



# Indian and American consumer perceptions of cockpit configuration policy



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## ABSTRACT

Prior studies have examined the passenger's trust in a human operated system versus an autonomous autopilot operated system. The results indicated that passengers had a more negative attitude toward the autopilot systems. The current study expands on this by examining perceptions of different cockpit configurations, and exploring cultural differences between Indian and American individuals. Participants from both India and the United States were asked to imagine a) that they were on a commercial flight, b) that they were sending a package on a cargo flight, or c) that they were on a corporate flight. In addition they were told that the aircraft was piloted by: a) two pilots in the cockpit, b) one pilot in the cockpit and one pilot located in a ground facility using remote controls, or c) two pilots in a ground facility using the remote controls. The results demonstrated that participants were strongly against having two pilots on the ground controlling the aircraft with remote controls, although most accepted this if the pilots were remote controlling cargo flights. In addition, American participants had more extreme views than the Indian participants, except with the cargo situation.

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## 1. Introduction

Prior research clearly demonstrates that there are major cultural differences between individuals from India and the United States. In addition, studies have been completed that have examined the level of trust that a potential airline passenger would have in autonomous autopilot systems. However, there has been little research that examines the effect of culture on an individual's level of trust in these autonomous systems. Therefore, participants were polled from India and the United States. A brief background and theoretical foundation will be provided followed by the methodology, results and discussion, and then conclusions of the study.

## 2. Background and theoretical foundation

Passengers must place their trust in flight crews who operate the aircraft. As technology develops, it may become feasible to replace some or all of the cockpit flight crew with autonomous systems. Technology can allow this to happen, but it is important to

capture the reactions of the passengers to the possibility that, instead of a pilot in the cockpit, the pilot or pilots are located in a room on the ground controlling and monitoring the flight. Additionally, it is useful to determine how an individual's cultural background affects their trust of these systems and therefore their willingness to travel as a passenger on such a flight.

While differences between Indian and American cultures have been found in many previous studies, differences in comfort, trust, and willingness to use automated technologies related to the flight of commercial aircraft have not been investigated in detail. Hence the purpose of this study is to: a) examine perceptions of different cockpit configurations, and b) explore cultural differences between Indian and American individuals with regard to these perceptions.

### 2.1. Comparisons of culture: India and the United States

Each year, there are approximately 50 million passengers that fly through India (Carrero, n.d.). India is experiencing rapid growth in the aviation market and has the potential to be a leader in the transformation of the flight and automated industries (Couchen and Lieching, 2008). Meanwhile, the Aircraft Owners and Pilot's Association (2010) has estimated that the number of commercial pilot certificates being issued in the United States has decreased by

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29%, which indicates a potential pilot shortage in the near future. Furthermore, Boeing (2013) recently reported that within the next 20 years there would be a need for 489,000 new commercial pilots worldwide.

Increased advancements in automated and remote controlled flight technology may mitigate the pilot shortage problem. Public perceptions and culturally influenced attitudes toward such technologies should inform the regulation and marketing of such systems, as well as their design. Apple and Android applications have been increasingly utilized by airlines combined with the available Wi-Fi technologies in flight (Airlinetrends.com, 2013). The ability for passengers to communicate in real-time with the crew, and to access in-flight entertainment through their wireless devices, have allowed airlines to generate ancillary revenue through in-flight product purchases. The growing usage of these in-flight capabilities and applications is a useful indicator of the customer's potential feelings towards the technologies related to automated flight capabilities. It suggests that our society is becoming more open to using various types of technologies related in aviation. Culture, however, is another aspect that is an important factor in the acceptance of the use of these new technologies.

Helmreich (2000) defined culture as “the shared norms, values, and practices associated with a nation, organization, or profession” (p. 134). An individual's inclination to trust others may also be influenced by cultural background (Hofstede, 1980). Furthermore, it has been demonstrated that propensity to trust can be related to whether a person is considered an introvert or an extrovert, with the latter being more willing to trust other individuals (Gaines et al., 1997; Omodei and McLennan, 2000; Shikishima et al., 2006).

Individualism versus collectivism and uncertainty avoidance has been investigated to compare the national level of cultural difference between countries. Markus and Kitayama (1991) determined that collectivist cultures have an interdependent view of the self, and that they are taught to trust without question (Wu & Jang, 2008). Furthermore, people from a collectivist culture tend to regard the opinion of others more importantly with respect to their decision-making and would consider other people's interests over their own in order not to contradict or offend them.

