are more focused on analytics and strategy [14].

5) Web User Interface Designing

AI helps create a modern brand image. It helps to design beautiful pages. Simply entering the information, you need, AI will analyze and recommend the design of the page to the user, which will help create a unique landing page. To attract more visitors. The application of AI capabilities in marketing and data is also part of MarTech as a design tool, such as website design or digital materials [3].

D. Marketing Mix

The marketing mix concept is one of the core concepts of marketing theory include 1. *Product*: finding something that meets the needs of your target audience and benefits your business 2. *Price*: define a sales price strategy that covers costs and profits an item or service 3. *Place*: choosing a way to sell products or services that meet the target audience 4. *Promotion*: strategy to offer products or services to attract interested audiences 5. *People*: developing employees to be of high quality and able to meet the needs of the target audience appropriately 6. *Privacy* : privacy collecting customer personal information and 7. *Personalize*: provide specific services, studying customer behavior, using Cookies [13][18][19][20]. The benefits of AI support business in many ways, helping entrepreneurs better understand customer behavior. To offer a better shopping experience, find new ways. To engage customers and provide automated advice, even using AI to analyze and solve business problems, it makes it important to apply technology to businesses. AI implementation in the retail sector focuses on resolving the issue of improving efficiency in supply chains, inventory balances, setting reasonable prices, and improving customer experiences.

6) Conversation Marketing (Chatbots)

Conversational marketing is a direct communication between a business and a customer an automated answering system. Conversation-oriented marketing Connect multiple responses to automate messages, helping to build stronger relationships with customers or buyers. AI builds trust with your target audience and strengthens customer relationships with chatbot or computer programs designed to simulate human conversations 24 hours [1]. There are two types of chatbots: 1) A front-end chatbot that is used to answer common questions, simple and simple questions that customers can answer in a straightforward way by directly discussing with AI and 2) A way to help customer service representatives in conversations. AI assist customer service, where customers will talk to service providers with AI to help them find the most appropriate answers, allowing agents and staff to correct or format them as appropriate [16][17].

III. RESEARCH OBJECTIVE

1. To analyzed and synthesized the conceptual framework for artificial intelligence for digital business performance.
2. To design the use case diagram, system architecture and system structure for digital business performance.
3. To develop digital business performance.
4. To evaluate the quality and efficiency of digital business performance.

IV. RESEARCH METHODOLOGY

The researcher reviewed previous studies in the field and developed Artificial Intelligence for digital business performance. This covered as follows:

Phase 1: To analyzed and synthesized the conceptual framework of the artificial intelligence for digital business performance from the document researches and literature review.

The researcher studied the relevant documents and researches by integrating different theories in order to create the conceptual framework of Artificial Intelligence for digital business performance, as shown in figure 1 and figure 2.
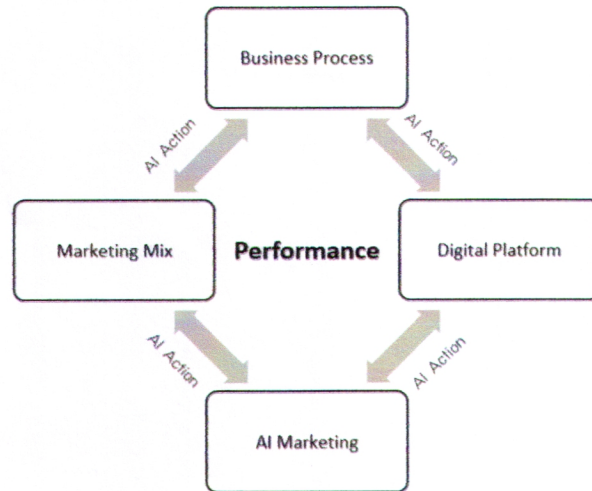

