

Getting the Picture: A Cross-Cultural Comparison of Chinese and Western Users' Preferences for Image Types in Manuals for Household Appliances

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Abstract

Research shows that Western and Chinese user instructions use visuals differently. Two basic tendencies may be discerned: Chinese manuals place more emphasis on visuals and their selection of visuals is less strictly confined to usability related functionality. This study investigates whether such cultural differences correspond to user preferences. Three hypotheses were tested: (a) Chinese users value pictures more than Western users; (b) Chinese users appreciate diverting, cartoon-like pictures more than Western users; and (c) Western users appreciate strictly instrumental pictures more than Chinese users. To test these hypotheses, a quasi-experiment ($N = 158$) was conducted with cultural background as independent variable and appreciation for pictures as dependent variable. All participants rated 15 pictures, which were presented in the context of user instructions. All three hypotheses were confirmed. Cultural differences regarding the use of visuals should therefore be taken into account when localizing Western manuals for the Chinese market, or vice versa.

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Keywords

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Introduction

It is widely understood that visuals are important elements in user instructions. The usefulness of combining textual and visual information is one of the foundations of document design as a professional and academic discipline (Schriver, 1997). Various authors have drawn attention to the power of visuals in technical, science, and professional communication and laid out the wide variety of options available for visual communication (Desnoyers, 2011; Ganier, 2004; Mijksenaar & Westendorp, 1999; Tufte, 2006).

The potential benefits of including pictures in manuals may be considered from a usability or a user experience (UX) perspective. Usability can be defined as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (International Organization for Standardization, 1998). A definition of UX is “a person’s perceptions and responses resulting from the use and/or anticipated use of a product, system or service” (International Organization for Standardization, 2010). In a study on the personal conceptions users have of usability and UX, Haaksma, De Jong, and Karreman (2018) showed that the two can best be seen as separate and complementary concepts, with usability focusing strongly on task execution and UX taking a broader perspective on the emotions associated with having and using the product. The two concepts can be used not only for technological products such as software or household appliances but also for their user support.

From the perspective of usability, various studies confirmed that the inclusion of visuals in manuals leads to better user instructions. Dual-coding theory predicts that a multimodal combination of visual and verbal information results in better performance than unimodal (text-only) information and empirical research confirmed this (Gellevij, Van der Meij, De Jong, & Pieters, 2002; Harrison, 1995; Paivio & Csapo, 1973; Van Hooijdonk & Kraemer, 2008). Maes and Lenting (1999) addressed the relevance of pictures from an entirely different angle by analyzing the considerable rhetorical problem of putting the “instructive space” (spatial dimensions of artifacts) into words. Larkin and Simon (1987) highlighted another drawback of verbal communication: Its sequentiality, which, compared with diagrams, limits the way elements can be related to each other and the freedom users have to see information from different perspectives. A study by Gellevij and Van der Meij (2004) showed how screen captures, as a specific type of picture, help users to connect instructions to

the tasks they have to perform, by supporting them in switching attention, developing a mental model, identifying and locating objects, and verifying screen states. Tenbrink and Maas (2015) thus analyzed how technical communicators can combine text and visuals in user instructions.

In addition to the usability perspective, Van der Meij, Karreman, and Steehouder (2009) drew attention to UX as another quality aspect of manuals. From a UX perspective, pictures in manuals can make completely different contributions. They might, for instance, contribute to image and reputation (De Jong, Yang, & Karreman, 2017), reinforce users' satisfaction with the product, enhance the overall attractiveness of the manual and the product, motivate users to use the manual and enhance their self-confidence (Loorbach, Karreman, & Steehouder, 2007, 2013), or help to establish a relationship with the user. The role of pictures for these purposes has not yet been researched, but it is clear that pictures can make a powerful contribution here, similar to the way they do in other communication domains (Chan & Park, 2015; Hart & Feldman, 2016; Lazard & Atkinson, 2015; Powell, Boomgaarden, De Swert, & De Vreese, 2015). Interestingly, Gigante (2012) sketched a comparable shift of the functionality of images in the domain of science communication: from public understanding to public appreciation of science.

An additional advantage of the use of pictures is that they may facilitate intercultural and cross-cultural communication (Winn, 2014). Well-chosen visuals may help to relieve the burden of time-consuming and costly translation, which has become an important aspect of technical communication in a globalized world (Maylath, 2013; Risku & Pircher, 2008).

However, various studies have shown that there may be differences in the use of pictures across cultures. The majority of these cross-cultural studies used content analysis to compare the use of visuals in Western and Chinese (or, more generally, Asian) documents (see Li, De Jong, & Karreman, in press, for an overview). The results of these studies suggest that the use of pictures in Western and Chinese manuals may differ in two respects: (a) Chinese manuals may rely more on pictorial information than Western manuals and (b) Chinese manuals appear to contain more diverting, cartoon-like pictures and fewer strictly instrumental pictures than Western manuals.

