Small business in a small city: The implementation of augmented reality

Muhammad Yusuf Ariyadi[1,*], Imfrianti Augtiah[1], and Wakhid Kurniawan[2]
¹Faculty of Communication and Business, Universitas Muhammadiyah Karanganyar, Indonesia
²Faculty of Sains and Technology, Universitas Muhammadiyah Karanganyar, Indonesia

Abstract

SMEs (Small and Medium Enterprises) are the most are the most numerous sector in Indonesia; the MSME sector is the sector that absorbs the most workers. The MSME sector will dominate in Indonesia in 2023. The MSME sector's contribution to GDP will reach 60.5%, and total labor absorption will be 96.9% (Coordinating Ministry for the Economy, 2022). The total export contribution of MSMEs increased from 14.37% in 2020 to 15.69% at the end of 2022 (Coordinating Ministry for the Economy, 2022). Technology and digitalization have touched all elements of life. Education is one of the fundamental elements in life. This research examines the implementation of technology that can synergize aspects of education, information, and, at the same time, entertainment with augmented reality (AR) screen printing media in the alternative digital business for MSMEs as an innovative media for young people in Karanganyar Regency. This research uses a qualitative approach with a 2 stage interview method: pre-test and post-test in participant testing. The participants in this research were 51 people who were classified as producers, MSME employees, and t-shirt screen printing consumers aged 15-24 years as classified by the Central Statistics Agency (*Badan Pusat Statistik-BPS*). To maintain good distribution, participants in this research are expected to be representatives of all sub-districts in the Karanganyar Regency area. Implementing augmented reality (AR) technology in digital business alternatives for SMEs as innovative media for young people in Karanganyar Regency has very good prospects and potential.

Keywords: Augmented reality; education; digital business; SMEs

1. Introduction

SMEs are the main economic sectors in Indonesia, but their productivity, as measured by added value per worker, needs to catch up. The cause is entrepreneurial factors and business scale, and most of the MSMEs are in sectors that are less productive and saturated and are not based on science and technology. It is an undeniable reality that SMEs (Small and Medium Enterprises) have a strategic role in national economic development because apart from playing a role in economic growth and employment, they also play a role in distributing development results (Daniels, 1999; Green *et al.*, 2006; Rajaiah and Sivasankar, 2012).

Augmented Reality is a technology that projects virtual objects into the real world (Haumer *et al.*, 2020). Augmented reality (AR) is emerging as a media platform with a more immersive display of digital human interaction (Xiong *et al.*, 2021). The advantage of the Augmented Reality method is that it can display a more attractive visual with three-dimensional objects in a real environment. This Augmented Reality method has the advantage of being interactive to display certain three-dimensional objects that are pointed at the camera. The three-dimensional object will display an attractive interface close to the real shape. In addition, applying the concept can increase the user's imagination. AR drives purchase intent and positive attitudes toward the medium better than web-based products (Yim *et al.*, 2017). Augmented reality (AR) revolutionizes the way we interact with various digital information (Zhan *et al.*, 2020).

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* Corresponding author at Jl. Raya Solo-Tawangmangu No.KM. 12, Pandes, Papahan, Kec. Tasikmadu, Kabupaten Karanganyar, Jawa Tengah 57761. Email: yusufariyadi@umuka.ac.id

The use of AR has been implemented quite a lot, including by Blanco-Pons *et al.* (2019) on rock sites in Spain, Berman and Pollack (2021) on companies, Greenwood and Wang (2018) in the education sector through mobile learning. The national research was also conducted on one focus area only: Ahdan *et al.* (2020) in volleyball and Pradana (2020) in high school education. This research tries to synergize the role of SMEs through multi-purpose screen printing t-shirts into several related sectors: 1). Edutainment, 2). Tourism, and 3). Advertising.

2. Literature review

You must know that Ivan Sutherland revealed augmented reality several years later, in 1968. Lately, in 1990, augmented reality transitioned out of the lab and into various industries and businesses by Tom Caudell as a Boeing researcher. In 1999, NASA made a hybrid vision system for their spacecraft. The system elevated AR technology to provide better navigation during their test flight—nowadays, the development and use of augmented reality technology have been taken to the next level. Augmented reality is not only for business majors but also involves lifestyle (Blanco-Pons *et al.*, 2019). Blanco-Pons *et al.* (2019) said augmented reality (AR) could compile and combine 3D explorative objects and information into world reality concepts.

Along with developments in time and technology, augmented reality can also be used in personal business aspects. Berman and Pollack (2021) state that augmented reality can be developed by utilizing innovative technologies such as mobile devices and personal computers. The augmented reality (AR) market is up-and-coming and continues to increase, but industry adoption still needs to grow (Masood and Egger, 2020).

According to Hutamy *et al.* (2021), there are several areas for improvement in SMEs in Indonesia, such as management, organization, technology, capital, operational and technical in the field, limited market access, licensing constraints, and difficult non-technical costs. to avoid. Besides the competition in the industry, which is also tight, entrepreneurs must be responsive to correctly understand what types of products are needed by the market. Printed t-shirts were most prevalent in young communities. Many of them wear them regularly wherever they do activities. There has yet to be an example of printed t-shirt products using augmented reality technology. As Greenwood and Wang (2018) stated, the interactive aspect can be obtained by accessing the AR use gadget, and the advantage of augmented reality is being able to display more exciting visuals with 3D objects in a real environment.