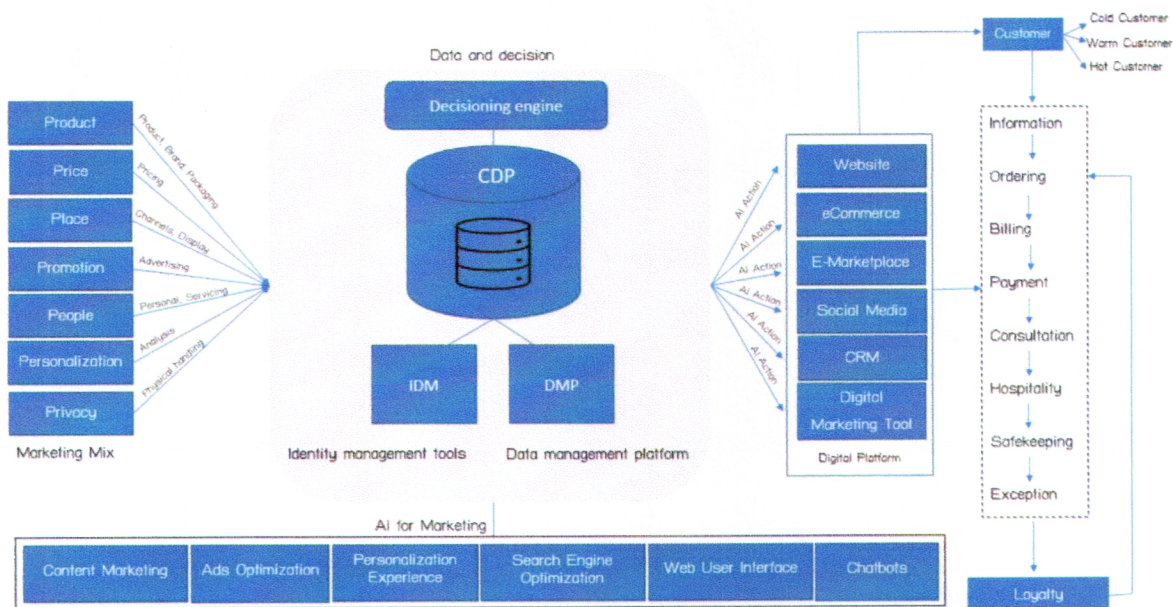Fig. 1. AI and digital business performance

Fig. 2. Conceptual framework of digital business performance

Phase 2: To design the use case diagram and system of digital business performance.

The design of the developed digital business performance consisted of 1. Create the use case diagram; 2. Design the system of the digital business performance.

A. Use case diagram is a tool to design the overall of system. Shows the system users work. and relationships of sub systems for Use case diagram. It illustrates the relationship between stakeholders/users and the sub-systems. The use case diagram is shown in figure 3. Administrator is responsible for add new product, create content, respond to chat, reply feedback, add new staff and view report. Customer is responsible for register, login, view product, add to cart, payment, chat online, track delivery, post feedback and check out. Delivery is responsible for the record delivery, check information and delivery information. AI action support administrator for building deals, product content, price forecasting, demand forecasting and AI action support customer for search results, review and rating, selection the seller and feedback, etc.

Fig. 3. Use case diagram

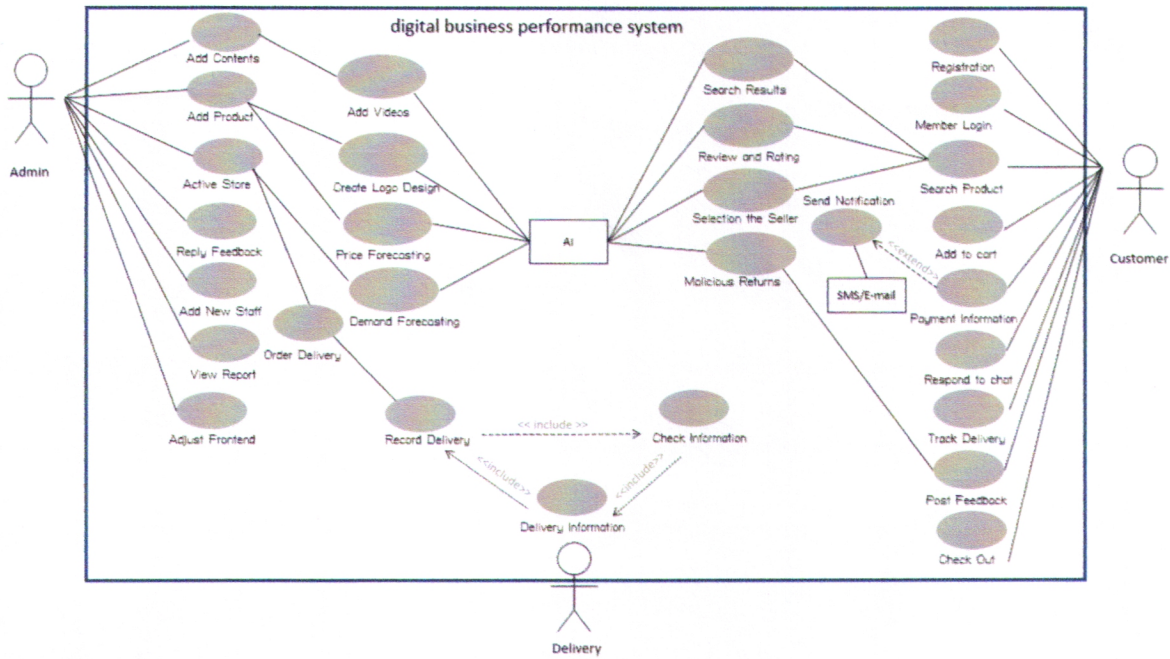**B. System**: Digital business performance system show in figure 4 the composition of operation structure.