Although there have been a few user studies comparing the way Chinese and Western users interact with user instructions and their visual information (Honold, 1999; Y. Wang & Wang, 2009; Zhu & St.Amant, 2007), it is unclear whether such differences in document design practices actually reflect differences in user preferences. In this article, we therefore describe the design and results of a quasi-experimental study comparing Chinese and Western users' reactions to five types of pictures included in manuals for household appliances.

Earlier Studies and Research Hypotheses

Most of our knowledge on cultural differences between Chinese and Western technical communication is based on content-analytic research, which typically involves a comparison of a corpus of Chinese and Western documents. The most comprehensive of these content analyses was conducted by Li et al. (in press), who systematically compared 50 Chinese and 50 Western manuals for household appliances, using a coding scheme based on all earlier content-analytic studies (Barnum & Li, 2006; Carroll & Delin, 1998; Fukuoka, Kojima, & Spyridakis, 1999; Q. Wang, 2000; Y. Wang & Wang, 2009; Zhu & St.Amant, 2007). The earlier studies suffered from one or more of the following methodological shortcomings: They focused on a variety of documents, had rather informal research designs, and used relatively small samples of documents. User research into cultural differences and pictures is scarce. There are no studies available that focused exclusively on the way users from different cultures react to visuals in manuals. Only three user studies included users' reactions to visuals as a part of a broader research focus (Honold, 1999, Y. Wang & Wang, 2009; Zhu & St.Amant, 2007). Like most content analyses, the available user studies also suffered from rather informal research designs and small samples. For our research, we took the insights from the content analyses as a starting point, and where possible complemented them with insights from the available user studies.

Li et al. (in press) drew attention to two overall themes regarding the use of pictures in user instructions. The first theme involves the prevalence of visuals in manuals. Carroll and Delin (1998), Y. Wang and Wang (2009), and Zhu and St. Amant (2007) found that Chinese (or other Asian) documents contain more visuals than Western documents. Li et al. (in press) could not confirm this observation. However, user research by Honold (1999) suggested that Chinese users have a stronger preference for visual information than Western users. This preference might reflect a difference in cognitive style based on a long-standing tradition in which the pictographic nature of Chinese characters may play a role (Y. Wang & Wang, 2009). Based on these findings, we formulated our first research hypothesis:

Hypothesis 1 (H1): Chinese users appreciate pictures in manuals more than Western users.

The second theme involves the types of pictures included in Chinese and Western manuals. Q. Wang (2000) found that visuals in Western manuals are more often closely related to task performance, where Chinese manuals tend to give overall product presentations. Carroll and Delin (1998) observed that Asian (Japanese) documents appear to have more diverting, cartoon-like visuals than Western documents. Fukuoka et al. (1999) suggested that such cartoon pictures in Asian manuals help to make difficult tasks seem like fun and to create a friendly atmosphere. Yu (2011) arrived at similar conclusions in the completely different genre

of advertisements for banking and financial products. The comprehensive content analysis by Li et al. (in press) confirmed these general tendencies, stating that Chinese manuals include more visuals with an entertaining function, while Western manuals tend to limit themselves to entirely instrumental visuals. Specifically, Chinese manuals had more cartoon-like pictures, often with detailed human depiction and personification, and fewer technical line drawings and detail blowups than Western manuals. No user research is available as yet to confirm that these document design practices correspond with user preferences. Based on the document design practices, two hypotheses were formulated:

Hypothesis 2 (H2): Chinese users appreciate diverting, cartoon-like pictures more than Western users.

Hypothesis 3 (H3): Western users appreciate strictly instrumental pictures more than Chinese users.

Method

To test the aforementioned hypotheses, we designed a quasi-experimental study in which we exposed Chinese and Western participants to a selection of pictures that we collected from manuals for household appliances. All participants were asked to evaluate 15 pictures, which represented five categories (three pictures per category). Three categories represented entertaining pictures (cartoons, cartoons with detailed human depiction, and cartoons with personification); and two categories represented strictly instrumental pictures (technical line drawings and detail blowups). Participants were asked to evaluate each picture using a short questionnaire. To check for potential acculturation effects, we included two groups of Chinese participants in our study: Chinese living in the Netherlands and Chinese living in China.

We collected our data in individual sessions in an omnibus research setting in which we also collected data for two other experiments, about which we report in separate articles (Li, De Jong, & Karreman, in press; Li, Karreman, & De Jong, 2019). The tasks and stimulus materials of the three experiments differed considerably so that it was unlikely that they would influence each other. The research was approved by the ethical committee of our university. Later, we describe the various aspects of our research more in detail.

Research Materials

Table 1 gives an overview of the visuals used in our study. The five categories were based on the significant differences found by Li et al. (in press). In that study, cartoons, cartoons with detailed human depiction, and cartoons with

Table 1. Pictures Used in the Research.