3. Methodology

This research is to test and answer related problems: 1). development and application of technology in digital business in Indonesia, especially in the Karanganyar Regency area, 2). Augmented reality is part of implementing technology in the SME sector, and 3)—business aspects in optimizing the synergy of augmented reality technology in the hologram screen printing SME sector. The problem-solving approach in this research uses a qualitative narrative analysis experimental approach, which consists of interviews and field observations in the form of participant tests with pre- and post-tests on participants. The researcher's limitations determine the conditions for participants: 1) SMEs operate for a minimum of 2 years, 2). The location of SMEs is in the Karanganyar Regency area; 3). Participants are young (15-24).
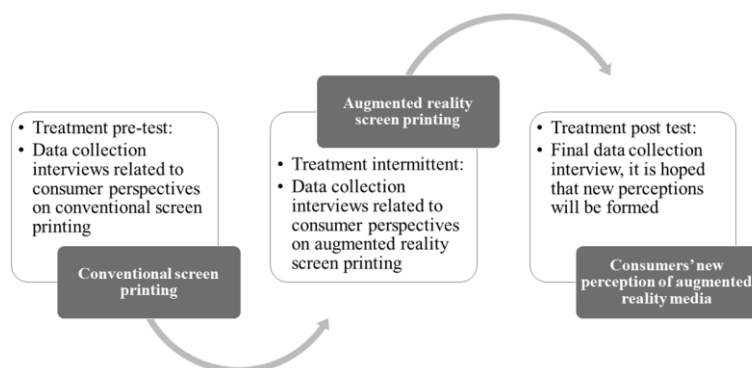

Figure 1. Stages of pre and post-test

The treatment carried out is in the form of pre-and post-tests on participants who have previously been filtered. In the pre and post-test stages, the researcher conducted a Focus Group Discussion (FGD) accompanied by closed-ended questions (Yes/No) to the participants. This was done to make it easier to obtain definite conclusions from interviews with participants at the pre and post-test stages. The pre and post-test stages have three steps, as follows in Figure 1.

Table 1. Interview questions to participants (*pre-test*)

Topic	Code	Question	Yes/No
Development and implementation of technology	DIT	a. Do you have an Android/IOS phone?	
		b. (Pass this question if you do not have an Android/IOS phone) Have you ever accessed the internet with your phone?	
		c. (Pass this question if you do not have an Android/IOS phone) Have you ever accessed social media with your phone?	
		d. (Pass this question if you do not have an Android/IOS phone) Have you ever used the camera on your phone?	
		e. (Pass this question if you do not have an Android/IOS phone) Have you ever uploaded the result camera capture from your phone?	
Understanding of Augmented Reality	UAR	a. Have you ever heard about 'Augmented Reality'?	
		b. (Pass this question if you have never heard about Augmented Reality) Have you ever heard about 'Augmented Reality'?	
		c. (Pass this question if you have never heard about Augmented Reality) Do you feel amazed by augmented reality?	
		d. (Pass this question if you have never heard about Augmented Reality) Do you know that augmented reality can be used to print t-shirts?	
		e. (Pass this question if you have never heard about Augmented Reality) Are you willing to wear the product t-shirt printed screen with augmented reality?	
Business aspect	BA	a. Do you like to wear or wear printed T-shirts?	
		b. Are you willing to try printed t-shirts with Augmented Reality technology?	
		c. Are you willing to replace conventional printed t-shirts with augmented reality ones?	
		d. Are you willing to sell an augmented reality t-shirt?	
		e. Are you willing to try creatively applying augmented reality to other media? (Ex: jacket, hats)	

Data analysis

This research compiled a list of questionnaires in Table 1. with the following steps:

➢ Distribution of questions on three aspects that represent the problem: 1) Development and application of technology, 2) Understanding of Augmented reality, and 3) Business Aspect.

➢ Coding (coding) on each aspect to facilitate data analysis. Development and Application of Technology (PPT), Understanding of Augmented Reality (PAR), and Business Aspects (AB).

➢ Each aspect is explained in 5 questions with closed answers (Yes/No).

➢ Of all the answers collected, both 'Yes' and 'No' are cumulatively multiplied by three topic aspects.

4. Results and discussion

This research meticulously focuses on exploring three critical dimensions of research variables: Technology development and application (DIT), understanding of augmented reality (UAR), and business aspects (BA). Each of these variables is intricately crafted to encompass a set of five closed-ended questions, demanding respondents to furnish binary 'Yes' or 'No' responses. The formulation of these questions was conducted with meticulous precision and subsequently integrated into the interview process, which unfolded in two distinct stages: a preliminary pre-test phase followed by a subsequent post-test stage.

