# A Small Icon and Its Effect on User Perception - How the Design of the Passenger Call Button Shapes Passengers Communication with Cabin Crew

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**Abstract.** "Learn how to see. Realize that everything connects to everything else" - Leonardo da Vinci. Flight attendants are usually perceived as service workers although their main responsibility is to ensure safety and security on board. This picture has been manifested due to historic developments such as the deregulation of commercial air travel and resultingly the focus on service as a mean for airlines to differentiate their offerings in the market. However, some of the relics of these times, such as the icon for the Passenger Call Button, do not seem to fit into the modern world where gender-equality is a strong value. **Research question.** This paper assess different icon configurations on an IFE screen to assess passenger's preference. **Methodology.** A video containing sample IFE screens with alternating icons were shown to participants to firstly identify whether the changes will be noticed and secondly to asses their preference on the design. **Results.** Passengers preferred the gender-neutral icons over feminized symbols mainly due to gender-neutrality. There was a significant relation between education and the preference of the icon which indicate that the higher the education level the more attention is paid to gender-equality. **Discussion.** The overall positive responses for the spot the difference test result from prolonged display times which could be shortened to induce change blindness. Further research e.g. using eye-tracking technology could provide more insights into the visual scanning process. **Conclusion.** This study provides insights into how an optimal icon design can change the perception of passenger's on how cabin attendants work shall be done. Detailed cross-cultural studies need to be carried out in order to understand whether gender-equality is equally important in all parts of the world.

**Keywords:** gender-equality · WAD vs. WAI · Flight attendants · Passenger Call Button · visual attention · user-centered design


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## 1 Introduction

Flight attendants are expected to have "effective" communication skills [14] [6]. In the initial stages of commercial air transport air travel was only accessible to a small passenger group [24]. Travelling these days should have recreated an intimate feeling of "being home" [24]. Therefore, the task of the so-called "sky girls" was to relieve the flight anxiety of predominantly wealthy business men [24]. Service offerings have been one of the major differentiation factors for airlines after the deregulation [19]. One aspect for perceived good service quality is responsiveness and communication according to [26]. Responsiveness refers to the service provider being able to provide the service in a timely manner (e. g. arranging meetings with the customer, quick call-backs and service) [26]. Communication means that the customer is informed in an understandable manner. Further examples for good communication routines are explanations of the provided service and re-assuring that occurring problems will be handled [26]. In an aircraft cabin the only mean for passengers to discreetly inform the cabin crew is to use the Passenger Call Button (PCB) [22]. According to Manikath et al., 2024 [21] the PCB is mainly used for service requests . Further, cabin crew use the button too as part of their own communication routine which makes it difficult to distinguish who has initiated the call [39]. Since the PCB is predominantly used for service requests, flight attendants usually do not attend the call immediately, assuming it is not an emergency [21]. This could have a negative effect on the perceived service quality but more importantly on task response in case of emergencies. Currently there is no mean to discreetly alert the cabin crew in case of emergencies [20]. The importance of efficient and clear communication can be seen in the accident of Japan Airlines Flight JAL516 at Tokyo Haneda Airport. According to Aviation Herald the landing initially seemed to be normal, however fires could be seen outside the windows [16]. The cabin crew made an announcement stating that everyone should remain calm and no one should take their luggage and stand up [16]. The cabin crew of flight JAL516 has been internationally praised for the efficiency of evacuation. All of the 379 passengers onboard were able to calmly evacuate the aircraft. No one was seen to be carrying their luggage, obstructing the evacuation by filming or panicking. This can be seen as the result of a well trained crew, as flight safety expert Prof. Dr. Graham Braithwaite stated in Business Insider [27] and their communication skills. The purpose of this study is to understand how the design of the PCB, specifically the icon is perceived by passengers and which implication it might have for future designs. Following research questions will be assessed in this paper:

RQ1: How can the design of the Passenger Call Button be improved to increase passenger's visual attention?

RQ2: What are passenger's requirements on the design of a Passenger Call Button?

#### Historical Development of the Passenger Call Button

In the following section some peculiar designs of the Passenger Call Button over the past decade of aviation history will be described. After researching in online archives and contacting archivist at aviation museums, there is evidence of an early design of a Passenger Call Button in the Vickers Viscount 724/757 series delivered to Trans Canada Airlines in 1954. The aircraft had approximately 48 to 53 (depending on the configuration) passengers in a two-abreast seating [38]. The picture taken from the Operations Manual shows the "Stewardess Call Button" located in between the two light switches [35]. The button needed to be pulled out and it then lit up (Figs. 1 and 2).