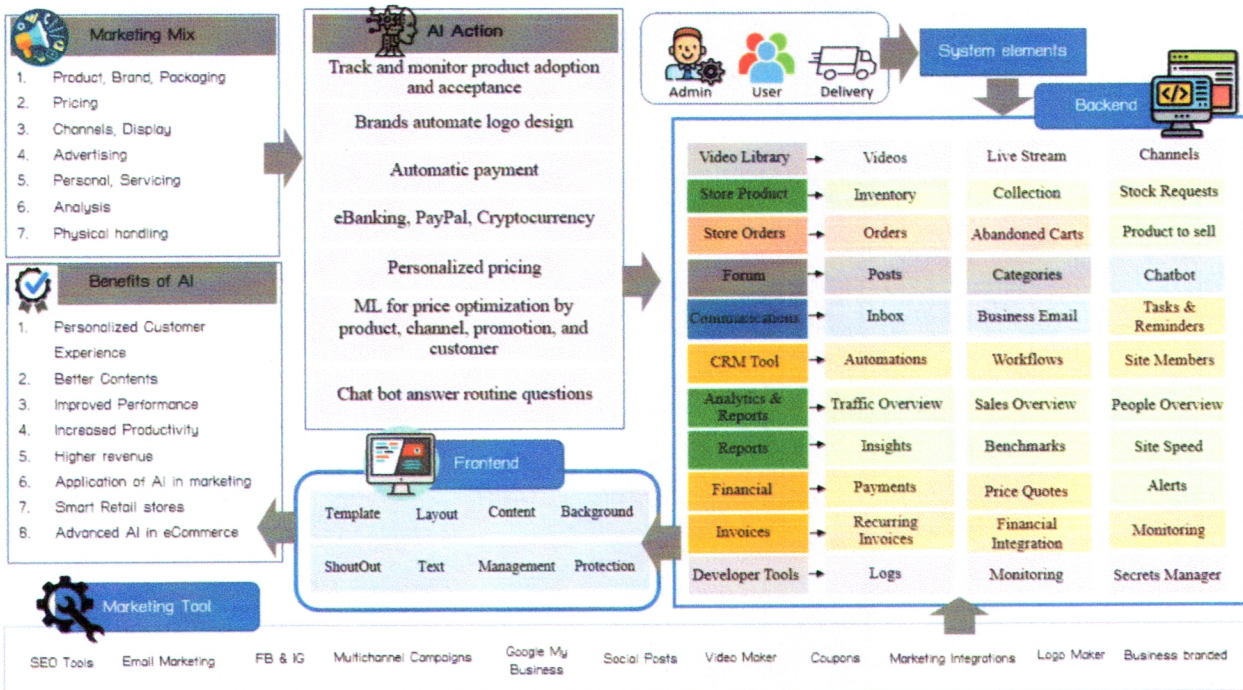The developed system of digital business performance consists of elements as below.

Fig. 4. System of digital business performance

Maintain data quality of AI for digital business performance as shown in table 1. in the table 2. is the benefits of AI for digital business performance.