India scored 48 out of 100 on Hofstede's Cultural Values by Nation Index regarding the individualistic versus collectivist dimension, indicating a mainly collectivist culture with some individualistic characteristics (Robbins and Judge, 2009). On the other hand, a country like Guatemala scored six, which is the lowest score possible, indicating a highly collectivist culture. A very individualistic culture such as the United States scored the highest value of 91.

Uncertainty avoidance (Robbins and Judge, 2009) is defined as the “extent to which a society feels threatened by uncertain and ambiguous situations and tries to avoid them” (p. 125). This can be used to determine a culture's feelings toward automated flight technologies because the use of automated or remote-controlled aircraft can be regarded as ambiguous or uncertain. In terms of uncertainty avoidance, India scored a 40 out of 100 and the US scored 46. This slight variance in score still indicates that there is a difference in uncertainty avoidance between India and the US, where Indian individuals would be less extreme in their responses toward new technologies than would US individuals.

## 2.2. Expansion of automated technologies and trust

The growth and reliability of automated technologies can improve task performance and allow users to successfully multi-task (Wickens and Dixon, 2007). The four stages of automation are information synthesis, diagnosis, selection, and execution (Parasuraman et al., 2000). These four stages are similar to human

information processing. Moreover, trust in the automation system by the user is dependent on a number of factors. Sorkin and Woods (1985) stated that an individual that can access raw data could make a choice to accept or reject the automation's recommendation; however, if it fails, both operator trust and dependence are affected.

Comfort, trust, and willingness to use automated technologies are aspects that need to be considered due to the nature of potential negative consequences if used inappropriately (Merritt and Ilgen, 2008). Due to the exponential growth in automated technologies (Rice, 2009), individuals will interact with and use machines that they feel they can trust. Moreover, machine characteristics linked to perceptions of trust such as competence, predictability, and dependability can be related to these automated technologies, and can affect the level in which a user will place their trust in the system. Consumer willingness to use automated technologies will have a direct impact on the financial success of the air transport industry as these technologies are increasingly incorporated into daily operations.

A previous study investigated the passenger's trust in a human operated system versus an autonomous autopilot operated system (Hughes et al., 2009). The results indicated that passengers had a more negative attitude toward the autonomous autopilot system compared to having human pilots operating the aircraft, even when monetary discounts would be offered to fly with the auto-pilot system. A more recent study examined the cultural differences between Americans and Indians with respect to their perceptions of remote controlled and automated commercial flight operations (Rice et al., 2014). This had two layers. The first layer observed the passenger's comfort, trust, and willingness with respect to being in an aircraft piloted by either a human, a fully automated aircraft with no human involved, or with a human pilot located at a ground facility that had the capability to remotely control the aircraft. The second layer involved observing the cultural and sociological aspects by asking the same questions but comparing their responses on perceptions of the various flight configurations with who was on board the aircraft: themselves, their child, or their colleague.

The results indicated that Indians and Americans both had a high positive view on having human pilots located in the cockpit, whereas completely automated or remote controlled configurations were negatively rated. Furthermore, the results confirmed that Indian culture is more collectivistic, because the attitudes towards automated and remote controlled aircraft were less negative compared to American participants. Lastly, the results demonstrated the concept of self-preservation and the desire to protect one's offspring. Both groups of participants across all three pilot scenarios had a lower rating in terms of trust, willingness, and comfort when these were to be on board as opposed to their colleagues. Furthermore, the participants had an even more negative rating when their child was on board compared to themselves or their colleagues.

## 2.3. Current study

Previous research has shown the importance of consumer perceptions when proposing changes to the traditional cockpit. No research that we know of has looked at consumer perceptions of cockpit configurations where one pilot is located in the cockpit and the co-pilot is located at a ground facility, with the ability to fly the airplane via remote control. Participants from India and the United States were given scenarios about: a) two pilots located on the cockpit; b) one pilot located in the cockpit and one pilot located in a ground facility using remote controls; or c) two pilots located in a ground facility using remote controls. They were told that the airplane was a commercial, corporate or cargo flight. Participants

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