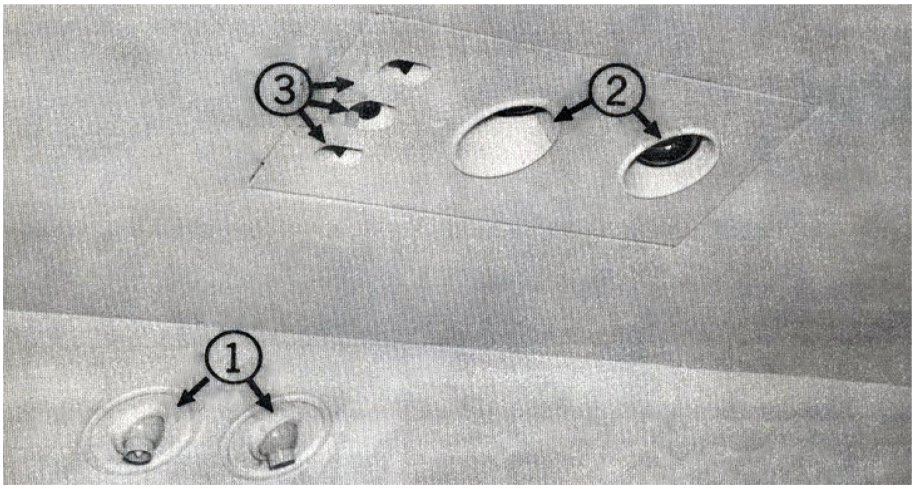
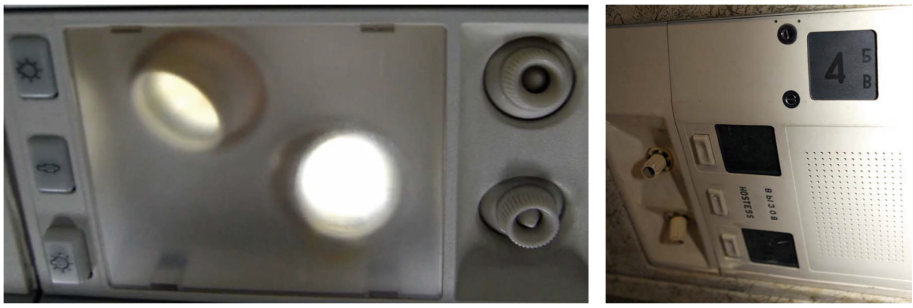



**Fig. 1.** Passenger Call Button in the Vickers Viscount 724 [35]

It was pushed back when the flight attendant reached the seat. The British de Havilland DH.106 Comet was the world's first turbojet engine aircraft [37]. The Comet 4 (first flight in 1958) had typically 56 seats to a maximum of 106 seats [37]. The "call switch" is located on the passenger's individual lamp panel, forward of the two light switches [12]. This could be the first attempt to separate the light switches from the reading lights, which in later cabin designs often lead to confusions for the passengers pressing accidentally the call button instead of the light switches. The call switch itself is a "three-position push-pull switch" [12]. The knob is pushed in and an amber lights illuminates. The flight attendants need to pull out the switch to reset the call.

The design of the Passenger Call System for both supersonic jets Tupolev Tu-144 and Concorde is similar (Fig 3). Bold rectangular push-buttons located in between the light switches with either an icon or a labelling could be found in pictures of the cabin interior of these aircraft [1,34].


**Fig. 2.** Passenger Call Button in the de Havilland DH.106 Comet 4 [23]



(a) [1] (b) [34]

**Fig. 3.** PCB design in a Concorde (a) and a Tu-144 (b).

It can only be assumed why the aircraft designers chose to place the PCB close to the light switch which according to Boeing is a faulty design and lead to misuse of the PCB instead of the light switch [11]. The higher seat density and reduced space in the overhead passenger service channel could be reasons for this faulty design. Over the years designers tried to highlight the call button by marking it either with an eye-catching colour (e. g. red, blue, amber), striking icon or a different size/location of the button (cf. Fig. 4) [36].

**Fig. 4.** Detailed icon of Passenger Call Button in a Soviet aircraft [36]

Boeing claimed with their improved "Sky Interior" on the Boeing 737 Max that they "came up with a really good improvement" by positioning the PCB away from the reading lights and differentiating it [11]. However, looking back at the Comet 4 or even the Boeing 737-CL (depending on the individual configuration) the innovation is not as "radical" as it has been proclaimed by Boeing. The technological advancement can be seen in the button size, evolving from an initial mushroom shaped (Comet 4) to rectangular blocks (e. g. Concorde, Boeing 747) to a smaller, semi-spherical round shaped button.

