



SURVEILLANCE VS PRIVACY: THE IMPLICATIONS OF HIDDEN CAMERAS IN CUSTOMER SPACES

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Abstract : World is changing in a rapid manner. The Internet of Things (IoT) has emerged over the last decade as it finds applications in a variety of fields. It has been used widely in Hospitality industry wherein it is used to create novel services such as smart hotel rooms, personalised services, interactive talking and robotic services etc. For the purpose of customer security, camera installations have been done in almost all the hotels above 3-star category. This is only one side of the coin, there are some unique challenges to using IoT solutions and cameras in the hospitality environment, such as easy physical access to devices. Furthermore, due to the nature of these domains, customers are at the middle of these IoT technologies, resulting in massive data collection from them. This sort of huge data is not only difficult to manage but also rises the issues such as privacy and ethics. As a result, this paper surveys and analyses security, privacy, and ethical issues related to the use of cameras and IoT devices in the hotel industry. Hence there is a dire need to understand the perception of the people towards the cameras installed in the restaurants and found that there is no influence of gender on the perception.

Index terms - Customer privacy, Ethics, Internet of Things, Personalized services and Robotic services.

1. INTRODUCTION

There is no device available to find out how fast the world is changing. The fast developments in the domain of information and communication's technology and the advent of mobile networks have widened technology's reach to move beyond the scope of working environments. The concept of "The Disappearing Computer" is getting increasing attention, as major manufacturers continuously introduce innovative home appliances that smudge the line between fantasy and reality (Mosseberg, 2017). These are the same appliances that people have been using for decades, however, today they integrate smart features that aim to simplify and automate daily activities. Every appliance is no longer a simple device that performs certain tasks, but rather an interconnected, technologically-enhanced peer, that can interact, share information or control other appliances to satisfy users' needs. The list of the currently available smart features is limited, yet indicative of those to come: smart ovens and refrigerators, sophisticated surveillance systems, etc. It is apparent that the era of technological convergence is approaching through a wealth of commercially available smart appliances and holds great potentials, including new ways to improve the quality of life for all.

While travelling, people must overcome to unfamiliar environments, where they must learn how to tackle and perform simple things that are taken for granted at home. These days there are systems that leverages the drawbacks of being away from home and offers a unique user experience by redefining the way people stay and interact with a hotel room (Gilbert & Morris, 1995). A technologically augmented hotel room, which includes cameras programmed with Artificial Intelligence, that observes its environment and adapts its behaviour, in real-time, to deliver "intelligent" and personalized services without hampering the privacy of its guests. In order to maintain privacy, non-invasive observation methods are utilized to collect the contextual data that drive the decision making process. However, pervasive data collection about customers through such devices shifts the control of information from user to business owner as some ethical concerns come in between (Allhoff & Henschke, 2018). It is even challenging to clearly inform in prior the type of information that will be collected from customers because of the presence of variety of devices. While the data transfer is impeccable, the operator must behave responsibly and not use the data beyond the consumer's intent.

2. REVIE OF LITERATURE

The outstanding evolution of the tech generation, like the microprocessors, cell networks and devices, social media, etc., has necessarily introduced a lot of interest from the scholar's network to the area of Ambient Intelligence. The technological improvements made accessible the essential equipment to materialize the idea of "Disappearing Computing" and enhance the pleasure of people's

lifestyles through introducing latest applications, ranging from “simple” technologically-augmented objects to prevalent and extensive environments wherein the technology disappears amidst the environment and seamlessly helps every day activities.

In the past few years several studies and latest applications have outlined the potentials of ambient intelligent across various domains, including education and edutainment (Antona et al., 2011; Korozi et al., 2012), cultural heritage (Grammenos et. Al., 2012) products promotion and marketing (Grammenos, 2012) and as expected home automation. In particular, in the domain of home automation the available systems share a common objective: monitor the environment, directly or indirectly, and guide users to perform their daily chores. Monitoring relies either solely on computer-vision technologies through wall- or ceiling- mounted cameras (Brdiczka, Crowley & Reignier, 2009) or on a combination of cameras with additional sensors like microphone arrays, motion detectors, etc., (Chen, 2004; Nijholt, Zwiers & Peciva, 2009) for improved efficiency. But monitoring is not sufficient; the purpose of smart environments is use the collected data to decide which actions should be taken (Cetina, Giner, Fons & Pelechano, 2010) to facilitate user activities.