TABLE 1:

MAINTAIN DATA QUALITY OF AI

FOR DIGITAL BUSINESS PERFORMANCE

AI for digital business performance	[21]	[22]	[23]	[24]	[25]	[26]	[27]	Synthesis Results
Accurately	•	•	•	•	•	•	•	•
Real time	•	•	•	•	•	•	•	•
Complete and complete information	•	•	•	•	•	•	•	•
Unique of the data.	•	•	•	•	•	•	•	•
Formatted of data sources	•	•	•	•	•	•	•	•
Trusted for data	•	•	•	•	•	•	•	•

TABLE 2:

BENEFITS OF AI FOR DIGITAL BUSINESS PERFORMANCE

AI for digital business performance	[8]	[28]	[29]	[30]	[31]	[32]	[33]	Synthesis Results
Personalized Customer Experience	•	•	•	•	•	•	•	•
Better Contents	•	•	•	•	•	•	•	•
Improved Performance	•	•	•	•	•	•	•	•
Increased Productivity	•	•	•	•	•	•	•	•
Higher revenue	•	•	•	•	•	•	•	•
Application of AI in marketing	•	•	•	•	•	•	•	•
Smart Retail stores	•	•	•	•	•	•	•	•
Advanced AI in eCommerce	•	•	•	•	•	•	•	•

TABLE 3:

RESULTS OF THE QUALITY

OF DIGITAL BUSINESS PERFORMANCE

Indicators of digital business	Digital business performance	$\bar{x}$	S.D.	Quality Level
Awareness	Brand Awareness	4.14	0.69	high
Consumer perception of brands	Audience Growth Rate	4.43	0.79	high
	Post Reach	4.29	0.76	high
	Potential Reach	4.14	0.69	high
	Social Share of Voice (SSoV)	4.14	0.38	high
Engagement	Applause Rate	4.43	0.53	high
Consumer engagement with brand communication	Average Engagement Rate	3.86	0.90	high
	Amplification Rate	4.00	0.58	high
	Virality Rate	4.43	0.53	high
Conversion	Conversion rate	4.00	0.58	high
Measurement of customer actions	Click-Through Rate (CTR)	3.71	0.49	high
	Bounce Rate	3.29	0.49	medium
	Cost-Per-Click (CPC)	3.86	0.38	high
	Cost Per Thousand Impressions (CPM)	4.00	0.82	high
	Social Media Conversion Rate	4.29	0.49	high
	Conversation Rate	4.14	0.38	high
Consumer	Customer Testimonials	4.57	0.53	highest
Evaluate customer actions	Customer Satisfaction (CSat)	4.43	0.53	high
Total		4.12	0.58	high

V. RESULTS

A. Results of the Artificial Intelligence for digital business performance

Artificial Intelligence is a process of digital business performance for supporting entrepreneurs' online business. details are provided in Fig. 5
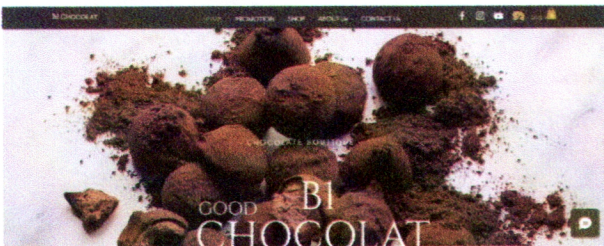

Fig. 5. Artificial Intelligence for digital business performance

B. Results of quality and efficiency evaluation of Artificial Intelligence for digital business performance

I. DISCUSSION

The digital business performance as a tool to support entrepreneur. the conclusion can be made as follows:

1. Administrator: refers to entrepreneurs or employees. an agent with access to the system in the 1) Backend section. in management, add products. enter item details enter content, check orders, check stock, interact with customers. view summary of order reports, bestseller reports, payment reports, deliver the product to customers, and so on. and 2) For its part, Frontend makes modifications to the template, modifying the aesthetics of the website, with AI helping to design it to be beautiful and professional.

2. User: means customers or interested parties to visit the website for product details. The customer will search for the information of the interested products to make an order decision. The customer's ordering process can be divided as follows: 1) register 2) login 3) view product 4) add to cart 5) payment 6) chat online 7) track delivery 8) post feedback 9) checkout.

