Acceptance of Enrollment Advertisement of Virtual Agent by Real Viewers

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Abstract—**Many educational institutions have been challenged by sub-replacement fertility in recent years. As such, it is becoming increasingly challenging to enroll new students in their programs. In this context, using Artificial Intelligence (AI) to create avatars to attract student enrollment is an emerging trend and possible solution. However, virtual agents have not yet been widely used to attract enrollment in university departments. Based on the "matching hypothesis," anthropomorphism affects human perception and behavior by increasing trust and connectedness or stimulating social response behaviors. This study explored viewers' perceptions of the virtual spokes-character's smooth performance, expertise, facilities, internship opportunities, and future employment opportunities and prospects in the Department of M at C University. We invited potential students to watch an enrollment advertisement film regarding the Department of M, in which a virtual spokes-character introduced the department. A total of 122 valid questionnaires were retrieved. The findings indicate that the virtual agent positively influenced the viewers. Most viewers found the virtual agent's performance smooth, professional, and effective in conveying the department's characteristics. Moreover, most viewers expressed trust in the virtual agent's endorsement.**

Keywords—**enrollment, sub-replacement fertility, Artificial Intelligence (AI), matching hypothesis, virtual agent, virtual campus, trust**

I. INTRODUCTION

In the context of sub-replacement fertility, Chen [1] suggested that the focus of schools at all levels in Taiwan should be to actively develop school characteristics and enrollment marketing strategies to attract students. They should engage in diversified enrollment activities to increase the school's level of attraction. In recent years, advanced AI technology has enabled the creation of virtual agents. Virtual schools are a convenient and compelling way to open new doors for enrollment strategies without requiring real people or props for rehearsal.

Selecting a school or department is a significant event in students' lives. They must be convinced that a school will provide a positive learning environment and support where they can achieve their academic and career goals. Through enrollment films where virtual agents narrate, schools can demonstrate their expertise and integrity to potential students. The virtual agent's performance can make the viewers feel the narration's expertise, which builds their trust in the school. Such trust arises not only from the virtual agent's professional performance but also from the integrity and reliability of the school in its enrollment advertisement. Therefore, this study used a virtual agent to introduce a department's enrollment film to attract students as the enrollment method. We explored the trust between the virtual agent and the viewers. Networks reserves the right to do the final formatting of your paper.

II. RESEARCH MOTIVES AND RESEARCH PURPOSES

As technology advances, artificial intelligence and machine learning techniques can be used to design avatars that match user preferences. These avatars act as agents, which can reduce labor costs while significantly reducing operational expenses [2]. Liou *et al.* [3] indicated that enterprises can create a representative character for brands to establish an emotional connection with the public. This can narrow the distance between a brand and the public while highlighting the significance and value of the brand.

Furthermore, Fournier [4] stated that brand relationships, similar to interpersonal relationships, are complex and delicate interactions; their construction is influenced and shaped by various emotions, perceptions, and behaviors. Additionally, Ranaweera and Prabhu [5] suggested that when people feel satisfaction, commitment, and trust in a brand, they are more likely to actively disseminate positive comments. Further research indicates that when the public has established a good brand relationship, they are more likely to provide a positive evaluation regarding the characteristics of the virtual spokes-character. This strengthens their willingness to promote the brand via word of mouth [3]. Based on the literature, building good brand relationships and using virtual spokes-characters can help to increase brand awareness, influence, and marketability, thus bringing added value to a brand. Therefore, companies and organizations can create virtual spokes-characters to advertise their brands to enhance brand awareness and influence while achieving better market results and brand value.

