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Customer Acceptance of Biometric Technology in the Hospitality Industry

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ABSTRACT

Information intensive industries, such as the hospitality industry, are attempting to turn back the customer service clock by creating more personalized experiences for their guests. Customer Relationship Management (CRM) systems have enabled organizations to record and gain insight into the relationship it has with each one of its clients. The act of face and name recognition continues to remain an essential ingredient in creating positive customer service experiences. A biometric recognition system could assist hotel employees by providing an on-demand history of customers' behaviors and preferences. A prototype was developed to simulate a hotel facial recognition system with a fingerprint identification application. The experiment also included a survey instrument to measure the likelihood of customer acceptance of biometric technology. This study concluded that user intention to adopt depended on the attractiveness of the innovation and new product attributes.

Keywords

Biometrics, customer relationship management, database, facial recognition, fingerprint identification, hospitality industry, information systems development, loyalty, technology adoption

INTRODUCTION

Customer Service. What is it? What does it mean to you? Maybe it's a "hello" from an employee when you enter a store. A smile and eye contact when you are making a purchase. A simple "thank you" when you leave the store. If you are a repeat customer, you may expect the staff to acknowledge your valued patronage by providing personalized services and exclusive perks. With an increase in online business transactions and strip mall shopping experiences, the act of face-to-face interaction has become as rare as the mom-and-pop, corner drug store.

Information intensive industries, such as the hospitality industry, are attempting to turn back the customer service clock by creating more personalized experiences for their guests. Reward programs, priority programs, and membership programs have been designed to increase feelings of exclusivity and to sustain customer loyalty. Efforts to personalize service only begin with specially designed programs. When guests arrive at a hotel, face-to-face interaction can make or break the relationship. The old-fashioned act of face and name recognition continues to remain an essential ingredient in creating positive customer service experiences (Barsky & Nash, 2003). Researchers Maganini and Honeycutt (2005) addressed the importance face and name recognition to the hospitality industry. Their research pointed out that personalized greetings increased feelings of "comfort, welcome, sophistication, and importance" and thus strengthened customer emotional loyalty to the organization (ibid, 2005).

USING TECHNOLOGY TO STRENGTHEN RELATIONSHIPS

Customer Relationship Management (CRM) systems have been defined as tools which enable organizations to record and gain insight into the relationship it has with each one of its clients and thereby increasing customer loyalty (Dyche, 2001). In 1999, Harrah's Entertainment invested in data warehousing software as part of their National Customer Recognition (NCR) system (Boushy, 1999). The NCR system created a standardized, national platform which enabled repeat customers to earn rewards at any of the Harrah's properties. Following Harrah's Entertainment lead, other national gaming and hotel franchises adopted similar CRM packages. Technology was used by the hospitality industry to help manage the information intensive task of strengthening relationships.

BIOMETRICS – THE NEXT KILLER APPLICATION?

In its special issue of "Breakthrough Ideas for 2005" writers for the Harvard Business Review looked at 20 emerging management concepts (Wirts & Eracleous, 2005). The creative use of biometric technology was reported as one of those breakthrough ideas. The report noted that while biometrics may increase safety, it argued that security will not be the next "killer" application. Instead, the forecasted benefit of biometric technology was in its potential to enhance the customer experience and thus transform business practices (ibid 2005). Specifically noted were systems which could enhance efficiency and improve customer services such as payment or loyalty-programs (ibid 2005). The report concluded that industries like hospitality which depend on the knowledge of customer's identities and preferences could use biometric technology to improve personalized services.

METHODOLOGY

Few research studies have examined the factors surrounding customer relationship management combined with the electronic support of biometric systems. Most empirical studies have focused on survey research to measure the public's general acceptance of the technology (Prism, 2003; Business Wire, 2002). To explore the possibility of using biometric technology as a customer relationship management tool, a prototype was developed to simulate a hotel facial recognition system with a fingerprint identification application. The experiment also included a survey instrument to measure the likelihood of customer adoption of such a technology.

Prototype Development

The prototype was composite of two separate biometric technologies – facial recognition and fingerprint identification. The first component of the prototype, facial recognition, was developed by integrating OpenCV C++ facial detection code with an Eigenface algorithm. The facial recognition program was linked to a Web camera application and a PC laptop. This configuration allowed the facial recognition system to capture both still-frame and real-time images. Still-frame images were used to train the system to recognize faces moving in real-time.

