Toward Customer Needs Cultural Risk Indicator Insights for Product Development

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Colorado School of Mines
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TOWARD CUSTOMER NEEDS CULTURAL RISK INDICATOR INSIGHTS FOR PRODUCT DEVELOPMENT

Douglas L. Van Bossuyt*
Assistant Professor
Department of Mechanical Engineering
Colorado School of Mines
Golden, Colorado 80401
Email: dvanboss@mines.edu

Jered Dean
Teaching Associate Professor
Department of Mechanical Engineering
Colorado School of Mines
Golden, Colorado 80401
Email: jdean@mines.edu

ABSTRACT

As the availability and affordability of consumer products continues to increase around the world, consumers – especially those in developing countries and living on less than $10/day – will express more discerning in their tastes and preferences. Design teams have already been operating in design for the developing world contexts for many years and more are moving into the arena on a regular basis. Many designers do not have cultural knowledge of the customers cultures they are designing for. Cultural ignorance can lead to misinterpretation of customer needs that can lead to products that do not satisfy customer needs and results in disappointed customers, low sales figures, and a frustrated design team. The Customer Needs Cultural Risk Indicator (CNCRI) method introduced in this paper provides a method for design teams to rapidly analyze customer needs for "Risk Indicators" in customer needs based upon cultural differences between the customers and the design team. By understanding early on in the design process where a lack of cultural knowledge may be a risk to the design, the design team can make informed decisions on how to satisfy customer needs effectively.

1 INTRODUCTION

Designing products for the developing world is increasingly becoming an important and profitable market for a variety of for-profit companies and for many Non-Governmental Organizations (NGOs). One pitfall that many design teams have encountered is a misunderstanding of customer needs due to cultural ignorance. Tools such as Human Centered Design (HCD) and others provide tools that require lengthy investments of time and resources into understanding a customers culture before design work can begin. Significant product failures in the developing world marketplace, even with HCD and other methods being available, indicate that design teams remain blind to potential cultural risks.

Decisions on customer needs that tie to culture must be made in a cultural risk-informed framework. No method currently available provides a rapid quantifiable means of identifying the risks that exist between customers cultures and designers cultures in the context of interpreting customer needs. Without an understanding of cultural risks to customer needs, design teams cannot make informed decisions on what customer needs can be addressed by designers without cultural knowledge of the customers culture and what customer needs should be addressed by a designer with relevant cultural knowledge.

1.1 Specific Contributions

This paper introduces the Customer Needs Cultural Risk Indicator (CNCRI) method to help design teams make early design decisions based in part on cultural risk. CNCRI uses data from the Global Leadership and Organizational Behavior Effectiveness Research Program (GLOBE) Study to determine which customer needs have a high risk of being misunderstood or misinterpreted by a design team without direct cultural knowledge of

*Address all correspondence to this author.

the customers culture(s). The CNCRI method can be integrated directly into the House of Quality (HoQ) to provide designers with the information necessary to have meaningful conversations about how cultural differences present risks in the design process.

2 BACKGROUND

2.1 The Developing World

The term "Developing World" can have many different meanings depending on the context. The authors do not intend to address that debate as part of this paper. In *Out of Poverty*, Paul Polak estimates that 90 percent of the designers in the world spend their time working on solutions for the richest 10 percent of the worlds customers. For the purpose of this paper, design for the developing world refers to design of products and services that address the needs of what Paul Polak calls "the other 90%" [1]. Moreover, the term itself is meant to convey that design for the developing world is design work which is primarily completed by individuals outside of the situation for which their intended design will be used.

2.2 Design Methods

One of the first steps in the product development processes is to capture "customer needs." These customer needs (also called the voice of the customer) are used as the basis and driver for most product development cycles. An accurate, and complete, understanding of customer needs is critical to the market success of any consumer project. Often high-profile product failures, like that of the One Laptop per Child initiative, can be attributed to a failure to properly consider customer needs [2].

Many tools for collection and analysis of customer needs exist in the design literature. The most common methods for collecting the voice of the customer is through surveys, focus groups, and interviews [3]. This data can often be gathered relatively easily through interaction with potential and current customers during normal business activities. In addition, electronic surveys and other electronic tools simplify data gathering. After the voice of the customer has been captured, the data is filtered and processed to create a list of customer needs. Finally, these needs are typically ranked using affinity charts [3], Kano analysis [4], or more advanced methods [5].

Quality Function Deployment serves as a powerful tool for capturing and translating customer needs into actionable engineering metrics. The original creator of Quality Function Deployment (QFD), Yoji Akao, states that QFD is a method to transform user demands into design quality, to deploy the functions forming quality, and to deploy methods for achieving the design quality into subsystems and component parts, and ultimately to specific elements of the manufacturing process [6]. QFD is used by designers to focus on the characteristics and properties of a new or existing design. The viewpoint of the customer and the technology requirements are paramount to the methodology.