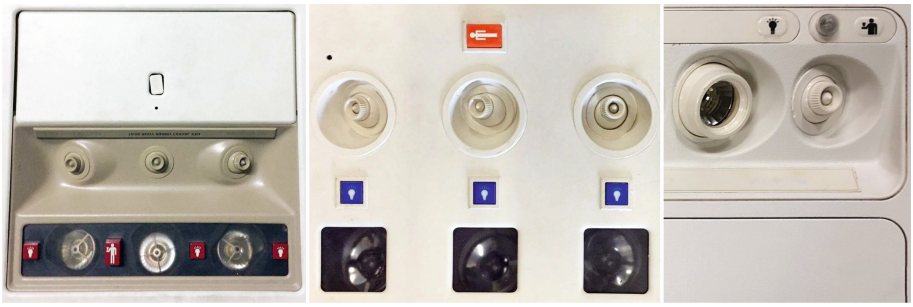
In modern aircraft like the Airbus A350 or the Boeing 787 there is a virtual button embedded in the IFE screen in addition to the physical button. This is a true novelty and can be seen as the next technological advancement. The reason for having a virtual PCB could be due to the more spacious cabin design [2] with high ceiling heights which make it simply difficult to reach the physical PCB while being seated. Usually there is an additional button in the handset of the seat, if available. The new Panasonic IFE system called Panasonic eX3 offers motion control: whenever the passenger is waving his hand the menu for reading lights and flight attendant call will open on the IFE screen.

## 2 Methodology

Passenger Call Buttons exist in various designs and are constantly developed further to fit the requirements of the modern passenger. One prominent aspect which deserves a deeper look for instance is different icons are used as a symbol for the flight attendant. The objective of this study is to evaluate passenger's preference on the design of the Passenger Call Button.

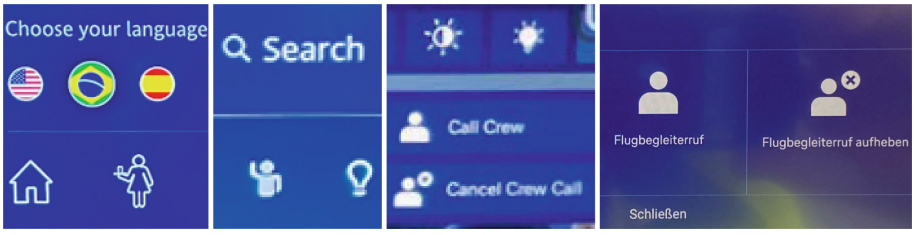
### 2.1 Participants

In total 155 people participated in the online survey. It was required to be over 18 years old to complete the survey. The link to the survey was shared with the participants and granted anonymous participation. Participants could terminate the study at any time by closing the window of the survey. Ethics approval (CURES/21010/2023) was granted by the institutional research ethics committee.



(a) [4] (b) [3] (c) [5]

**Fig. 5.** Different evolutions of the PCB in a Boeing 737 Classic (a), Boeing 737-200 (b), and Boeing 737 NG (c).




(a) [18] (b) [31] (c) (d) Courtesy of Jens Blawert, Deutsche Lufthansa AG

**Fig. 6.** Virtual PCBs in Airbus A330-900 (a), (b), Boeing 747-400 (c), and Boeing 787 (d).

### 2.2 Material

A qualitative survey study was distributed to passengers online to assess the preference on the design of the Passenger Call Button. The questionnaire started with basic demographic questions to categorize the participants according to their travel experience. Secondly, a one-minute video was shown to assess perception and directed visual attention. The video contained slight differences in the IFE screen designs (as shown in Fig. 7).


**Fig. 7.** Sample of an IFE screen

Six different screen samples were shown for five seconds with a white screen in between. Participants needed to watch the entire video and afterwards to detect the differences between the designs. The differences were only in the background objects (the icon for the Passenger Call Button). The icons shown are commonly found as the symbol for the flight attendant call in various aircraft types (see Fig. 8) and one novel symbol for service (hotel bell) which is not related to a depiction of a human. Icons A to D symbolize the desired final state (in this case having someone to come and provide support), Icon E symbolizes the action which is needed to create the final state (such as creating attention by waving or shouting), whereas Icon F stands exemplarily for the impending initial step which is needed to reach the final state (such as pressing the button). Based on this fundamental concept, most icons can be categorized into these three groups.

In case of the Passenger Call Button and also the Emergency Call Button it is desired to understand which category is most intuitive and favoured by the passenger and hence represents the fastest and easiest trigger.


**Fig. 8.** Detailed icons of the Passenger Call Button

Afterwards, the passengers were asked open-ended questions of the identified differences and for their preferred design. Additionally, three different icons were shown to understand passenger's preference on the service call. A female icon, gender neutral icon and the symbol for a hotel bell were used to understand whether there is an incline towards gender associated service or the action of actively calling someone represented by the hotel bell (see Fig. 9). The first two icons are commonly found in the aircraft, whereas the last one is found as a symbol for pure service in hotels.