Ho [6] found that schools must be pragmatic in understanding why students choose to attend a school or a particular department and the school's enrollment niche to develop specific enrollment goals. First, schools must understand what motivates students to choose a school or department. This can help schools understand the needs and preferences of their potential student groups. Second, schools should clearly understand their enrollment process niche, such as their strengths and characteristics compared to other schools. These may include faculty, teaching resources, campus facilities, academic expertise, and partnerships with industry. Highlighting these niches can help schools attract talented students who fit their characteristics, increasing their visibility and reputation. An in-depth understanding of these

factors can aid schools to meet students' needs and expectations more effectively while highlighting their strengths and attracting talented students.

Based on the above, the present study used AI to design an anthropomorphic virtual agent to produce an enrollment film. The scenes included a virtual campus, a virtual classroom, and a professional attitude to introduce the selected department characteristics. This gave viewers a deeper understanding of the Department of M at C University. They assessed the suitability of the facilities and equipment that provide many internship opportunities, leading to rich employment opportunities and prospects. This study further explored whether the content endorsed by the virtual agent could gain the trust of viewers. Therefore, this study developed a virtual agent to represent a real person in an enrollment advertisement film. We provided the film to real viewers to analyze the acceptance of the virtual agent's enrollment advertisement.

III. Literature Review

A. Sub-Replacement Fertility and Enrollment

According to the Organization for Economic Cooperation and Development [7], the total fertility rate is below the population replacement rate or even below the ultra-low fertility rate in many developed countries. Tsai [8] defined sub-replacement fertility as a phenomenon that occurs when the average fertility rate per woman is less than two, resulting in fewer and fewer children. Taiwan's total fertility rate has been below the replacement level of 2.1 since 1984[7, 9]. In 2003, Taiwan's total fertility rate reached an even lower level of 1.235, below the 1.3 level known as ultra-low fertility [9]. According to the National Development Council's Population Estimates Inquiry System statistics [9], Taiwan's total fertility rate will drop even further to 0.95 by 2023, indicating that Taiwan is facing severe sub-replacement of fertility.

Regarding education, Chen [1] highlighted that the most direct impact of sub-replacement fertility on schools is the enrollment challenges caused by the lack of student sources. Thus, schools shift to counseling or must exit. According to the Ministry of Education [10], the number of first-year university students is forecast to fall below 200,000 in the academic year starting August 2023. Moreover, the number of first-year university students will decrease by an average of 3,000 to 4,000 per year, 1.9%, over the next 16 years. As a result, sub-replacement fertility has significantly affected school enrollment, and schools must be aware of this trend to take appropriate measures to adapt.

B. Trust in Virtual Spokes-Characters

Believable characters are essential to an interactive story [11]. Most current industry methods rely on heavy scripting, where voice acting, cut scene scripting, dialog scripts, hand-coded animation routines, and hard-coded rules of behavior are used to portray characters [12]. However, when synthetic avatars exhibit consistent and believable behaviors, interaction with them is positive [13]. Research indicates that people are likelier to trust agents with humanoid features [14]. Westerman, Tamborini, and Bowman [15] suggest that the more anthropomorphic an avatar is, the more believable and capable it will appear. Therefore, designing virtual agents with humanoid features can increase their believability.

Holzwarth *et al.* [16] explored the impact of virtual spokes-characters on online consumers' shopping behavior. They found that virtual spokes-characters can be classified into "professional" and "attractive" virtual spokes-characters. Their findings indicate that participants were susceptible to the expertise of the avatars when they were highly involved in product purchases. Therefore, the perceived believability of a virtual image moderates the effect of its expertise on retailer satisfaction, product attitude, and purchase intention. In the context of electronic internet commerce, Bauer and Neumann [17] found that avatars increase customer satisfaction and trust and positively influence consumer behavior. Thus, using virtual spokes-characters can produce positive benefits and elicit trust.

C. Matching hypothesis

Saitō [18] explored the following question: Do you like people who look like you or people who do not look like you? Psychology suggests that people tend to like people who are similar in appearance and refers to this as the "matching hypothesis." For instance, clothing has a psychological impact on individuals; it is easy to decide whether to listen to someone's opinion, request, entrust, or believe in the content of a statement because of the clothing worn, such as a man in a fireman's costume. This study suggests that wearing formal clothing, or school uniforms, may impact one's identity.