Cartoons



(3)



(7)



(12)

Cartoons with detailed human depiction



(5)



(10)

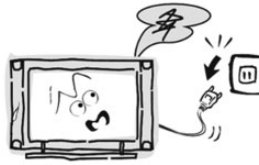


(14)

Cartoons with personification



(1)

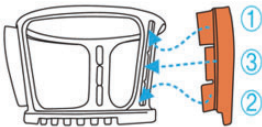


(13)

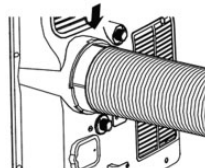


(15)

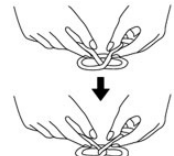
Technical line drawings



(6)

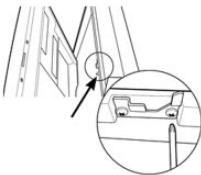


(8)

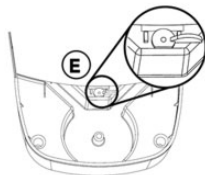


(9)

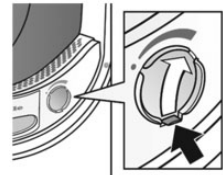
Detail blowups



(2)



(4)



(11)

Note. The numbers between parentheses refer to the order of the pictures in the study.

personification were found significantly more often in Chinese manuals than in Western ones. On the other hand, technical line drawings and detail blowups were significantly more often included in Western manuals than in Chinese ones. The five categories of pictures can be defined as follows:

- Cartoons: Simple nonrealistic drawings of the product, actions, or consequences of actions.
- Cartoons with detailed human depiction: Simple nonrealistic drawings of the product, actions, or consequences of actions with a clearly identifiable human being in them (so clear that it is possible to make rough estimates of gender and age).
- Cartoons with personification: Simple nonrealistic drawings of the product, actions, or consequences of actions in which the product gets human characteristics.
- Technical line drawings: Formal drawings of the product, actions, or consequences of actions.
- Detail blowups: Formal drawings of the product in which a crucial (and often complex) part of the product is enlarged to facilitate its identification and the task execution.

Within each category, three pictures were chosen from the corpus of Li et al. (in press). In our selection of pictures, we strived for representativeness and variation. In the presentation of the pictures, we added brief texts to give the participants an idea of the contexts in the manual. For example, the accompanying text for the cartoon about the rice cooker (Picture 3 in Table 1) was as follows: “First, measure the rice with the measuring cup provided. Do not overfill (as shown in the picture).” Participants were exposed to the 15 pictures in a fixed, randomized order.

All research materials were initially written in English. The English version was proofread and edited by two native English speakers. For Chinese participants, the materials were translated into Chinese by the first author. To minimize translation bias, we used a back-translation procedure. A professional translator translated the Chinese text into English. A comparison of the original and back-translated English texts showed that the two versions were consistent with each other.

Instrument

Participants’ appreciation of each picture was measured by a self-developed four-item scale. Participants reacted on 5-point Likert-type scales (*totally disagree* to *totally agree*) to four assertions about each visual:

- This illustration is appropriate for a manual
- This illustration is attractive

- The meaning of this illustration is clear
- It is a good idea to include this illustration in a manual

Factor analyses (with varimax rotation) indicated a one-factor solution for these four items. The four-item scale appeared to be reliable for all visuals, with Cronbach's α s ranging from .72 to .90.

To test H1, we then formed a construct of the mean appreciation of all 15 pictures (Cronbach's $\alpha = .79$). To test H2 and H3, we formed subscales of participants' mean appreciation of diverting, cartoon-like pictures (cartoons, cartoons with detailed human depiction, and cartoons with personification; nine items in total, Cronbach's $\alpha = .75$) and of their mean appreciation of strictly instrumental pictures (technical line drawings and detail blowups; six items in total, Cronbach's $\alpha = .67$).

Participants

For this study, we included two cultural groups: Westerners (from Western Europe and North America) and Chinese. To assess how varying levels of exposure to Western culture would influence the appreciation of visuals, two subgroups of Chinese participants were recruited: (a) Chinese living in China, who were born and bred in China and had never been abroad, and (b) Chinese living in the Netherlands, who had lived in Western countries for at least 1 year (on average 2.2 years).

Participants were recruited in various ways: from the university's pool of participants, with flyers and social media (Facebook and WeChat), and by word of mouth in the Netherlands and China. All participants received a compensation of five euros. In addition, participants from the university's pool of participants received participant credits.