**Fig. 9.** Detailed icons of the Service Call Button

### 2.3 Research Design

The questionnaire was generated using the online survey software Qualtrics (www.qualtrics.com). The short video for the visual search task was embedded in the questionnaire. It took around 15 min to complete the survey. Participants were advised to use a laptop or desktop computer to complete the study since the screen resolution for the "spot-the-difference" video were best on a bigger screen.

### 2.4 Hypotheses

There are five alternate hypotheses which will be tested as follows:

**Table 1.** Basic demographics passengers

| Category | | Count | Percent |
|---|---|---|---|
| Gender | Male | 117 | 75% |
| | Female | 35 | 23% |
| | other | 3 | 2% |
| Ethnicity | European | 139 | 89% |
| | African | 3 | 2% |
| | North American | 3 | 2% |
| | South American | 2 | 1% |
| | Asian | 7 | 5% |
| | Oceanic | 1 | 1% |
| Age | <30 | 42 | 27% |
| | 31-40 | 55 | 35% |
| | 41-50 | 36 | 23% |
| | >50 | 22 | 14% |

H1: There is an association between familiarity and detection of change of the cabin crew icon
H2: There is an association between gender and the preferred icon for cabin attendant call
H3: There is an association between gender and the preferred icon for service
H4: There is an association between travel class and preference of cabin crew icon
H5: There is an association between travel class and preference on the service icon
H6: There is an association between educational background and the preference on the cabin crew icon
H7: There is an association between educational background and the preference on the service icon

Statistical analysis was conducted using IBM SPSS (Version 28.0).

## 3 Results

### 3.1 Basic Demographics

The average age of the participants was 37.8 ($SD = 10.6$). The majority of the participants were male (75%, $n = 117$) and of European descent (89%, $n = 139$). For details refer to Table 1 for a summary of the demographic information. Differences in participants' preferences of the Passenger Call Button were collected and quantified by Chi-Square Analysis.

**Table 2.** Results Spot-the-difference test

| Category | Count | Percent |
|---|---|---|
| correct answer | 117 | 77% |
| no difference spotted | 21 | 14% |
| watched multiple times | 10 | 7% |
| wrong answer | 4 | 3% |

### 3.2 Results of the "Spot-the-difference" Test

152 of the 155 participants answered the open-ended question on the "Spot-the-difference" test. The majority of the participants identified the changes in the icons for the Flight Attendant Call Button correctly. 14% ($n = 21$) did not notice any difference, whereas 7% ($n = 10$) specifically mentioned that they only noticed the changes after watching the video multiple times (which was against the instructions of the experiment). Only a minority provided a wrong answer. All the above mentioned, in total 23% ($n = 35$) did not provide a correct answer on the first spot. For further details refer to 2.

The overall high number of positive responses could result from the fact that the participants were able to memorize the images and the changes correctly. According to Potter, 1976 approximately 400 ms are needed to memorize an image [28]. In the experiment participants looked 5000 ms at the picture sequence with an interstimulus interval (ISI) of the same length (5000 ms). According to Rensink, 2001 change blindness can be induced with an ISI of 80 ms or more. However, since in this experiment the ISI had the same length as the picture sequence and six alternating pictures were shown it can be assumed that for the majority of participants change blindness was not induced and the change could be detected. Furthermore, participants were given a cue to actively look for changes in the shown video. To assess whether familiarity (how many times per year is the participant taking air travel?) had an influence on the detection of change a Chi-Square Analysis has been performed. The results for the Chi-Square Test ($\chi^2(2, n = 152) = 2.7, p = 0.259$)indicate that there is no association between familiarity and the detection of change in the shown video.

### 3.3 Preference on the Cabin Crew Icon

Following the "Spot-the-difference" test participants needed to choose their preferred icon for the cabin attendant call out of the six shown. 150 participants answered this question. The most preferred icon is the "gender-neutral torso holding up an arm" with 38% ($n = 57$), which belongs to the category of icons that focusses on the action. 25% ($n = 38$) preferred the icon showing a "gender-neutral torso holding a cup", whereas 23% ($n = 34$) chose the "female wearing a scarf and cap". Surprisingly, the icon showing a "female wearing a skirt and holding a tray-table with a glass" was the least preferred with only 5% ($n = 7$).

**Table 3.** Preferred icon for the cabin attendant call

| Preference Cabin Crew Icon | Count | Percent |
|---|---|---|
| A | 34 | 23% |
| B | 14 | 9% |
| C | 38 | 25% |
| D | 7 | 5% |
| E | 57 | 38% |

Further, participants have been asked which icon would represent "Service" for them. Three different icons were shown: "gender-neutral torso holding a glass", "female wearing a skirt and holding a tray-table with a glass", and a "hotel bell". The majority (61%, $n = 91$) chose the gender neutral torso as the preferred symbol for service, which belongs to the category of icons that focusses on the desired final state. Additionally, surprisingly the feminized depiction was the least preferred (10%, $n = 15$).

