

Developing Product Promotion Models Using Augmented Reality Technology and Using Data to Develop Business Intelligence

Yotsaporn Pugdeechon¹, Suwut Tumthong²

¹ Master degree in Digital Media Technology, Faculty of Science and Technology
Rajamangala University of Technology Suvarnabhumi
Nonthabury, Thailand
e-mail: 164480322005-st@rmutsb.ac.th

² Department of Computer Science, Faculty of Science and Technology
Rajamangala University of Technology Suvarnabhumi
Nontabury, Thailand
e-mail: suwut.t@rmutsb.ac.th

Abstract— This paper “developing product promotion models using augmented reality technology and using data to develop business intelligence” is in partially fulfilment of the requirements for master degree in Digital Media Technology. There are four elements for developing product promotion models: 1) business intelligence (BI), 2) augmented reality technology (AR) for sales promotion, 3) customer relationship management, and 4) dashboard. This model is in form of data archive in the digital format by utilising business intelligence as a management tool with dashboard for practitioners and executives. In addition, AR is applied for enhancing sales promotion. All information is also managed for a better effectiveness of customer management.

The results are illustrated into two aspects. First, in relation to the appropriateness of product promotion models using augmented reality technology and using data to develop business intelligence from 36 experts from 12 workplaces rated as the most appropriate ($\bar{x}=4.53$). Second, in terms of a model for product promotion with the use of AR and using data to develop business intelligence from ten experts’ assessment, it is the most appropriate ($\bar{x}=4.63$).

Keywords- Augmented Reality Technology (AR), Business Intelligence (BI), Sale Promotion, Customer Relationship Management (CRM)

I. INTRODUCTION

Nowadays, numerous organisations aim to develop their products with good quality and best services for customers. Customer relationship management or providing useful information about a product can lead to customers’ decision. Companies can apply this technology and information for a better benefits and effectiveness, including strategic planning, management, executives’ decision, and customers’ decision. This is called business intelligence (BI) [1].

The examples of business intelligence (BI) are the development of a business intelligence by data warehouse [2], development of business intelligence system to support electrical distribution [3], a customers’ decision support for product by association rules [4], book recommendation [5], course introduction [6], association rule algorithm [7]. However, the most effective method that can support numerous products is scalable association rule learning (SARL) [8].

Augmented Reality (AR) can enable users via computer by combining 3D objects with 3D-real setting in real time [9]. This system can widen customers’ vision and experiences towards products [10]. In addition, it can be used for sales promotion [11] in order to increase product values and total sales. It can be applied in various aspects such as food [12] and users’ experience [13].

Customer Relationship Management (CRM) is the development between a company and a target customer by initiating activities that create customers’ good perception towards products, services, and companies. [14] CRM is both strategies and technology for this new era by focusing on customers’ value as a marketing decision model [15]. The goal is the high increase in effectiveness of customers’ value for towards companies both present and in the near future [16].

Developing product promotion models using augmented reality technology and using data to develop business intelligence is conducted in a friendly-user way by business intelligence (BI) for data management with dashboard for administration task. In addition, augmented reality technology is applied for promote sales promotion. All data brought from this model can elevate effectiveness in terms of customer relationship management (CRM).

II. RESEARCH OBJECTIVES

1. To study and analyse elements of the development of business intelligence promotion model by augmented reality technology (AR) and using data to develop business intelligence.
2. To design the development of business intelligence promotion model by augmented reality technology (AR) and using data to develop business intelligence.
3. To assess the development of business intelligence promotion model by augmented reality technology (AR) and using data to develop business intelligence.

III. PROPOSED METHODOLOGY

The process is divided into three steps as follows:

1. Related documents, research articles, and dissertations about business intelligence promotion and augmented reality technology were studied.
2. This model was logically designed based on conceptual framework.
3. This model was assessed its appropriateness by five experts from institutions and five experts from outside.