Aaker [19] and Nandan [20] mentioned that brand image and identity are interrelated concepts that are essential to forming a strong brand. When the two are consistent, human loyalty can be built and strengthened [21, 22]. As such, this study suggests that a school should develop a brand name in people's minds; if people have a favorable impression of a school's brand image, they may develop particular trust and goodwill toward an advertisement film produced by that school.

Anna-Maria Seeger, Jella Pfeiffer, and Armin Heinzl [23] indicated that anthropomorphism means attributing human qualities (including consciousness, intentions, and emotions) to non-human subjects. Anthropomorphism affects human perception and behavior in human-machine interactions by increasing trust and bonding while stimulating socially responsive behavior. If there are no other matching clues, disturbing images may result. However, advances in AI have enabled computer programs to take on more and more tasks previously performed by human experts [24].

The study hypothesis is as follows: design virtual digital characters as teachers and students; create anthropomorphic characters and a virtual school environment, classroom situations, and equipment; let real humans listen to and watch the content spoken by the virtual character; assume that the Questionnaire design actual humans trust the content presented by the virtual character, to test the effects of its influence on perceived behaviors.

Therefore, this study designed a campus virtual spokes-character and enrollment film. The film introducing a university department was provided to viewers. We analyzed the viewers' trust in the virtual spokes-character's statement accordingly.

IV. RESEARCH METHODS

A. Research Process Research Process

As sub-replacement fertility becomes increasingly severe, schools face significant student enrollment challenges. This study used a virtual spokes-character to attract increasing student attention. By working with teachers who have experience in enrollment to proofread the text, we designed the virtual spokes-character's messages to be more persuasive and formal. Specifically, we used Leonardo.Ai, Pika Labs, FinalFrame, IIElevenLab, TTSMAKER, LALAMU, plxoboy, and Capcut to create an enrollment film (see Fig. 1). Student viewers were invited to watch and learn more about the characteristics and strengths of the school department in this study (i.e., the Department of Business Administration).

Fig. 1. The enrollment film contents; a) The virtual spokes-character narrates about the school department (b) The virtual spokes-character narrates about the school's details.

Fig. 2 shows the research process. After determining the research topic, the process began with a broad and in-depth literature review. We focused on sub-replacement fertility, enrollment, virtual spokes-character, and trust. Next, we designed a questionnaire to collect viewers' feedback and perceptions regarding the content endorsed by the virtual agent in the film. Subsequently, the film was shown to the viewers (students, including working students), and they were asked to complete a questionnaire. Finally, the data collected was rigorously analyzed and validated, which will be discussed below.
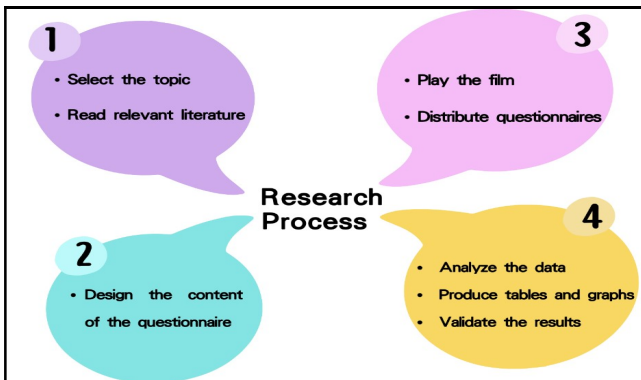

Fig. 2. Research process.