**Table 4.** Preferred icon for the service

| Preference Service Icon | Count | Percent |
|---|---|---|
| A | 91 | 61% |
| B | 15 | 10% |
| C | 44 | 29% |

To understand passenger's preference on the icon design hypotheses H2 - H6 have been tested. A Chi-Square Test for independence has been performed to assess the association between gender and preference on the symbol for the cabin attendant call (H2). The results of the Chi-Square Analysis are as follows: $\chi^2(10, n = 150) = 9.46$, $p = 0.45$. The calculated p value is greater than the chosen significance level of $\alpha = 0.005$. Therefore, the null hypothesis cannot be rejected.

Regarding the symbol for service hypothesis H3 (association between gender and icon for service) has been tested. The results for the Chi-Square Analysis ($\chi^2(6, n = 150) = 9.67$, $p = 0.13$) indicate that the null hypothesis cannot be rejected.

Additionally, the association between travel class and preference on the cabin attendant (H4) and service icon (H5) have been assessed. The results for the Chi-Square Analysis (relation between travel class and preference on the cabin crew icon) are as follows: $\chi^2(5, n = 150) = 7.95$, $p = 0.15$. Since the calculated $p$ value is greater than the chosen significance level the null hypothesis cannot be rejected.

The results for the service call are similar: $\chi^2(3, n = 150) = 5.43$, $p = 0.13$. Therefore, the null hypothesis ("There is no association between travel class and preference on the service icon") cannot be rejected.

Lastly, the association between educational background and preference on the cabin crew (H6) and service icon (H7) have been analyzed using Chi-Square Test. The calculated values for the Chi-Square Test on the cabin crew icon are as follows: $\chi^2(15, n = 150) = 27.29$, $p = 0.01$. Since the calculated $p$ value is smaller than the significance level $\alpha$, the null hypothesis can be rejected and there is an association between the educational background and the preference on the cabin crew icon. Similarly, the calculated values for calculations on the service icon are as follows: $\chi^2(9, n = 150) = 19.53$, $p = 0.01$. Consequently, the null hypothesis can be rejected since the $p$ value is smaller than the significance level $\alpha$. Therefore, there is an association between educational background and the preference on the service icon.

### 3.4 Results of Content Analysis

Participants were asked which icons they associate when they want to call a flight attendant. Interestingly, the majority ($n = 94$, 60%) related a gender neutral torso either holding a glass/tray-table, holding an arm up with a cabin crew call. Whereas the gender neutral torso holding up an arm was mainly associated with a passenger calling for help. The reasons stated by the passengers were familiarity with the existing PCB design depicting a gender neutral person, but also actively choosing to be gender-neutral. Around 28% ($n = 43$) associated a female depiction (either full body, wearing uniform or holding a glass/tray-table) with a flight attendant call. It is surprising, that the majority of the participants chose the gender neutral icon when thinking about flight attendant calls (cf. Fig. 10).

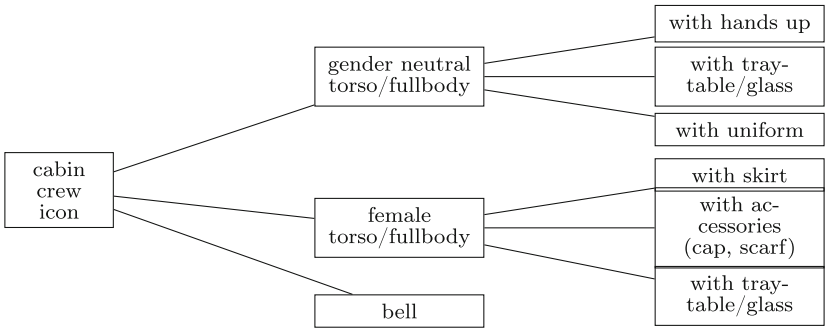



**Fig. 10.** Results of content analysis

## 4 Discussion

It might seem at the first glance that the current study focuses on a seemingly negligible topic, however, the historic development of the PCB design itself and the results of this study reveal the complex nature of the topic. The Passenger Call Button is an important feature for passengers to communicate with cabin crew [21]. The design of the button is a relict from the time when air travel developed as a form of mass transportation [22]. Unlike the mandatory warning signs such as Exit, No Smoking, and Fasten Seat Belt symbols (see EASA CS 25-811), the design of the Passenger Call Button is not standardized as it can be seen in the various designs as presented in Sect. 1 [13]. Further, the current design itself is "misleading" and can cause confusion [21]. Since the purpose of the PCB is not clearly defined and the button is mainly used for service requests ( [21]), in some designs you will find a symbol of a person holding a tray-table and a glass (cf. Fig. 4, 5(a), 5(c), and 6(a)).