To fulfil that, every system includes a proprietary context model for representing the environment, the actors and the activities, which is used by the appropriate inference engine to determine the actions to be executed. All approaches have in common that they build their models using ontologies to benefit from their expressive power and the available inferencing engines (Cook, 2003; Streitz & Nixon, 2005). However, the field of smart home research is still in its infancy and the relevant literature is sparse (Aldrich, 2003). However, the hospitality industry, despite being an excellent application domain for Ambient Intelligence technologies, has not received the same level of attention. Numerous studies have shown that sooner or later it will have to increase the adoption rate of new technologies to satisfy the new generations of tech-savvy tourists of the 21st century, who will have different requirements than their predecessors (Kelley, 2012) and will demand innovative services. As the hospitality industry becomes more competitive and industry professionals are strengthening their efforts to find competitive advantages in order to gain and retain guests (Berezina & Cobanoglu, 2010), they are coming up with concepts of soliloquising social robot. The objective of the social robot is to relieve the customers’ loneliness and provide interpersonal warmth (Nakanishi, 2019). Gender seems to play a role in shaping a person's perceptions of the desirability of using robots and cameras, although there is one noteworthy research that finds that gender does not play a role in shaping perceptions of robots (Dinet & Vivian, 2014). These findings generally indicate that females are more sceptical of social robots and generally resist wanting to use them in their staycations. A study based upon Eurobarometer data, shows that people in urban settings have a more favourable approach to the use of robots (Hudson et al., 2017).

3. RESEARCH METHODOLOGY

The present study is a descriptive study, gathering information from secondary literatures as well as through a survey method where a structured questionnaire was created and shared among 92 respondents using convenience sampling from the people who visited different types of hotels and restaurants in the last one year, the customer awareness to new technology development for security, their perceptions and comfort in using them. We have also looked into the demographic side of respondents. We have used Factor analysis to analyze the collected data and come to conclusions.

3.1 OBJECTIVES OF THE STUDY

- To analyze the general attitudes towards robots and whether it will positively impact upon a person's willingness to use a robot in a hotel or other tourism-related facility.
- To study the gender difference in the perception on cameras in hotels.
- To study whether the development of technology and usage of cameras in hotel rooms are hindering customer privacy or they are adapting with it positively.

4. RESULTS AND DISCUSSION

Communalities

	Initial	Extraction
You are aware that most of the hotels these days have installed cameras in their premises	1.000	.728
Hotels are responsible for keeping their customer's details private	1.000	.798
Keeping a hidden camera in a private place without the knowledge of the concerned person is ethical	1.000	.578
The enhancement in technology, should be used for creating a sense of security among people staying in hotels	1.000	.573
Hotels are increasingly accepting IoT to make customer's stay comfortable	1.000	.693
Surveillance cameras are used only for security purpose in hotels	1.000	.785
If the customer is having some doubt regarding hidden devices, the management is responsible to answer	1.000	.582

For a hotel business, ethics should be given more value than technology developments(for expansion as well as making profits)	1.000	.551
You are comfortable to have a continuous hidden eye watch while you are travelling	1.000	.732
You are comfortable with having a social robot at your service inside your room while you are staying at a hotel?	1.000	.570
Presence of social robots in your room relieves you from your loneliness?	1.000	.865
You have faced privacy issues during your stay at some hotel	1.000	.776
Image sensor in robots is the main concerning issue for you?	1.000	.676
Installation of cameras in hotel rooms is justifiable?	1.000	.532

Table 1: Extraction Method: Principal Component Analysis.

4.1 HYPOTHESIS

H_0 : There is no association between gender and acceptance of camera installation in hotels.

H_a : There is a significant association between gender and acceptance of camera installation in hotels.

Gender * Installation of cameras in hotel rooms is justifiable?

		Installation of cameras in hotel rooms is justifiable?				Total	
		strongly disagree	disagree	agree	strongly agree		
Gender	female	Count	8	4	1	0	13
		% of Total	27.6%	13.8%	3.4%	0.0%	44.8%
Gender	male	Count	4	6	5	1	16
		% of Total	13.8%	20.7%	17.2%	3.4%	55.2%
Total		Count	12	10	6	1	29
		% of Total	41.4%	34.5%	20.7%	3.4%	100.0%

Table 2: Gender and Installation of cameras in hotel rooms opinion

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.145 ^a	3	.162
Likelihood Ratio	5.748	3	.125
Linear-by-Linear Association	4.935	1	.026
N of Valid Cases	29		

a. 5 cells (62.5%) have expected count less than 5. The minimum expected count is .45.