A total of 158 university students participated in this study. Table 2 gives an overview of the demographic characteristics of our sample. A χ^2 test showed that there were no significant differences between the three participant groups regarding gender ($\chi^2 = .42$, $p = .81$). All participants were aged between 18 and 35 years ($M = 23.6$, standard deviation = 3.2). An analysis of variance indicated that there was a significant age difference between the three groups, $F(2, 155) = 11.99$, $p < .001$. A post hoc least significant difference (LSD) test showed that Chinese participants living in the Netherlands were on average older than both other groups. The Pearson product-moment correlation between participants' age and their appreciation of the 15 pictures, however, was nonsignificant (14 pictures) or weak (1 picture, $r = -.16$, $p < .05$). We therefore decided against including age as a covariate in our analyses.

Table 2. Background Characteristics of the Three Cultural Groups.

	Chinese living in China	Chinese living in the Netherlands	Westerners	Total
N	54	55	49	158
Age (M, SD)	22.4 (2.8)	25.1 (3.0)	23.1 (3.3)	23.6 (3.2)
Gender (% female)	54	49	55	53

Note. M = mean; SD = standard deviation.

Procedure

Data were collected in individual sessions in quiet rooms using an online experimental environment designed in Qualtrics. The session for this experiment started after participants had already taken part in the data collection of two other (nonrelated) experiments. At the beginning of the overall session, participants read and signed an informed consent form.

For the experiment reported here, participants were seated facing a laptop on which the visuals were displayed. The 15 visuals were presented to them one at a time, together with the surrounding text and the four questions. The participants were asked to read the text and carefully look at each visual before answering the questions. In general, the data collection for this study lasted between 5 and 10 minutes.

Analysis

SPSS version 25 was used for the data analysis. We first analyzed participants' mean appreciation of the 15 pictures together (H1). After that, we focused on participants' mean appreciation of diverting, cartoon-like pictures (H2) and strictly instrumental pictures (H3). Then, we analyzed participants' appreciation scores for each of the 15 pictures separately, in an exploratory attempt to nuance and further make sense of the data.

In all cases, we used one-way analysis of variance to test for differences between the three cultural groups, with cultural group as independent variable and appreciation scores as dependent variable. In the case of unequal variances (as indicated by Levene's test of homogeneity of variances), we used Welch's adjusted *F* ratio. To further examine differences between the three cultural groups, we used LSD post hoc tests.

Results

Below, we first address participants' overall appreciation of the 15 images (H1), followed by their appreciation for diverting, cartoon-like pictures (H2) and

Table 3. Participants' Appreciation of the Five Categories of Pictures.

	Chinese living in China N = 54	Chinese living in the Netherlands N = 55	Westerners N = 49	Significance	Effect size (η^2)
Overall appreciation for pictures	3.39 ^a (0.48)	3.38 ^a (0.46)	3.21 ^b (0.31)	$p < .05$	.03
Appreciation of diverting, cartoon-like pictures	3.49 ^a (0.47)	3.49 ^a (0.54)	3.07 ^b (0.36)	$p < .001$	.16
Appreciation of strictly instrumental pictures	3.23 ^a (0.63)	3.21 ^a (0.50)	3.43 ^b (0.39)	$p < .05$	.04

Note. Measured on 5-point scales (1 = negative, 5 = positive). Different letters in superscript indicate significant differences between the cultural groups.

strictly instrumental pictures (H3). After that, we provide more in-depth information about participants' appreciation of each picture separately.

Overall Appreciation of Pictures

As can be seen in Table 3, the overall appreciation of all pictures differed significantly between the three cultural groups, Welch's $F(2, 101.05) = 3.66, p < .05, \eta^2 = .03$. The η^2 indicates a small to medium effect size. Post hoc comparisons using the LSD test indicated that both groups of Chinese participants appreciated the visuals more than Western participants; there were no significant differences between the two groups of Chinese participants. Even though the differences found were relatively small, this finding confirms H1.

Appreciation of Diverting, Cartoon-Like Versus Strictly Instrumental Pictures

Table 3 shows that there was a significant difference between the cultural groups regarding their appreciation of diverting, cartoon-like pictures, Welch's $F(2, 102.24) = 18.56, p < .001, \eta^2 = .16$. The η^2 indicates a strong effect. An LSD post hoc test showed that both groups of Chinese participants appreciated the diverting, cartoon-like pictures significantly more than Western participants. This confirms H2. There was also a significant difference between the cultural groups regarding the strictly instrumental pictures, Welch's $F(2, 101.60) = 3.94, p < .05, \eta^2 = .04$. The η^2 , however, indicates a much weaker (medium) effect. In accordance with H3, a post hoc LSD test showed that Western participants appreciated the strictly instrumental pictures more than the two groups of Chinese participants.

Participants' Appreciation of the 15 Pictures

To further shed light on the way Chinese and Western participants appreciate pictures in manuals, we also analyzed the scores of each picture separately.

Table 4. Participants' Appreciation of the 15 Pictures.