B. Questionnaire Design

Fig. 3 shows the enrollment film details. Specifically, the virtual spokes-character, with its professional narration and smooth performance, presented the viewers with the department's excellent facilities and equipment. It detailed how the Department of M at C University provided an advanced learning environment and a wealth of resources to help students obtain employment opportunities and development prospects in their future careers. This introduction by the virtual spokes-character enabled viewers to determine the school's professional level and quality while believing in what the virtual spokes-character said.
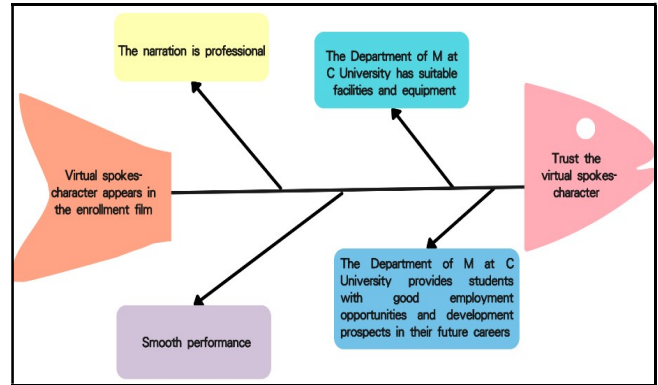

Fig. 3. Questionnaire design process.

Prada and Paiva [13] suggest that the believability of synthetic avatars is crucial to a user's interactive experience. As such, virtual avatars must exhibit consistent and believable behavior.

An advertising endorser's believability can be summarized as three main characteristics: high attractiveness, high trustworthiness, and high expertise. These characteristics can enhance consumers' awareness of an advertisement in terms of product recognition and persuasion in purchasing actions [25]. The term "match hypothesis" was first coined in 1985 by Kahle and Homer [26]; they suggested that the fit between a spokesperson's physical attractiveness and product image can influence an advertisement's effectiveness, increasing consumer attitudes toward favoring a brand and purchase intentions. However, in Matching Products with Endorsers: Attractiveness Versus Expertise, Till and Busler [27] suggested that while attractive endorsers positively affect attitude toward an endorsed brand, expertise is a more critical dimension for driving the endorser/brand fit. Therefore, based on the matching hypothesis framework, expertise is an essential matching factor because it can strengthen the consistency between endorsers and products while enhancing advertising effectiveness. Lou and Yuan [28] confirmed that endorsers' expertise and attractiveness enhance followers' brand perception. Moreover, since virtual endorsers' expertise affects believability, it is possible to control their attractiveness and expertise to make virtual endorsers more persuasive for specific consumer groups [16].

Based on the above, the questionnaire for this study was designed as follows.

1) I think the enrollment by the Department of M at C university and the virtual spokes-character's performance during the virtual campus tour and virtual classroom was smooth.
2) The virtual spokes-character made me believe in its expertise during the narration.
3) Based on the endorsement of the virtual spokes-character, I think that the Department of M at C University is a department with suitable facilities and equipment.
4) Based on the endorsement of the virtual spokes-character, I have learned that the Department of M offers many internship opportunities; I believe there are rich employment opportunities and development prospects for future careers.

5) Based on the endorsement of the virtual spokes-character, I trust what the virtual spokes-character says.

V. RESEARCH ANALYSIS

A. Research Subjects

This study developed an enrollment video in which a virtual agent introduced the selected department, which was provided to C University students to watch. Most students were between 20 and 40 years old. We used convenience sampling to analyze the results. The study was limited by the fact that the viewers had to be given the opportunity to watch the film before they could complete the questionnaire. A total of 122 questionnaires were distributed, and 122 were retrieved with a 100% retrieval rate. There were 0 invalid questionnaires after incomplete and contradictory answers were deleted. There were 122 valid questionnaires, and the proportion of valid questionnaires in the retrieved questionnaires was 100%.

B. Statistical Analysis

This study used Excel statistical analysis to analyze and interpret the data. Fig. 4 compares the number of valid choices for each questionnaire question.