The second component of the biometric prototype made use of a fingerprint identification application. Integrated hardware and software systems were used to identify and record fingerprint readings. The hardware piece of the system was a Microsoft fingerprint reader. The capabilities of this off-the-shelf product were boosted by using an open source kit and biometric authentication algorithm developed by Griaule Corporation (2007). The software allowed the system to read a fingerprint and record samples into a database.

The biometric prototype interfaced with a customer relationship management database to record and store information. Once a face was recognized, an application was launched which then retrieved a guest's profile from a database and displayed a populated form. The identity of the guest was then verified with the fingerprint application.

A pilot study of the application was conducted at a campus hotel located on one of the big-12 universities. The biometric application was set up at the registration desk. Two scenarios were demonstrated: 1) a guest check-in without biometric technology and 2) guest check-in with biometric technology. The time recorded for the check-in without biometric technology was 4.45 minutes and the time recorded for the check-in with biometric technology was 1.02 minutes.

Research Model

As part of the biometric experiment, a survey instrument was constructed to examine the likelihood of customer acceptance. Thirty-six graduate students enrolled in business related courses completed the 34-question survey. The research model included two independent variables and one dependent variable to predict customer acceptance of biometric technology. Because each of the biometric technologies (i.e. facial and fingerprint) carry their own separate issues of complexity, the survey instrument was split into two sections. One section was related to facial recognition as an additional benefit to the organization's customer relationship management system, and the other section was related to the use of biometric authentication in a hotel guest's check-in process. Both sections used the same variables, except that the wording was adapted to the technology in question. In order to measure intention to use biometric technology, the following research model was proposed (Figure 1).
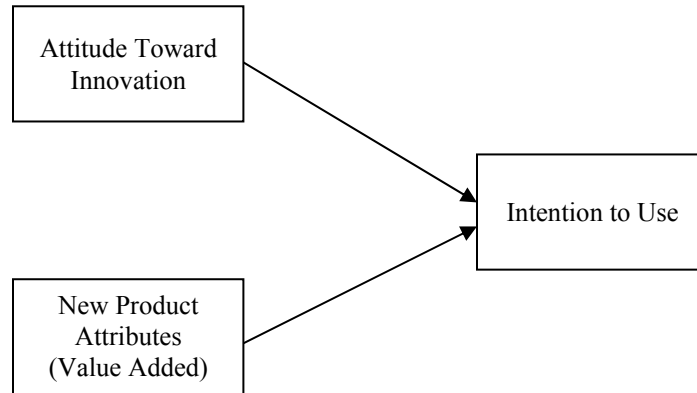
Figure 1: Customer Acceptance of Biometric Technology

The first independent variable of the model was adapted from research by Boyd and Mason (1999). In their study, the attractiveness of an innovation predicted the likelihood of successful adoption. The attractiveness concept not only examined what individuals thought of an innovation, but it also attempted to gauge how individuals perceived others would react to the innovation. Eleven validated questions from the Boyd and Mason research (1999) were used to measure the attractiveness variable of the biometric prototype and were based on a seven-point scale.

The second independent variable was adapted from Mukherjee and Hoyer (2001). The purpose of this variable was to measure the extent to which individuals believed the biometric prototype could provide additional benefits and value to a hotel check-in process. Three questions examined the perceived benefits variable and were based on a seven-point scale.

Finally, the dependant variable was adapted from a study by Putrevu and Lord (1994). This variable measured the degree to which a consumer intended to try this technology in the future. Three questions were used to measure intention and were based on a seven-point scale.

It was the decision of the research team to not use the Technology Acceptance Model (Davis, 1989) due to the nature of the biometric recognition system. The recognition of the customer happens seamlessly by the activity of enrolling in the loyalty program and walking into the hotel. Hence, we felt that the ease of use would not vary since there is little effort on the part of the customer. We instead focused on the customer's perceived benefit of having this biometric service available, and the attractiveness of this added service which was an alternative indicator to the perceived usefulness of TAM.