	Chinese living in China N = 54	Chinese living in the Netherlands N = 55	Westerners N = 49	Significance	Effect size (η^2)
Cartoons					
Picture 3	3.36 (0.97)	3.71 (0.96)	3.53 (0.81)	$p = .14$	
Picture 7	2.30 ^a (0.74)	2.19 ^a (0.67)	2.57 ^b (0.66)	$p < .05$	.05
Picture 12	3.68 (1.01)	3.58 (1.03)	3.34 (0.78)	$p = .18$	
Cartoons with detailed human depiction					
Picture 5	3.80 ^a (0.74)	3.75 ^a (0.96)	3.13 ^b (0.84)	$p < .001$	.11
Picture 10	3.88 ^a (0.80)	3.84 ^a (0.72)	3.20 ^b (0.85)	$p < .001$	.13
Picture 14	4.26 (0.56)	4.27 (0.71)	3.99 (0.76)	$p = .07$	
Cartoons with personification					
Picture 1	2.48 ^a (0.77)	2.57 ^a (0.83)	1.97 ^b (0.66)	$p < .001$	.10
Picture 13	3.40 ^a (0.92)	3.36 ^a (1.08)	2.59 ^b (0.69)	$p < .001$	.14
Picture 15	4.31 ^a (0.77)	4.16 ^a (0.89)	3.27 ^b (0.84)	$p < .001$	.23
Technical line drawings					
Picture 6	2.94 (0.93)	2.94 (0.92)	2.82 (0.82)	$p = .74$	
Picture 8	3.08 (0.99)	3.11 (0.77)	3.23 (0.84)	$p = .66$	
Picture 9	3.95 ^a (0.74)	4.09 (0.85)	4.30 ^b (0.53)	$p = .05$	.04
Detail blowups					
Picture 2	3.10 ^a (0.90)	3.18 ^a (0.79)	3.82 ^b (0.81)	$p < .001$	.13
Picture 4	3.25 (0.86)	3.04 (0.87)	3.14 (0.85)	$p = .42$	
Picture 11	3.05 (0.95)	2.94 ^a (0.88)	3.30 ^b (0.65)	$p < .05$	.03

Note. Measured on 5-point scales (1 = negative, 5 = positive). Different letters in superscript indicate significant differences between the cultural groups.

The mean appreciation scores of the 15 pictures, grouped by category, are summarized in Table 4. Using the scores of the specific pictures, we tried to gain a deeper understanding of the differences between Chinese and Western users.

From these exploratory analyses, two variables of interest emerged. For the Chinese participants, an important explaining factor seemed to be whether the picture contributed to a light and pleasant atmosphere: Only in those cases did the diverting, cartoon-like pictures receive higher appreciation scores from the Chinese participants than from the Western participants. For the Western participants, an important explaining factor seemed to be whether the picture had an action orientation: Only in those cases did they give higher scores to the strictly instrumental pictures than the Chinese participants did. We will clarify these observations when discussing the five types of pictures.

The results regarding *cartoons* were entirely not in line with H2. For two of the three cartoons (3 and 12), no significant differences were found. For the other cartoon (7), a significant difference was found, $F(2, 155) = 4.11, p < .05, \eta^2 = .05$, but in the opposite direction. An LSD post hoc test showed that

Western participants were significantly more positive about this cartoon than both groups of Chinese participants. It should be noted that this was one of the two pictures in the sample that received an overall appreciation score that was significantly lower than the midpoint of the scale ($M = 2.35$, t test for one sample, $t = -11.66$, $p < .001$). A possible explanation for these unexpected findings is that none of the three cartoons evoked a light and pleasant atmosphere; they merely depicted objects or actions. As such, they may, in retrospect, be seen as a category in-between the diverting and the instrumental pictures.

The results regarding *cartoons with detailed human depiction* were largely in line with H2. For two pictures, we found highly significant differences between the cultural groups, which corresponded to medium to large effect sizes. These pictures were Picture 5, $F(2, 155) = 9.56$, $p < .001$, $\eta^2 = .11$, and Picture 10, $F(2, 155) = 11.53$, $p < .001$, $\eta^2 = .13$. For both pictures, LSD post hoc tests showed that the two groups of Chinese participants were significantly more positive about cartoons with detailed human depiction than Western participants. The other picture (14) did not result in a significant difference between the cultural groups but still had a tendency, $F(2, 155) = 2.67$, $p = .07$, in the same direction. The light and pleasant atmosphere might be an explanation here as well. Picture 5 created such an atmosphere using humor (the strange facial expression of the person who obviously did something wrong). Picture 10 did the same using a harmonious scene (a person happily, devotedly, and successfully cleaning the refrigerator). Picture 15, however, depicted danger in a nonhumorous way and therefore contributed less to a light and pleasant atmosphere.