P value is more than 0.05 so accept null hypothesis, that is there is no association between gender and acceptance of camera installation in hotel rooms.

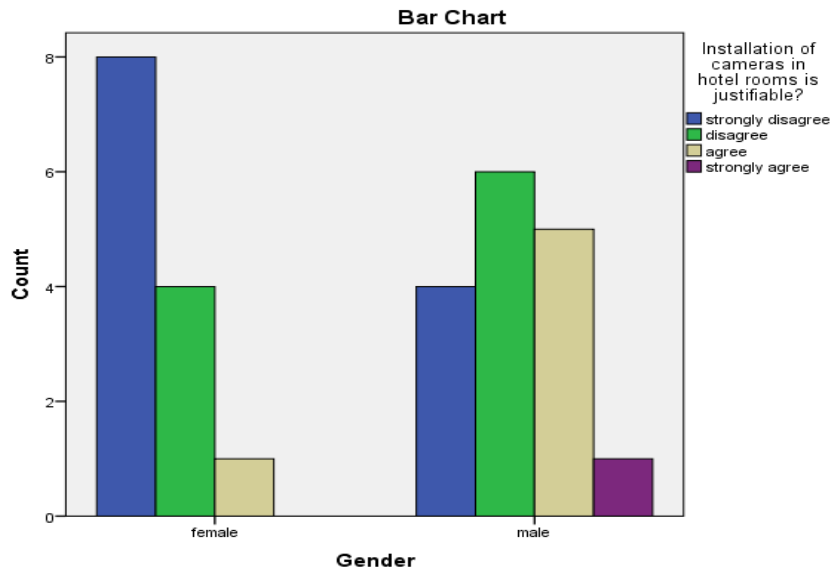


Figure 1: Gender wise opinion on installation of camers

H_0 : The development of technology and usage of cameras in hotel rooms in relation to customer privacy are not correlated to travelling preference.

H_a : The development of technology and usage of cameras in hotel rooms in relation to customer privacy are correlated to travelling preference.

Correlations

		Traveling preference	You are aware that most of the hotels these days have installed cameras in their premises	Keeping a hidden camera in a private place without the knowledge of the concerned person is ethical	Surveillance cameras are used only for security purpose in hotels	Hotels are increasingly accepting IoT to make customer's stay comfortable	Presence of social robots in your room relieves you from your loneliness?	You are comfortable with having a social robot at your service inside your room while you are staying at a hotel?	You are comfortable to have a continuous hidden eye watch while you are travelling
Traveling preference	Pearson Correlation	1	.042	.099	.367	-.009	.268	.140	-.012
	Sig. (2-tailed)		.829	.610	.051	.965	.160	.469	.951
	N	29	29	29	29	29	29	29	29
You are aware that most of the hotels these days have installed cameras in their premises	Pearson Correlation	.042	1	-.429*	.247	.021	.260	-.083	-.333
	Sig. (2-tailed)	.829		.020	.196	.913	.174	.669	.077
	N	29	29	29	29	29	29	29	29
Keeping a hidden camera in a private place without the knowledge of the concerned person is ethical	Pearson Correlation	.099	-.429*	1	-.110	.143	-.039	-.213	.266
	Sig. (2-tailed)	.610	.020		.569	.460	.840	.267	.164
	N	29	29	29	29	29	29	29	29
Surveillance cameras are used only for security purpose in hotels	Pearson Correlation	.367	.247	-.110	1	-.090	.572**	.411	.026
	Sig. (2-tailed)	.051	.196	.569		.644	.001	.027	.892
	N	29	29	29	29	29	29	29	29
Hotels are increasingly accepting IoT to make customer's stay comfortable	Pearson Correlation	-.009	.021	.143	-.090	1	-.147	-.309	-.213
	Sig. (2-tailed)	.965	.913	.460	.644		.446	.103	.267
	N	29	29	29	29	29	29	29	29
Presence of social robots in your room relieves you from your loneliness?	Pearson Correlation	.268	.260	-.039	.572**	-.147	1	.390	.064
	Sig. (2-tailed)	.160	.174	.840	.001	.446		.037	.743
	N	29	29	29	29	29	29	29	29
You are comfortable with having a social robot at your service inside your room while you are staying at a hotel?	Pearson Correlation	.140	-.083	-.213	.411	-.309	.390	1	.266
	Sig. (2-tailed)	.469	.669	.267	.027	.103	.037		.162
	N	29	29	29	29	29	29	29	29
You are comfortable to have a continuous hidden eye watch while you are travelling	Pearson Correlation	-.012	-.333	.266	.026	-.213	.064	.266	1
	Sig. (2-tailed)	.951	.077	.164	.892	.267	.743	.162	
	N	29	29	29	29	29	29	29	29