3. Delivery: 1) entrepreneurs or employees check purchase order 2) send the product and 3) notify the customer to track their product status.

4. AI Action: 1) track and monitor product adoption and acceptance 2) brands automate logo design 3) automatic payment 4) eBanking, PayPal, Cryptocurrency 5)

personalized pricing 6) ML for price optimization by product, channel, promotion, customer and 6) chat bot answer routine questions.

5. The Results of quality of digital business performance showed that the overall quality was rated at a high level ($\tilde{x}$=4.12, S.D.=0.58).

II. CONCLUSION

Artificial Intelligence for Digital Business Performance works well by learning deeply of machines with deep learning capabilities, showing that it is a hand machine that accurately knows the needs of future consumers, and also has the ability to connect sales with the number of purchases that are the frequency of advertising [34]. Social media marketing technology is flexible, customizable to integrate, as well as operate. Information is encourages successful business, including formulating strategies on package and promote programs to attract customers [35]. Collect and analyze important information about your customers and competitors. help manage, improve, and develop business. AI Marketing build trust with target audiences and strengthens good relationships with customers. AI chatbot is of interest to very large businesses. Because it can help with a lot of customer service well and work every time without rest. As a result, many companies are increasingly investing in this tool to help. Artificial Intelligence is a matter of high attention from people around the world. Regardless of the sector, especially technology companies, are constantly interested in implementing artificial intelligence in sales and marketing strategies. The importance of Artificial Intelligence to marketing it is very important because AI capabilities can help with recognition. complex solutions translation or planning, planning enable marketers to analyze their business. The target audience is more accurate from ai-based marketing data, which in the core of AI, some of which include what is known as machine learning (ML), allowing it to create some systems to learn and solve problems on their own. Creating websites but not adept at AI marketing can help you create websites that enhance your brand's modern image by simply putting the information. AI in the SEO world can therefore highlight the best and most relevant strategy for your website, which is an enormously useful tool in superior competition.

AUTHOR CONTRIBUTIONS

Tippawan Meepung conducted the research; Phudit Kannikar the research consulting and approved the final version.

ACKNOWLEDGMENT

REFERENCES

[1] H. B. Review, "How to Design an AI Marketing Strategy," 2021. [Online]. Available: https://hbr.org/2021/07/how-to-design-an-ai-marketing-strategy.

[2] D. Dumitriu and M. A. M. Popescu, "Artificial intelligence solutions for digital marketing," *Procedia Manuf.*, vol. 46, no. 2019, pp. 630–636, 2020.

[3] J. Lies, "Marketing Intelligence and Big Data: Digital Marketing Techniques on their Way to Becoming Social Engineering Techniques in Marketing," *Int. J. Interact. Multimed. Artif. Intell.*, vol. 5, no. 5, p. 134, 2019.

[4] J. Holmi, "Förnamn Efternamn Artificial Intelligence in Digital Marketing Now and in the future," 2021.

[5] A. Amado, P. Cortez, P. Rita, and S. Moro, "Research trends on Big Data in Marketing: A text mining and topic modeling based literature analysis," *Eur. Res. Manag. Bus. Econ.*, vol. 24, no. 1, pp. 1–7, 2018.

[6] L. I. U. Xiao-Yuan, "Agricultural products intelligent marketing technology innovation in big data era," *Procedia Comput. Sci.*, vol. 183, pp. 648–654, 2021.

[7] E. Ragozina, "Analysis of the main Artificial Intelligence marketing trends and their potential impact on Targeting Generation Z," 2019.

[8] S. Verma, R. Sharma, S. Deb, and D. Maitra, "Artificial intelligence in marketing: Systematic review and future research direction," *Int. J. Inf. Manag. Data Insights*, vol. 1, no. 1, p. 100002, 2021.

[9] B. Frank, B. Herbas-Torrico, and S. J. Schvaneveldt, "The AI-extended consumer: Technology, consumer, country differences in the formation of demand for AI-empowered consumer products," *Technol. Forecast. Soc. Change*, vol. 172, no. July, 2021.

[10] P. Kumar, "Role of Artificial Intelligence (AI) in Marketing," no. August, 2021.

[11] K. J. Aladayleh, "A framework for integration of artificial intelligence into digital marketing in Jordanian commercial banks.," *J. Innov. Digit. Mark.*, vol. 1, no. 1, pp. 32–39, 2020.