For *cartoons with personification*, the results were even stronger in accordance with H2. For all three pictures, we found significant differences between the three cultural groups, with medium to large effect sizes overall: $F(2, 155) = 9.01$, $p < .001$, $\eta^2 = .10$, for Picture 1, Welch's $F(2, 101.97) = 16.68$, $p < .001$, $\eta^2 = .14$, for Picture 13, and, $F(2, 155) = 23.14$, $p < .001$, $\eta^2 = .23$, for Picture 3. LSD post hoc tests showed that both groups of Chinese participants were significantly more positive about the cartoons with personification than Western participants. It should be noted that Picture 1 was the second picture with an overall score that was significantly below the midpoint of the scale ($M = 2.35$, t test for one sample, $t = -10.21$, $p < .001$). In all three cases, the cartoons contributed to a light and pleasant atmosphere by humorous facial expressions on products.

For *technical line drawings*, only one of the three pictures was in line with H3. For Picture 9, we found a significant difference between the three cultural groups, $F(2, 155) = 2.97$, $p = .05$, $\eta^2 = .04$. The effect size was small to medium. An LSD post hoc test showed that Western participants were significantly more positive about this technical line drawing than Chinese participants living in China. Chinese participants living in the Netherlands took a (nonsignificant) middle position. For the other two technical line drawings (6 and 8), no significant differences were found. A possible explanation may be the action orientation of Picture 9. In contrast to the other two line drawings, Picture 9

clearly shows how a user must perform a certain action. It might be that this was the characteristic that enthused the Western participants more than the Chinese participants.

Finally, the results for *detail blowups* offered some support for H3. For two pictures, we found highly significant differences between the cultural groups, one with a medium effect size and one with a small to medium effect size. These pictures were Picture 2, $F(2, 155)=11.20$, $p < .001$, $\eta^2 = .11$, and Picture 11, Welch's $F(2, 102.22)=3.20$, $p < .05$, $\eta^2 = .03$. For Picture 2, an LSD post hoc test showed that Western participants were significantly more positive about this detail blowup than both groups of Chinese participants. For Picture 11, the LSD post hoc test showed that Western participants were more positive about this detail blowup than Chinese participants living in the Netherlands; Chinese participants living in China took a (nonsignificant) middle position. The other picture (4) did not correspond to significant differences between the cultural groups. Action orientation might be an explaining factor here as well. In the two pictures that are appreciated more by Western participants than by Chinese participants, the blowup seems to refer to an action that is required (which is emphasized by the arrows); Picture 4 seems to merely depict how a detail of the device looks like.

In all, looking at the participants' appreciation for the individual pictures somewhat relativizes the confirmation of H2 (five of the nine pictures) and H3 (three of the six pictures). It is clear that there is variation in appreciation within the categories and that other characteristics may interfere. For instance, when looking at the two pictures with negative overall scores (1 and 7), it is imaginable that other considerations played a role in the participants' evaluations. The image clarity and the somewhat ambiguous personification in Picture 1 and the absence of the device and its functionality in Picture 7 might have affected the appreciation scores.

Still, our exploratory analysis leads to two possible refinements of H2 and H3, which at the same time shed light on the underlying mechanism. Regarding H2, we now would propose that Chinese users appreciate diverting, cartoon-like pictures more than Western users, especially when such pictures contribute to a light and pleasant atmosphere. Regarding H3, we would propose that Western users appreciate strictly instrumental pictures more than Chinese users, especially when such pictures have a clear action orientation. Figure 1 summarizes our main findings regarding H2 and H3.

Discussion

Main Findings

The research described in this article is a first attempt to empirically validate differences between Chinese and Western user instructions in the way they use

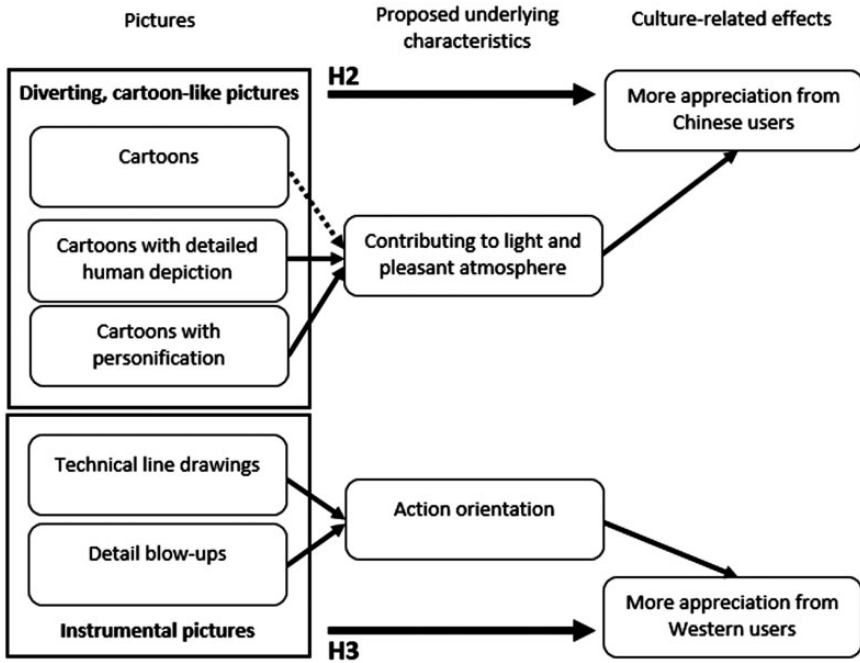


Figure 1. Summary of the findings regarding H2 and H3.