In these stages, participants were actively involved through direct interviews, a method carefully chosen to facilitate a more nuanced exploration of the designated research variables. Throughout the process of responding to these inquiries, participants were meticulously guided and provided with assistance whenever they encountered challenges or complexities. This approach was employed to ensure a comprehensive and coherent collection of data. The aim was to glean comprehensive insights into the intricate interplay between Technology Development and Application, Understanding of Augmented Reality, and Business Aspects, thereby contributing valuable knowledge to the broader research landscape.

The selected interview participants encompassed a diverse group consisting of producers and consumers. This intentional selection aimed to directly engage individuals from different perspectives within the researched domain, ensuring the validity and authenticity of the responses obtained. The objective was to capture firsthand and genuine insights into the subject matter, reflecting the actual occurrences and dynamics within the domain under investigation.

The interview process, conducted in this initial stage, served as a pre-test, constituting the first phase of treatment administered to the research subjects. As part of this pre-test phase, participants were provided with samples of conventionally screen-printed t-shirts. These samples were strategically designed to elicit the participants' reactions, perceptions, and attitudes. The deliberate intervention allowed for an exploration of the respondents' experiences with the provided samples, laying the foundation for subsequent stages of inquiry and analysis. Following the pre-test and post-test, the data was analyzed to obtain the percentage distribution, as outlined in Table 2. The subsequent discussion delves into the results obtained after the treatment and post-test stages, shedding light on the essential findings and insights derived from the research:

- The Technology Development and Application (PPT) variable has not experienced any significant changes.
- Variables Understanding augmented reality (AR) experienced substantial changes by participants.
    a. 100% of participants knew the term Hologram, from the original 80.4%
    b. 100% of participants understood the term Augmented reality, from initially only 2%
    c. 100% of participants were amazed by AR technology after knowing the finished product; from the beginning, only 39%
    d. 100% of participants already know that AR technology can be used on t-shirt screen printing media
- The Business Aspect Variable (AB) experienced significant changes by the participants.
    a. From the beginning, 100% of participants have become likes and users of screen printing t-shirts 96.1%.
    b. 100% of participants are still enthusiastic about trying AR screen printing products

    c. 96% of participants are willing to switch products from conventional screen printing t-shirts to AR screen printing, from 39.2% originally. This is because the participants have been treated in the form of seeing and trying the product.

    d. 68% of participants are willing to sell AR printed t-shirts, from only 19.6% earlier. This is because the participants consider AR screen printing a good sales prospect. Meanwhile, some participants still felt that price was an obstacle.

    e. 100% of participants are willing to try to be creative with AR applications in other media (jackets, hats), from only 49% earlier.

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Table 2. Interview results (pre & post-test)

Code	Pre-test		Post-test	
	Yes	No	Yes	No
DIT1	100%	0%	100%	0%
DIT2	100%	0%	100%	0%
DIT3	100%	0%	100%	0%
DIT4	100%	0%	100%	0%
DIT5	62.7%	37.3%	80,4%	19,6%
UAR1	80.4%	19.6%	100%	0%
UAR2	2%	98%	100%	0%
UAR3	39%	61%	100%	0%
UAR4	39.2%	60.8%	100%	0%
UAR5	100%	0%	100%	0%
BA1	96.1%	3.9%	100%	0%
BA2	100%	0%	100%	0%
BA3	39.2%	60.8%	96%	4%
BA4	19.6	80.4%	68%	32%
BA5	49%	51%	100%	0%

5. Conclusion

      From the research and discussion results, implementing augmented reality (AR) technology in digital business alternatives for SMEs as innovative media for young people in Karanganyar Regency has very good prospects and potential. The significant results evidence this after 2 step pre- and post-test interviews. Producer and consumer perceptions are improving and more positive after treatment

through clear and real persuasion and education. An understanding of technological products that can be applied in everyday life can be better understood after being proven by a post-test.

Despite its insightful contributions, this research is circumscribed by several limitations that demand acknowledgment and careful consideration. One significant constraint revolves around the relatively small number of respondents who participated in the interviews, potentially restricting the broader applicability of the research outcomes beyond the specific region under study. This limitation underscores the need for caution when attempting to generalize the findings to other areas or populations, as the research sample might need to fully capture the diversity of perspectives that could exist in different contexts.

To address this limitation in future research endeavors, I suggest employing more extensive participant involvement facilitated by adopting appropriate and comprehensive sampling methodologies. By expanding the participant pool in subsequent studies, researchers can enhance the robustness and applicability of their findings to a broader demographic spectrum or geographic scope. This proactive approach to participant selection would contribute to a more comprehensive understanding of the subject matter, allowing for a more nuanced and representative exploration of the research variables.

Moreover, an avenue for future development lies in transitioning this research towards quantitative methodologies. Quantitative approaches could complement the current qualitative framework, allowing for a more comprehensive analysis and validation of the research outcomes. Integrating quantitative methods might enable the establishment of statistical correlations and numerical patterns, thereby enriching the depth and breadth of insights derived from this study. This expansion into quantitative research methodologies could fortify the validity and reliability of the study's conclusions, paving the way for a more comprehensive understanding of the investigated subject matter.

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