### 4.1 Visual Attention and Change Blindness

In this study two assessments have been conducted to understand passenger's visual attention and preference on the icon design. The "spot-the-difference" experiment revealed that 77% of the participants were able to note the change in the symbol for the flight attendant call, whereas 23% were either not able to note a change, noted the change after several trials or provided a wrong answer. The high number of positive responses could result from the fact that participants were able to memorize the picture and additionally they were given a cue to actively look for changes. In the introductory section of the questionnaire a note about the purpose of the study was given which could have been interpreted as a valid cue. The presence of a valid cue can speed up the detection of change [30], because attention might be more focused. The key factor to identify change is attention, without it change becomes unrecognizable (known as Coherence Theory) [30]. According to [30] change blindness can appear if for example the ISI were greater than 80 ms and according to Potter, 1976 400 ms are necessary to memorize a picture [28]. The video used for the "spot-the-difference" test consisted of scenes displayed for 5000 ms with an ISI of 5000 ms in between which is exceeds the conditions where change blindness typically occurs. Additionally, it is possible to detect only a few changes at any point in time [30]. The only change introduced in the video was the icon for the cabin crew call button. Further, according to [33] the search for presence of change is easier and faster than for the absence of a feature requiring a more thorough visual scan of the display [33]. Once the change is spotted it can be easily seen [29]. All these factors could be an explanation for the positive outcome of the "spot-the-difference" test. In case the display and the ISI times were shorter as suggested by Rensink, 1997, it can be assumed that change blindness can be observed and the ratio for non-detection would be higher. In cognitive psychology research revolves whether familiarity has an effect on the allocation of visuospatial attention [7]. The findings in [7] prove that a familiar item in a visual display might attract attention

faster than an unfamiliar item. At the same time there are also findings from other researchers e. g. Johnston and Schwarting, 1997 which state that novel items draw attention in searches quicker [17]. In the present study it could not be clearly identified whether the novel or familiar items created the attention for a change. The first three icons presented were familiar ones typically used on Airbus A320, Boeing 737 aircraft. Icon D and E are only found in newer aircraft types such as the Airbus A330-900 (e. g. Icon D: Azul Airlines Airbus A330-900; Delta Airlines Airbus A330-900). Icon F is unfamiliar as a symbol for the Passenger Call Button. The Chi-Square Analysis results of hypothesis H1 indicate that there is no association between familiarity and correct detection of the change of the crew call icon. However, six participants (4%) specifically mentioned the bell icon which seemed to draw their visual attention to the change. To assess whether familiarity or novel icons created the attention detection rates need to be measured which were not the focus of the current study [7].

### 4.2 Preferences on Icon Design

Surprisingly, in this study the participants preferred gender-neutral symbols for the cabin crew as well as service icon. Further, the majority associated the icon which shows the action to reach the target state (gender-neutral torso holding up an arm) as the preferred symbol for the cabin crew icon. This finding implies that designers should focus more on depicting actions which lead to a target state (e. g. person waving the hand or shouting) than the target state (e. g. depiction of a uniformed person) or the initial step needed to complete the task (e. g. ringing a bell). This can also be found in ISO 7010 where indication signs are standardized. For example Exit signs show a person running towards a symbolized door [25]. Usually, women work predominantly as flight attendants and the job is perceived as a "service occupation" [8]. Further, service and care are usually seen as a "natural part of femininity" [32]. Therefore, the job of a flight attendant can be seen as a classic example for the "Work-as-imagined" (WAI) vs. "Work-as-done" (WAD) dichotomy. "Work-as-imagined" as per definition deals with the perception and assumptions of how work should be done whereas "Work-as-done" refers to the actual how the work is carried out [15]. The main reasons stated by the participants for choosing the "gender neutral torso holding a glass" and the "hotel bell" were gender neutralism ("And I strongly advise against the skirt-version (it is nearly 2024!)" and "Icon B is outdated") and the association of ringing a bell with actively calling for support ("Ringing the bell is synonymous to service call"). The participants which specifically mentioned the gender neutralism in their comment were mainly of European descent where gender equality is strongly rooted as a core value [9]. However, the Chi-Square Analysis does not provide enough evidence to reject the null hypothesis of that there is no association between gender and preferred icon type. It would be interesting to assess in future studies whether there is a cross-cultural difference in the perception of the cabin attendant icon. The only significance could be found for the association between education and the preferred type of the icon. An assumption for this finding could be that the higher

the educational level, the more concerned are these people about gender equality and female empowerment. Higher education institutions serve as a platform where women can express their ideas and be empowered [10].