DATA ANALYSIS

Based on the results of the survey, the attractiveness and perceived value added by these technologies were found to be significant predictors of user acceptance. There was a perception that biotechnology was a great idea and that it could add value to one's hotel check-in experience. These results validated previous research findings that stated consumers who used rewards systems wanted to be acknowledged and recognized for their loyalty to an organization. In this case, the survey participants believed that this biometric technology could add value to their experience as a reward member of a particular hotel chain.

Table 1. Reliability of the Cronbach's coefficient alpha

Variables / Models	IV #1 Attractiveness of the Innovation	IV #2 New Product Attributes	DV User Intention
Facial Recognition	.865	.836	.956
Biometric Fingerprint	.892	.887	.973

For a reliability measure, the Cronbach's coefficient alpha estimated internal consistency reliability and the proportion of variance that was systematic or consistent in a set of test scores. Most variances were consistent if the number was close to 1.00. In our case, the Cronbach's alpha for a set of scores turned out to be .87 for the first independent variable (Attractiveness of the Innovation) in facial recognition model, the test was 87 percent reliable. In addition, 84 percent of items in the second independent variable (New Product Attributes) and 97 percent items in the dependent variable (User

Intention) of facial recognition had internal consistency and were reliable. Furthermore, the factors held constant and had normally distributed scores intents to have high Cronbach's alpha reliability estimates as illustrated in Table 1.

For the regression, both facial recognition ($R2 = 0.87$) and biometric fingerprint ($R2 > 0.7$) had strong relationship with each variable as showed in Table 2. There was a significant level (0.001) in the ANOVA for facial recognition models, also a significant level (0.000) in the ANOVA for biometric fingerprint model. Thus, this study concluded that user intention to adopt depended on the attractiveness of the innovation and new product attributes.

Table 2. Pearson Correlation of Multiple Regressions

Pearson Correlation Models Variables	R^2 Facial Recognition		R^2 Biometric Fingerprint	
IV #1 (Item1-11) Attractiveness of the Innovation	1	.794	18	.780
	2	.621	19	.665
	3	.622	20	.627
	4	.479	21	.789
	5	.466	22	.564
	6	.432	23	.641
	7	.562	24	.447
	8	.773	25	.723
	9	-.312	26	-.176
	10	.548	27	.524
	11	.393	28	.431
IV #2 (Item 12,13,17) New Product Attributes	12	.670	29	.778
	13	.404	30	.533
	17	.732	34	.841

IMPLICATIONS

In this study, a biometric facial detection and fingerprint verification prototype was developed to simulate a hotel check-in scenario. The facial recognition system would identify a "priority" customer upon entrance into the hotel lobby. A database application would be launched. The hotel clerk would be able to greet the recognized customer by his or her name. The customer's identity would be verified by the fingerprint reader. The hotel clerk would then confirm the customer's preferences.

Researchers Barsky and Nash (2002) remarked how efforts by hotel staff to make guests feel sophisticated, welcomed, and comforted were rewarded by developing strong ties of customer emotional loyalty. Research by Magnini and Honeycutt (2005) demonstrated how face and name recognition was able to increase customer satisfaction and loyalty. Biometric technology could enhance customer service by allowing hotel clerks the ability to greet guests as valued patrons, to confirm customer accommodations and amenities needs prior their request, and to speed-up the check-in process with accurate information. The benefits of the biometric customer relationship management application do not end at the hotel check-in desk. Biometric technology could be used throughout the hotel stay to allow guests to access facilities (e.g. pool, spa, recreation) or allow guests to pay for additional services (e.g. bar, room service, gift shop) without the need of carrying a key or credit card in the hotel.

CONCLUSION

Biometric technology has been used by the security sector for a number of years. Recent events have propelled its popularity as a viable option for identification purposes in the hospitality industry. Facial recognition systems have been used by casinos to reduce cheating and criminal behavior. However, as forecasted by the writers of Breakthrough Ideas for 2005 the next "killer" biometric application will not be in the safety or security sector, but would be used to enhance the customer experience (Wirts & Eracleous, 2005).

Organizations have implemented customer relationship management systems which can supply insight into the relationship that each customer has with the organization. This includes such features as reward programs, priority programs, and membership programs. However in the high turnover hospitality industry, short-term employees might not remember long-term customers. Therefore, an electronic facial recognition system could assist the employee by providing a history of customers' behaviors and preferences.

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