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3: Correlation matrix of variables and opinions

According to the travelling preferences, there is a correlation to the acceptance of IoT usage in hotels for increasing customer comfort and people based on their travelling preference are comfortable to have a continuous hidden eye during their stay. However the correlation is very weak and negative.

H_0 : The general attitudes towards robots will negatively impact upon a person's willingness to use a robot in a hotel or other tourism-related facility.

H_a : The general attitudes towards robots will positively impact upon a person's willingness to use a robot in a hotel or other tourism-related facility.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.112 ^a	.012	-.202	.95965

a. Predictors: (Constant), Hotels are responsible for keeping their customer's details private, The enhancement in technology, should be used for creating a sense of security among people staying in hotels, You have faced privacy issues during your stay at some hotel, Image sensor in robots is the main concerning issue for you?, Hotels are increasingly accepting IoT to make customer's stay comfortable

b. Dependent Variable: Installation of cameras in hotel rooms is justifiable?

ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	.267	5	.053	.058	.998 ^b
Residual	21.182	23	.921		
Total	21.448	28			

a. Dependent Variable: Installation of cameras in hotel rooms is justifiable?

b. Predictors: (Constant), Hotels are responsible for keeping their customer's details private, The enhancement in technology, should be used for creating a sense of security among people staying in hotels, You have faced privacy issues during your stay at some hotel, Image sensor in robots is the main concerning issue for you? Hotels are increasingly accepting IoT to make customer's stay comfortable

Table 4: Model developed with the variables

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.483	2.103		.705	.488
Hotels are increasingly accepting IoT to make customer's stay comfortable	.218	.463	.113	.470	.643
You have faced privacy issues during your stay at some hotel	-.008	.307	-.005	-.025	.980
Image sensor in robots is the main concerning issue for you?	.051	.331	.035	.153	.880
The enhancement in technology, should be used for creating a sense of security among people staying in hotels	-.081	.387	-.049	-.209	.836
Hotels are responsible for keeping their customer's details private	-.050	.436	-.025	-.115	.910

a. Dependent Variable: Installation of cameras in hotel rooms is justifiable?

Table 5: Model significance with the variables

The model is not significant as $F_{Statistic}$ value is more than 0.05. However, the P value of each independent variable is greater than 0.05 which means the general attitudes towards robots will negatively impact upon a person's willingness to use a robot in a hotel or other tourism-related facility, but very faintly as the model is insignificant and weak.

From the analysis, we have found out that there is no association between gender and their acceptance towards installation of cameras in hotel rooms. Female may have certain level of discomfort in the presence of cameras in the form of social robots but they are also aware that it is mostly for their security reasons.

According to the travelling preferences, people are being acceptable towards IoT usage in hotels to increase customer comfort but people are not comfortable to have a continuous hidden eye on them as it intrudes their privacy.

Finally, we also found out that the general attitude of people towards robots are positively impacting a person's willingness to have a social robot around them in a hotel or other tourism related facility to reduce loneliness.

5. CONCLUSION

Hotel room surveillance is against law, according to Hotel Security Camera Laws. However, for security reasons, installation of cameras in hotel hallways is becoming increasingly popular. These days, Social robots or robot soliloquy has become a travel companion for all solo travelers. However, if tourists are concerned about the presence of any devices in their rooms, they can request a room change upon checking in to a hotel. From a management standpoint, the findings suggest that tourists will accept cameras and social robots more readily if the robots have a more machine-like appearance than a human-like one. A balance of human and robotic labor would be appreciated by those who are more “high-tech”.

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