Fig. 4 shows that viewers' responses to the virtual spokes-character, virtual campus, and virtual classroom in the enrollment film are mostly positive. This indicates that viewers were positive about the professional image presented due to the virtual spokes-character's smooth performance.
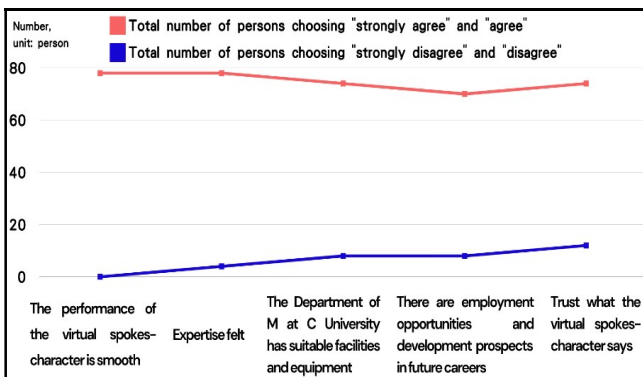

Fig. 4. Comparing the numbers of choices in the valid questionnaires retrieved.

Fig. 5 shows the comparison regarding the different percentages of the number of choices for questions 1, 2, 3, and 4 of the valid questionnaires. The findings indicate that the viewers gave a favorable evaluation of the virtual spokes-character's performance in the Department of M at C University's enrollment film. They generally found the viewing process smooth and fluid and were impressed with the expertise presented during the virtual spokes-character's narration. The virtual spokes-character convinced viewers that the Department of M at C University has excellent campus facilities and equipment. Viewers also learned that the Department of Business Administration offered various internship opportunities and were confident about the career opportunities and prospects of the department.

Regarding the comparison of the different percentages of the number of choices for questions 1, 2, and 5 of the valid questionnaires, Fig. 6 shows that viewers gave a favorable evaluation of the virtual spokes-character's performance in

Department of M at C University's the enrollment film. They generally felt that the viewing process was very smooth, and they were impressed by the expertise of the virtual spokes-character. Although some viewers were skeptical about the content shared by the virtual spokes-character, the majority of viewers believed that the virtual spokes-character's performance was smooth and natural and that the content was believable and reliable. This proves that the virtual spokes-character's performance was smooth and professional, leading the viewers to trust it.
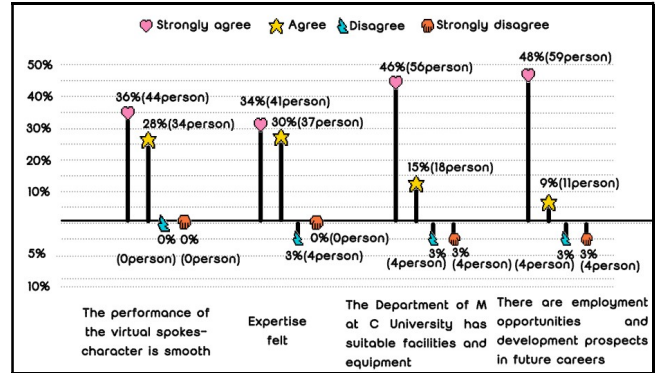

Fig. 5. Viewers gave a favorable evaluation of the performance of the virtual spokes-character in the enrollment film of the Department of M at University C (comparing the different percentages of the number of choices for questions 1, 2, 3, and 4 in the valid questionnaires retrieved).
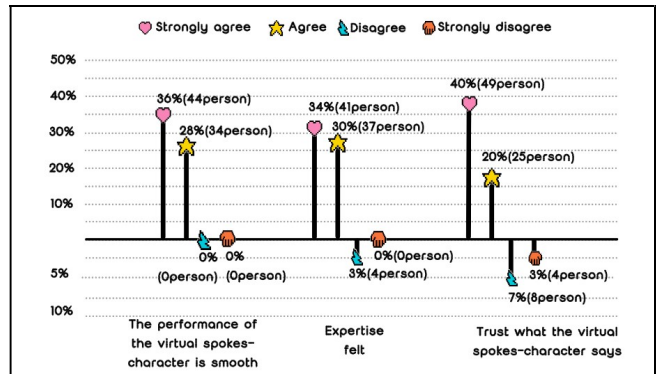