visuals. Our results confirm all three hypotheses we had formulated. In line with H1, we found that Chinese users appreciate visual content more than Western users, which corroborates more anecdotal observations in Honold's (1999) user research and is in line with several content-analytic studies suggesting that Chinese (or Asian) documents contain more visuals (Carroll & Delin, 1998; Y. Wang & Wang, 2009; Zhu & St.Amant, 2007).

In line with H2, we found that Chinese users appreciate diverting, cartoon-like pictures much more than Western users. And in line with H3, we found that Western users appreciate strictly instrumental pictures more than Chinese users. These findings suggest that cross-cultural document design practices regarding the selection of visuals (Barnum & Li, 2006. Fukuoka et al., 1999; Li et al., in press; Q. Wang, 2000; Yu, 2011) may reflect what users actually prefer. This is in contrast to cultural differences regarding structure: Research by Li, De Jong, and Karreman (2015) did not find such a clear connection between the structural differences in manuals found in content analyses and the task performance and appreciation of users.

However, our research also places some side notes to these findings. Our analysis of separate pictures showed that there will be other characteristics

affecting to what extent users from both cultures will appreciate specific pictures. As a matter of fact, only in the categories of cartoons with detailed human depiction and cartoons with personification, all three pictures pointed in the same direction, albeit with different effect sizes. In the two strictly instrumental categories, we can see that half of the pictures did not get the difference in appreciation that was expected. The category of cartoons per se (without detailed human depiction or personification) did not meet the expectations at all: The only significant difference we found was in the opposite direction.

Our exploratory analysis of the 15 separate pictures sheds light on possible underlying mechanisms and gives rise to a possible refinement of H2 and H3. For Chinese participants, it seemed to be particularly important if the pictures contributed to a light and pleasant atmosphere. For Western participants, the action orientation seemed to be particularly important. Because the pictures were not systematically selected based on these characteristics, these additional observations can at this stage not be more than propositions requiring future research.

Theoretical Implications

Our study is the first quantitative user study to confirm the existence of cultural differences in technical communication. The body of knowledge on intercultural and cross-cultural technical communication is to a large extent based on formal or less formal content analyses comparing document design practices as manifested in user instructions (e.g., Barnum & Li, 2006; Carroll & Delin, 1998; Fukuoka et al., 1999; Li et al., in press; Q. Wang, 2000; Y. Wang & Wang, 2009; Zhu & St.Amant, 2007). Earlier user studies were either small-scale and qualitative (Honold, 1999; Y. Wang & Wang, 2009; Zhu & St.Amant, 2007) or did not find significant differences between Chinese and Western users (Li et al., 2015).

Our findings show that the cultural differences between Chinese and Western users affect their appreciation of visuals. In more general terms, they confirm that Chinese users have a relatively strong preference for visuals (Carroll & Delin, 1998; Honold, 1999; Y. Wang & Wang, 2009; Zhu & St.Amant, 2007) and that they expect more from a manual than a document that merely supports them to (learn to) work with devices. The former relates to cognitive style, which might go back to the pictographic nature of Chinese characters as opposed to the Western alphabet (Y. Wang & Wang, 2009). The latter might be attributed to a more holistic way of thinking, which allows for a less rigid demarcation of the strict usability focused functionality of user instructions (Li et al., in press). Compared with Western users, Chinese users have more appreciation for visuals that do not immediately contribute to their comprehension or task execution. This might indicate a stronger focus on UX in user instructions (which might become more important in Western manuals as well). Chinese users might also

expect to get confidence and motivation from diverting, cartoon-like pictures (a direction of confidence and motivation research that has not been explored in Western technical communication literature; cf. Loorbach et al., 2007, 2013). In contrast, Chinese users have less appreciation for the strictly instrumental instructions in manuals.

Our analysis of possible underlying characteristics, of confirmed by future research, might indicate a more fundamental difference between Chinese and Western users in their expectations of user instructions. For Western users, with their preference for instrumental, action-oriented visuals, usability would be the core criterion for satisfactory user instructions. For Chinese users, with their preference for diverting, cartoon-like visuals contributing to a light and pleasant atmosphere, UX would be the core criterion. The light and pleasant atmosphere might not only contribute to their appreciation of the product or the company behind the product but may also motivate them and give them the confidence to follow the instructions and perform well.