## 5 Conclusion

Flight attendants are the flagship of every airline. Marketing campaigns usually depict smiling cabin attendants. Consequently, according to Chute and Wiener, 1995 flight attendants are typically organised in the "marketing department" [8]. Since the focus of these advertisements was on service, the public perception of flight attendants duty are reduced to serving food and drinks only [8]. The feminization of the role can be rooted back to the 1930 s, where "Stewardesses" are mentioned in Boeing Air Transports first Flight Attendant Manual according to Mahler, 1991 as cited in [8]. A relict of these times is the Passenger Call Button, initially called "Stewardess Call Button" ( [38]), in the first years with just a depiction and later on with icons. The most prevalent icons which can be found nowadays are either gender-neutral (full-body or upper body) torsos or a feminized version, depending on the requirements of the airline. The first finding of this research is that the majority of participants were sensitive about gender issues and preferred icons which are gender-neutral. A possible explanation could be the cultural background of the participants (mainly European) where gender-equality is considered to be a strong value. A significant association between education and the preference on the icon could be found which indicates that higher education levels could result in being more aware about gender discrimination. Additionally, icons showing the actions which are needed to reach a target were preferred by the participants. The results of the visual attention test indicate that change blindness could be induced with much shorter screen times (display time $t$ <400 ms with an ISI $t$ >80 ms). Both of these conditions were not met in this study resulting in overall positive change detection rates. It could also not clearly be identified whether the new icons or the familiarity was the cause for attention. Further eye-tracking studies should be done to better understand the visual scan process and assess the effect of familiarity of icons in the visual display. To conclude the findings of this study provide important insights into the user-centered design of the Passenger Call Button. A clever choice on the icon shapes how passengers perceive the PCB, either as a Service Call Button to order meal and beverages or as a mean to communicate with cabin crew.

## References

1. Aerospatial, British Aerospace Company Concorde: Explore the world of concorde with heritage concorde (2010). https://www.heritageconcorde.com/carpets-and-overhead-luggage-bins. Accessed 07 Feb 2024
2. aircraft commerce: The evolution of aircraft seating & cabin technologies (2019). https://www.aircraft-commerce.com/wp-content/uploads/aircraft-commerce-docs/General%20Articles/2019/122_REV.pdf. Accessed 11 Feb 2024

3. Boeing Commercial Aircraft 737: B737-200. https://airskystore.com/shop/aloha-airlines-boeing-737-200-passenger-service-unit-psu/. Accessed 07 Feb 2024
4. Boeing Commercial Aircraft 737: B737cl. https://airskystore.com/shop/boeing-737-classic-passenger-service-unit/. Accessed 07 Feb 2024
5. Boeing Commercial Aircraft 737: B737ng. https://airskystore.com/shop/boeing-737ng-passenger-service-unit-psu/. Accessed 07 Feb 2024
6. Chen, C.F., Chen, S.C.: Investigating the effects of job demands and job resources on cabin crew safety behaviours. Tourism Manage. **41**, 45–52 (2014)
7. Christie, J., Klein, R.: Familiarity and attention: does what we know affect what we notice? Mem. Cogn.**23**(5), 547–550 (1995). https://doi.org/10.3758/BF03197256
8. Chute, R., Wiener, E.: Cockpit-cabin communication: I. A tale of two cultures. Int. J. Aviat. Psychol. **5**(3), 257–276 (1995). https://doi.org/10.1207/s15327108ijap05032
9. Commission, E.: Gender equality strategy (2023). https://commission.europa.eu/strategy-and-policy/policies/justice-and-fundamental-rights/gender-equality/gender-equality-strategy_en. Accessed 02 Feb 2024
10. Council, B.: Report: Gender equality in higher education - maximising impacts (2022). https://www.britishcouncil.org/gender-equality-higher-education-maximising-impacts. Accessed 02 Feb 2024
11. De Clerq, G.: Boeing rights a wrong: the flight attendant button (2011). https://www.reuters.com/article/oukoe-uk-airshow-button-idUKTRE75K2IR20110621/. Accessed 31 Jan 2024
12. deHavilland: Comet 4 maintenance manual; passenger announcement equipment trixadio system. Comet 4 Maintenance Manual **23-5-0** (1961)
13. EASA: EASA CS-25 Amendment 28 Certification Specifications and Acceptable Means of Compliance for large aeroplanes (2023). https://www.easa.europa.eu/en/document-library/certification-specifications/cs-25-amendment-28. Accessed 01 Feb 2024
14. Helfrich, W.: Improving airline cabin safety. J. Aviat. Aerosp. Educ. Res. **12**(2), 6(2003). https://doi.org/10.58940/2329-258X.1583
15. Hollnagel, E.: Can we ever imagine how work is done? HindSight **25** (2017)
16. Hradecky, S.: Accident: Jal a359 at Tokyo on Jan 2nd 2024, collided with coast guard dh8c on runway and burst into flames (2024). https://avherald.com/h?article=5132b9fe&opt=0. Accessed 31 Jan 2024
17. Johnston, W., Schwarting, I.: Novel popout: an enigma for conventional theories of attention. J. Exp. Psychol. Hum. Percept. Perform. **23**(3), 622 (1997). https://doi.org/10.1037/0096-1523.23.3.622
18. Klint, M.: Azula330neo (2021). https://liveandletsfly.com/azul-airlines-a330-900neo-business-class-review/. Accessed 13 Feb 2024
19. Konieczny, G.: Die Messung und Steigerung der Qualität von Dienstleistungen in der Flugzeugkabine - Ein Beitrag zur kundenorientierten Flugzeugentwicklung (2001)
20. Manikath, E., Li, W.C.: Usability evaluation of a web interface for passengers' health monitoring system on detecting critical medical conditions. Engineering Psychology and Cognitive Ergonomics: 19th International Conference, EPCE 2022, Held as Part of the 24th HCI International Conference, HCII 2022, Lecture Notes in Computer Science **13307** (2022)
21. Manikath, E., Li, W.C., Piotrowski, P.: Usability assessment on existing alerting designs for emergency communication between passengers and cabin crews. conference paper DLRK 2023 in Deutsche Gesellschaft für Luft-und Raumfahrt. Lilienthal-Oberth.e.V. (2024). https://doi.org/10.25967/610019