The criteria used for appropriateness assessment was 5-rating scale as follows: This assessment form used was Index of item objective (IOC) by five experts. The criteria is as follows:

- 1 if the item is congruent.
- 0 if the item is not certainly congruent.
- 1 if the item is not congruent.

After that, scores from the experts were calculated and interpreted as follows:

- If IOC values from 0.50-1.00, it is valid.
- If IOC value is below 0.50, the items in the assessment form need improvement.

IV. RESULTS AND DISCUSSION

1. Results from reviewing related documents about developing product promotion models using augmented reality technology and using data to develop business intelligence lead to three elements illustrated as follows:

1.1 Management

1.1.1 Recording information of customers, total sales, and products at least three years in the digital format

1.1.2 Generating customer relationship system for establishing customer bonds

1.1.3 Creating new sales promotion strategies for persuading new customers for ordering products

1.1.4 Generating innovative consultation system for sales promotion via a variety sales channels

1.2 Digital Technology

1.2.1 Utilizing business intelligence (BI) as a management tool

1.2.2 Employing customer relationship management

1.2.3 Enhancing sale promotion by augmented reality technology (AR)

1.3 Services

1.3.1 Empowering staff to be knowledgeable and skilful in digital technology

1.3.2 Developing devices by digital technology that is suitable workplaces

1.3.3 Developing devices for elevating workplace services for a better chance in sales promotion and high revenue from trades

2. Results from designing developing product promotion models using augmented reality technology and using data to develop business intelligence

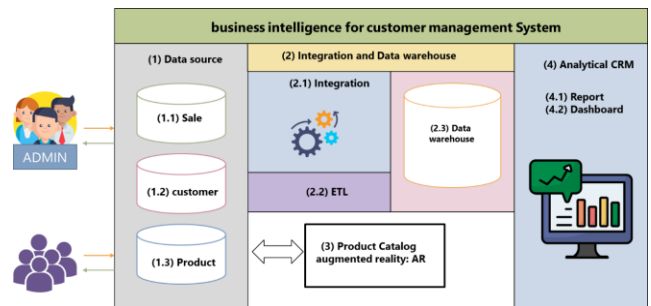


Figure 1. illustrates developing product promotion models using augmented reality technology and using data to develop business intelligence

Developing product promotion models using augmented reality technology and using data to develop business intelligence consists of four elements as follows:

1. Data source: all data in the past three years are recorded in the digital format which consists of:

- 1.1 Sale
- 1.2 Customer
- 1.3 Product

2. The integration and Data Warehouse consist of:

- 2.1 Extract: importing data from product selling each month
- 2.2 Transform: conversing original data into a table as required
- 2.3 Load: retrieving data for the analysis
- 2.4 Data Warehouse: data archive in a user-friendly way

3. Augmented Reality Technology (AR)

3.1 Developing products and catalogs for sales promotion

3.2 Illustrating the clips with 3D Picture / Clip VDO/ Animation Clip

3.3 Using marker for image analysis

3.4 Using cellphones and portable gadgets for communication

4. Analytical CRM via dashboard consist of:

4.1 Data of total sales before and after sales promotion

4.2 Data of customers before and after sales promotion

4.3 Data “agreed sales” value-added investigation after sales promotion

4.4 Data analysis report for executives

3. Results about appropriateness of this model

TABEL 1. DISPLAYS THE APPROPRIATENESS ASSESSMENT OF THE ELEMENTS OF DEVELOPING PRODUCT PROMOTION MODELS USING AUGMENTED REALITY TECHNOLOGY AND USING DATA TO DEVELOP BUSINESS INTELLIGENCE BY 36 EXPERTS FROM WORKPLACES.