Focusing exclusively on users' appreciation of visuals, our study can be seen as a first step toward understanding cultural differences between Chinese and Western users. Of course, it remains to be seen to what extent differential effects on appreciation for visuals will lead to more comprehensive and practically relevant effects, such as users' overall appreciation for a manual, their intention to use the manual, the usability and UX of the manual, product or brand image, and brand loyalty. The specific differences we found in users' appreciation of pictures draw attention to the more generic effects they might have.

The differences found do not seem to connect well to existing frameworks of cultural dimensions, such as Hofstede's six dimensions (Hofstede, 2001; Hofstede, Hofstede, & Minkov, 2010) or those proposed by Hall (1976) and by Trompenaars and Hampden-Turner (1993). We cannot be sure whether the differences found merely reflect document design habits users have gotten used to or indicate more fundamental differences in values and ways of thinking.

Our final theoretical implication involves the role of acculturation. In our study, we used Chinese participants living in China and Chinese participants living in the Netherlands so that we could check for possible effects of acculturation. We did not find systematic differences between the two groups of Chinese participants, suggesting that their preferences for pictures are not easily changed by exposure to another culture. For researchers on cross-cultural technical communication, this would mean that they do not necessarily have to recruit Chinese participants living in China to get meaningful results regarding Chinese users' preferences for pictures in manuals.

Practical Recommendations

The practical recommendations that can be derived from our study are quite straightforward. Technical communicators and technical translators may want

to pay special attention to the visual content of their manuals when localizing a Western manual for the Chinese market or localizing a Chinese manual for Western markets. Visualizations are essential in all user instructions but may be even more important in the Chinese context than in the Western context. When it comes to the types of pictures that may be included in manuals, Chinese users appear to really appreciate cartoons with detailed human depiction and personification; Western users do not seem to be turned off by such pictures but do not value them as high as Chinese users. A possible underlying characteristic is whether the picture contributes to a light and pleasant atmosphere. Using humor and portraying harmonious scenes are two ways of doing this. Western users, on the other hand, seem to appreciate the strictly instrumental, preferably action-oriented pictures in manuals more.

As Li et al. (in press) argued, this might be indicative for a different conception of the phenomenon of user manuals. In Western countries, a manual seems to be perceived as purely instrumental: facilitating the actual use of products by end users. In China, the boundaries of a manual may be less clear. That is why aspects of UX seem to be more prominently represented in Chinese manuals than in Western ones. Li et al., for instance, mentioned the more prominent role of relationship building in Chinese manuals. For the entire field of technical communication, it would be interesting to more systematically explore the potential of user instructions to contribute to UX.

Limitations and Suggestions for Future Research

Several limitations must be taken into account when interpreting our research findings. First, it must be stressed that our study focused on users' appreciation of pictures not on their actual behavior with pictures in manuals or the way they used pictures while using the manuals. Future research should focus on these aspects as well, for instance, using eye tracking to measure the attention paid to (various types of) visuals in manuals. Experimental research designs could be used to see whether the inclusion of certain types of pictures leads to better task performance and higher appreciation.

Second, it is important to acknowledge that the amount of contextual information provided with the visuals was rather limited. To keep the experimental sessions manageable, we only provided one to three sentences to the participants so that they understood how the visual would fit in the user instructions. But the bigger contextual picture was lacking. One can think of the extent to which the picture would facilitate task execution or the extent to which the picture contributes to an optimal balance of visual and textual information. Future research into the appreciation of pictures in manuals could verify whether our findings are confirmed in the case of a richer context.

Third, we only included young and highly educated participants in our study. Future research should expand the sample so that it also includes older

participants and participants with lower levels of education. It would be interesting to see whether the findings of our study will be corroborated in research with a broader range of users.

Fourth, our study was limited to the context of household appliances. This is not only an extremely relevant but also limited range of technological products for which user instructions are available. Future research could expand the scope of the instructions to other product types, such as software applications for the general public as well as for professional user groups.

Finally, our analysis of the 15 separate pictures led to two interesting propositions about underlying characteristics. For Chinese users, it might be important that pictures contribute to a light and pleasant atmosphere, whereas for Western users, action-oriented pictures seem to be important. Our sample of 15 pictures was not composed to systematically vary on these two characteristics, so we cannot say whether the picture types, the underlying characteristics, or a combination of both is what matters most. Future research should shed more light on this. One can think of experimental research in which picture types and underlying characteristics are systematically varied.

Conclusion

We empirically investigated whether Chinese and Western users react differently to five types of pictures that are often included in user instructions. On the basis of earlier content-analytic research, we hypothesized that cultural differences would manifest themselves in users' overall appreciation of pictures: We expected Chinese users to be more appreciative of visual elements. We also expected that Chinese users would have more appreciation for diverting, cartoon-like pictures, which merely contribute to a positive and light atmosphere, whereas Western users would have more appreciation for instrumental, action-supporting pictures. All three hypotheses were confirmed. Visual elements appear to be more important to Chinese users, and their conception of a manual is less confined to the immediate and exclusive support of task execution than that of Western users.

Declaration of Conflicting Interests


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