22. Manikath, E., Li, W.C., Piotrowski, P., Zhang, J.Y.: Usability evaluation of an emergency alerting system to improve discreet communication during emergencies. In: Engineering Psychology and Cognitive Ergonomics: 20th International Conference, EPCE 2023, Held as Part of the 25th HCI International Conference, HCII 2023, Copenhagen, Denmark, July 23–28, 2023, Proceedings, Part II **14018** (2023). https://doi.org/10.1007/978-3-031-35389-5_9
23. Montagu-Pollock, G.: Comet 4 (2023)
24. Murphy, A.: The flight attendant dilemma: an analysis of communication and sensemaking during in-flight emergencies. J. Appl. Commun. Res. **29**, 1 (2001)
25. International Standards Organization: ISO7010 (2023). https://de.wikipedia.org/wiki/ISO_7010. Accessed 28 Aug 2023
26. Parasuraman, A., Zeithaml, V.A., Berry, L.L.: A conceptual model of service quality and its implications for future research. J. Mark. **49**(4), 41–50 (1985)
27. Porter, T., Musumeci, N.: How did nobody die on the burning japan airlines plane? modern safety features and great training. (2024). https://www.businessinsider.com/japan-airlines-fire-how-passengers-managed-to-escape-burning-plane-2024-1. Accessed 31 Jan 2024
28. Potter, M.: Short-term conceptual memory for pictures. J. Exp. Psychol. Hum. Learn. Mem.**2**(5), 509 (1976). https://doi.org/10.1037//0278-7393.2.5.509
29. Rensink, R.: Seeing, sensing and scrutinizing. Vis. Res. **40** 1469–1487 (2020). https://doi.org/10.1016/S0042-6989(00)00003-1
30. Rensink, R.A.: To see or not to see: the need for attention to perceive changes in scenes. Psychol. Sci. **8**, 5 (1997)
31. Rosen, E.: Deltaa330neo (2023). https://thepointsguy.com/reviews/delta-one-suites/. Accessed 13 Feb 2024
32. Simpson, R.: Gender, space and identity: male cabin crew and service work. Gend. Manage.**29**(5), 291–300 (2014). https://doi.org/10.1108/GM-12-2013-0141
33. Treisman, A., Gormican, S.: Feature analysis in early vision: evidence from search asymmetries. Psychol. Rev. **95**(1), 15 (1988). https://doi.org/10.1037/0033-295X.95.1.15
34. Tupolev Tu-144: Tu144sst (2003). http://www.tu144sst.com/detailedpics/004/pop62.html. Accessed 07 Feb 2024
35. Viscount, V.: Viscount 72 ramp operations (1966)
36. Wayan, V.: Soviet airline flight attendant call button (2011). https://www.flickr.com/photos/dcmetroblogger/5799918208/in/photostream/. Accessed 07 Feb 2024
37. Wikipedia: dehavilland comet (2023). https://en.wikipedia.org/wiki/De_Havilland_Comet. Accessed 07 Feb 2024
38. Wikipedia: Vickers viscount (2024). https://en.wikipedia.org/wiki/Vickers_Viscount. Accessed 31 Jan 2024
39. Wong, S., Neustaedter, C.: Collaboration and awareness amongst flight attendants. In Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing. Association for Computing Machinery, New York, NY, USA (2017). https://doi.org/10.1145/2998181.2998355