No.	items	appropriateness assessment		
		\bar{x}	S.D.	interpretation
1	Management	4.71	0.47	the most appropriate
1.1	Digital technology should be used for organization management	4.67	0.53	the most appropriate
1.2	Total sales record in the past three years should be recorded in the digital format	4.44	0.50	highly appropriate
1.3	Generating customer relationship system for establishing customer bonds.	4.75	0.44	the most appropriate
1.4	New sales promotion strategies for persuading new customers for ordering products	4.78	0.42	the most appropriate
1.5	Innovative consultation system for sales promotion via a variety of sales channels	4.89	0.32	the most appropriate
2	Digital Technology	4.69	0.51	the most appropriate
2.1	Utilizing business intelligent (BI) as a management tool	4.75	0.44	the most appropriate
2.2	Employing customer relationship management	4.64	0.59	the most appropriate
2.3	Enhancing sales promotion by augmented reality technology (AR)	4.67	0.48	the most appropriate
3	Service	4.44	0.60	highly appropriate
3.1	Empowering staff to be knowledgeable and skilful in digital technology	4.39	0.69	highly appropriate
3.2	Developing devices by digital technology that is suitable for workplaces	4.42	0.60	highly appropriate
3.3	Developing devices for elevating workplace services for a better chance in sales promotion and high revenue from trades	4.53	0.51	the most appropriate
4	Overall	4.63	0.53	the most appropriate

TABEL 2. ILLUSTRATES THE RESULTS IN TERMS OF APPROPRIATENESS OF DEVELOPING PRODUCT PROMOTION MODELS USING AUGMENTED REALITY TECHNOLOGY AND USING DATA TO DEVELOP BUSINESS INTELLIGENCE BY TEN EXPERTS FROM BOTH ACADEMIC INSTITUTIONS AND WORKPLACES.

No.	items	appropriateness assessment		
		\bar{x}	S.D.	interpretation
1	Business Intelligence consists of:	4.57	0.50	the most appropriate
1.1	Data Source contains:	4.44	0.51	highly appropriate
	1) Sales data in the past three years are recorded in the digital format.	4.33	0.50	highly appropriate
	2) Customer data in the past three years are recorded in the digital format.	4.44	0.53	highly appropriate
	3) Product information in the past three years are recorded in the digital format.	4.56	0.53	the most appropriate
1.2	Integration and Data Warehouse consist of:	4.67	0.48	the most appropriate
	1) Extract: importing data from product selling each month	4.44	0.53	highly appropriate
	2) Transform: conversing original data to be into a table as required	4.67	0.50	the most appropriate
	3) Load: retrieving data for analysis	4.78	0.44	the most appropriate
	4) Data Warehouse: Data archives in a user-friendly Way	4.78	0.44	the most appropriate
2	Augmented Reality Technology (AR) consists of:	4.50	0.51	highly appropriate
2.1	Developing products and catalogs for sales promotion	4.56	0.53	the most appropriate
2.2	Illustrating the clips with 3D pictures/animation clip	4.56	0.53	the most appropriate
2.3	Using marker for image analysis	4.44	0.53	highly appropriate
2.4	Using cellphones and portable gadgets for communication	4.44	0.53	highly appropriate
3	Customer Relationship Management (CRM) consists of:	4.56	0.50	the most appropriate
3.1	B2B CRM strategy is used.	4.56	0.50	the most appropriate
3.2	Central database is used for customers’ records.	4.59	0.50	the most appropriate
3.3	Real-time customer tracking system is employed.	4.52	0.51	the most appropriate
3.4	Analytical CRM is reported.	4.52	0.51	the most appropriate
4	Dashboard consists of:	4.49	0.51	highly appropriate
4.1	Reports for practitioners	4.44	0.53	highly appropriate
4.2	Dashboard for executives	4.56	0.53	the most appropriate
4.3	Data of total sales before and after sales promotion	4.44	0.53	highly appropriate
4.4	Data of customers before and after sales promotion	4.44	0.53	highly appropriate
4.5	Data “agreed sales” value-added investigation after sales promotion	4.56	0.53	the most appropriate
5	Overall	4.63	0.53	the most appropriate