[12] C. Olson and J. Levy, "Transforming marketing with artificial intelligence," *Appl. Mark. Anal.*, vol. 3, no. 4, pp. 291–297, 2018.

[13] M. H. Huang and R. T. Rust, "A Framework for Collaborative Artificial Intelligence in Marketing," *J. Retail.*, no. 4, 2021.

[14] K. Nair and R. Gupta, "Application of AI technology in modern digital marketing environment," *World J. Entrep. Manag. Sustain. Dev.*, vol. 17, no. 3, pp. 318–328, 2020.

[15] A. Schneider-Kamp, "The Potential of AI in Care Optimization: Insights from the User-Driven Co-Development of a Care Integration System," *Inq. (United States)*, vol. 58, 2021.

[16] W. H. S. Tsai, D. Lun, N. Carcioppolo, and C. H. Chuan, "Human versus chatbot: Understanding the role of emotion in health marketing communication for vaccines," *Psychol. Mark.*, no. April 2020, pp. 1–16, 2021.

[17] M. D. Illescas-Manzano, N. V. López, N. A. González, and C. C. Rodríguez, "Implementation of chatbot in online commerce, and open innovation," *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 7, no. 2. 2021.

[18] T. H. Thabit and M. Raewf, "The Evaluation of Marketing Mix Elements: A Case Study," *Int. J. Soc. Sci. Educ. Stud.*, vol. 4, no. 4, 2018.

[19] K. S. Al Badi, "The Impact of Marketing Mix on the Competitive Advantage of the SME Sector in the Al Buraimi Governorate in Oman," *SAGE Open*, vol. 8, no. 3, 2018.

[20] Budiyono, M. Tho'in, D. Muliasari, and S. A. R. Putri, "An analysis of customer satisfaction levels in islamic banks based on marketing mix as a measurement tool," *Ann. Rom. Soc. Cell Biol.*, vol. 25, no. 1, pp. 2004–2012, 2021.

[21] S. Lindig *et al.*, "International collaboration framework for the calculation of performance loss rates: Data quality, benchmarks, and trends (towards a uniform methodology)," *Prog. Photovoltaics Res. Appl.*, vol. 29, no. 6, pp. 573–602, 2021.

[22] A. Wenz, T. Al Baghal, and A. Gaia, "Language Proficiency among Respondents: Implications for Data Quality in a Longitudinal Face-To-Face Survey," *J. Surv. Stat. Methodol.*, vol. 9, no. 1, pp. 73–93, 2021.

[23] and R. S. Sari, Karina , Priwanza, Herfran Rhama, Kharisma, Sandi Rizky, "Digitalization in Collaborative Framework : Maintain High Quality Drilling Performance in Mahakam's Complex Well Preparation," in *Paper presented at the SPE/IATMI Asia Pacific Oil & Gas Conference and Exhibition*, 2021.

[24] F. Kazi and A. Mushtaq, "SHEA Spring 2021," *Lancet. Infect. Dis.*, vol. 21, no. 6, p. 771, 2021.

[25] P. Eyal, R. David, G. Andrew, E. Zak, and D. Ekaterina, "Data quality of platforms and panels for online behavioral research," *Behav. Res. Methods*, no. August, 2021.

[26] M. . Verma, P., Kumar, V., Mittal, A., Rathore, B., Jha, A. and Rahman, "The role of 3S in big data quality: a perspective on operational performance indicators using an integrated approach," *TQM J.*, 2021.
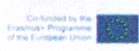
CERTIFICATE

THIS CERTIFICATE IS AWARDED TO

Tippawan Meepung and Phudit Kannikar

THIS ORAL PRESENTATION IS PRESENTED FOR YOUR PAPER ENTITILED:

Artificial Intelligence for Digital Business Performance

The 7th International Conference on Digital Arts, Media and Technology (DAMT) and
5th ECTI Northern Section Conference on Electrical, Electronics, Computer and Telecommunications Engineering (NCON)

_____
ASST.PROF. DR.PRADORN SUREEPHONG
GENERAL CHAIR

_____
ASST.PROF. DR.PUMIPONG DUANGTANG
GENERAL CO-CHAIR

PID-27