Fig. 6. The virtual spokes-character's performance achieved high evaluation from the viewers (comparing the different percentages of the number of choices for questions 1, 2, and 5 in the valid questionnaires retrieved).
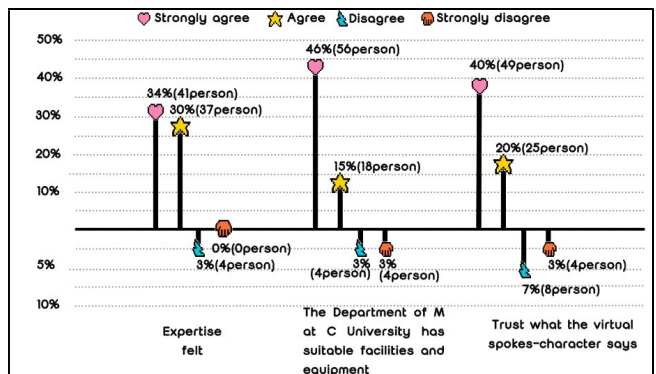

Fig. 7. The virtual spokes-character's performance encouraged the viewers to feel the expertise of its narration (comparing the different percentages of the number of choices for questions 2, 3, and 5 in the valid questionnaires retrieved).

Comparing the different percentages of the number of choices for questions 2, 3, and 5 of the valid questionnaires, Fig. 7 shows that the virtual spokes-character's performance encouraged viewers to deeply feel the expertise of its narration. Based on its endorsement, most viewers believed

that the Department of M at C University is a department with suitable facilities and equipment. This professional narration provided viewers with a more favorable impression while deepening their trust and expectations of the department. As such, the virtual spokes-character's endorsement was a professional performance that led viewers to trust the suitable facilities and equipment of the M Department at C University.

VI. Conclusion

The validation analysis for this study was as follows.

In an era of sub-replacement fertility, educational institutions must continuously innovate and improve their enrollment strategies to meet challenges and maintain a competitive advantage. Using AI technological advantages to create virtual spokes-characters to encourage enrollment is a new direction worth exploring and implementing. The results of this study indicate that the virtual spokes-character clearly and methodically presented information about the enrollment of the Department of M at C University in a virtual classroom on a virtual campus. The viewers felt that the entire process was smooth; the professional way relevant content was narrated gave viewers a better understanding of the characteristics and advantages of the Department of M at C University. Furthermore, the viewers believed that the Department of M at C University has suitable facilities and equipment, that it offers a wide range of internship opportunities, and that it has good career prospects. Thus, the appearance of the virtual spokes-character further strengthened the viewers' trust in the Department of M at C University. It made them more willing to accept the content presented. This positive impression and trust not only arises from the professional performance of the virtual spokes-character. It also reflects the virtual spokes-character's effectiveness in delivering the Department of M at C University's brand image in the enrollment advertisement. The findings indicate that using virtual agents to encourage enrollment is a promising new trend. Virtual agents can be used to provide students with information about a department so that they can quickly learn about its characteristics. This novel approach to enrolling students can attract interested students more effectively and easily, leading to breakthroughs in educational enrollment.

VII. Suggestions

Suggestions for future research:
1) Create virtual agents to market school products and examine the effect of virtual agents' marketing on school brand and customer trust.
2) Introduce an AI system to enable interaction with students and to explore whether students trust what the AI is telling them.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Ting Sheng Weng developed the research idea, conducted the analysis, and wrote the manuscript; I-Ching Chao is responsible for collecting the literature; Jin-Sui Zheng was designed a campus virtual spokes-character and enrollment film. All of the authors have read and approved the final manuscript.

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