V. CONCLUSION

This paper “developing product promotion models using augmented reality technology and using data to develop business intelligence”

The model consists of four elements: 1) business intelligence, 2) augmented reality (AR), 3) customer relationship management, and 4) dashboard. Business intelligence is used for data management with dashboard [1-8] supported by augmented reality technology for sales promotion [9-13]. This information is managed for increasing its effectiveness of customer relationship management [14-16]. The assessment shows in relation to the elements of product promotion models using augmented reality technology and using data to develop business intelligence, there are three elements: managements, digital technology, and services. According to 36 experts from workplaces, it is rated as the most appropriate ($\bar{x} = 4.53$).

Developing product promotion models using augmented reality technology and using data to develop business intelligence compose of four elements as follows: 1) business intelligence, 2) augmented reality technology (AR) for sales promotion, 3) customer relationship management (CRM), and 4) dashboard. From 10 expert, five of them are from institutions and five of them from workplaces, it shows that the model of product promotion using augmented reality technology and using data to develop business intelligence is the most appropriate ($\bar{x} = 4.63$).

REFERENCES

- [1] Negash, S., & Gray, P. (2008). Business intelligence. In Handbook on decision support systems 2 (pp. 175-193). Springer, Berlin, Heidelberg.
- [2] Kaewwit, R., Wangchin, S. (2011). Business Intelligence Development with Data Warehouse. Executive Journal. Bangkok (Vol.1, pp. 160-165).
- [3] Pipatjessadakul, P., Pinngern, O. (2019). Development of Business Intelligence System to Support Electrical Distribution, Journal of Computer Science and Information Technology Projects, 5(2), 48-56.
- [4] Mukhopadhyay, D., Dutta, R., Kundu, A., & Dattagupta, R. (2008, December). A product recommendation system using vector space model and association rule. In 2008 International Conference on Information Technology (pp. 279-282). IEEE.
- [5] Jomsri, P. (2014, August). Book recommendation system for digital library based on user profiles by using association rule. In Fourth edition of the International Conference on the Innovative Computing Technology (INTECH 2014) (pp. 130-134). IEEE.
- [6] Bendakir, N., & Aimeur, E. (2006, July). Using association rules for course recommendation. In Proceedings of the AAAI workshop on educational data mining (Vol. 3, pp. 1-10).
- [7] Li, H., & Sheu, P. C. Y. (2021). A scalable association rule learning heuristic for datasets. Journal of Big Data, 8(1), 1-32.
- [8] [1] Negash, S., & Gray, P. (2008). Business intelligence. In Handbook on decision support systems 2 (pp. 175-193). Springer, Berlin, Heidelberg.
- [9] Porter, M. E., & Heppelmann, J. E. (2019). Why every organization needs an https://chools.in/wp-content/uploads/HBR-2019.pdf#page=100
- [10] Rauschnabel, P. A., Babin, B. J., tom Dieck, M. C., Krey, N., & Jung, T. (2015). What is augmented reality marketing? Its definition, complexity, and future. Journal of Business Research, 142, 1140-1150.
- [11] Styliaras, G. D. (2014). Augmented Reality in Food Promotion and Analysis: Review and Potentials. Digital, 1(4), 216-240.
- [12] Kennedy, A. A., Thacker, I., Nye, B. D., Sinatra, G. M., Swartout, W., & Lindsey, E. (2014). Promoting interest, positive emotions, and knowledge using augmented reality in a museum setting. International Journal of Science Education, Part B, 11(3), 242-258.
- [13] Changchenkit, C. (2003). CRM customer relationship management. (2nd ed.) Tipping Points Press.
- [14] Kumar, V., & Reinartz, W. (2006). Customer relationship management. Springer-Verlag GmbH Germany
- [15] Guerola-Navarro, V., Gil-Gomez, H., Oltra-Badenes, R., & Sendra-García, J. (2021). Customer relationship management and its impact on innovation: A literature review. Journal of Business Research, 129, 83-87.