A typical tool used to deploy QFD is the House of Quality (HoQ). In large product development projects, the HoQ generally is implemented as four separate Houses of Quality. The first HoQ, the Functional House of Quality, feeds information in the second HoQ, the House of Quality for Part Design, and so on through the House of Quality for Production and House of Quality for Quality Control.

2.3 Design for the Developing World

When engineers take on the challenge of designing for the developing world, they are designing for (and hopefully with) communities and cultures of which they are not a member. This causes unique challenges in the design process, particularly in the collection, refinement, and ranking of customer needs.

Human Centered Design (HCD) has been proposed as one possible design approach to understand customer needs in the developing world. The HCD process, as defined by the HCD Toolkit, focuses on significant up-front efforts in user research and observation in order to better understand the user [7]. Using a variety of tools, a design team would spend time on-site in the user community gathering data and stories which are used by the team to identify patterns and latent needs, and finally for brainstorming. HCD is an iterative process that may require several Hear, Create, Deliver cycles before reaching a viable product solution. Design firms such as iDE and IDEO.org, who co-developed the HCD Toolkit, have had proven success in applying this method to design for the developing world. One particular weakness of the HCD process is that it can produce biased or inaccurate needs due to mis-communication if the design team is prejudice about the users needs or unable to effectively listen for key pieces of information [8].

HCD requires significant allocation of resources up-front to gather customer needs. One method that has been advanced in literature to try to mitigate the up-front investment of time and capital required for design in the developing world is the Lean Design for the Developing World (LDW) Method [9, 10]. The LDW method provides an iterative design approach, incorporating tools from the Lean Startup Method [11], that is explicitly targeted for use in new product development. The LDW method is built around rapid deployment of a minimum viable product based on many assumptions and then using market response to tune the product to meet customer needs. In effect, LDW distributes the up-front customer needs analysis throughout the life of the product. Unfortunately, the full LDW method has not been proven in practice to date. In addition, the LDW method is targeted at the design of small consumer level products that often require very little capital expenditure for iteration meaning that LDW may not be appropriate for large-scale projects [9, 10]. Other methods of understanding customer needs in a developing

world context have recently been developed [12].

2.4 Methods of Quantifying Culture

The concept of measuring culture in quantifiable terms first appeared in the literature in the 1960's. Hall published a series of anecdotes in the Harvard Business Review that were intended to get American business people thinking about how cultures in different countries would affect their work overseas [13]. In the following decades, several scholars began to further refine the idea of quantifying culture. Hofstede published a significant study defining (originally) four cultural dimensions [14–16]. Others followed suit including Schwartz [17–20] and the GLOBE Study [21, 22]. Extensions to several of the core cultural quantification methods have been attempted in the business community [23–31]. After criticism was leveled against Hofstedes and Schwartzs methods, the GLOBE Study has become the preferred method of quantifying culture in the business community [32–35].

The GLOBE Study represents two decades of research into the dimensions of culture by more than 170 investigators spanning 62 different cultures. The sample includes data from more than 17300 managers in 951 organizations to test 27 hypotheses [21, 22]. The GLOBE Study was massive in scope and participation.

The GLOBE Study found a total of nine cultural dimensions with two measures of each dimension being available. One measure ranks an individual's perception of herself while the other measure ranks an individual's perception of other people within her own culture. The nine dimensions found by GLOBE include: 1) Uncertainty Avoidance, 2) Power Distance, 3) Institutional Collectivism (Collectivism I), 4) In-Group Collectivism (Collectivism II), 5) Gender Egalitarianism, 6) Assertiveness, 7) Future Orientation, 8) Performance Orientation, and 9) Humane Orientation. In-depth information about a variety of cultures profiled by GLOBE was released to provide further insights on the quantifiable differences between cultures [22].

It should be noted that only leadership in organizations was studied by GLOBE. The sample populations consisted of middle managers who were selected from two to three identical industries found in all countries included in the survey. Clearly this does not provide a representative sample of an entire country. It does, however, provide a very representative sample of the group surveyed and can provide insight into the larger culture beyond managers [21, 22, 36].

2.5 Quantified Culture in Use

Several fields have adopted cultural dimensions in a variety of fashions. Business and marketing have found it useful to determine appropriate marketing campaigns for various culturally segmented markets. Usability engineering and interface design have both made use of cultural dimensions to better understand their customers. Several other fields, such as technical writing, medicine, and human capabilities development, have started to make use of the information present in the cultural dimension schemes. This chapter presents a sampling of how cultural dimensions are used in other disciplines.

2.5.1 Examples in Business and Marketing Some of the original uses of Hofstede's Cultural Dimensions were in business leadership. At around the same time as some were starting to call for new non-ethnocentric management strategies in international firms, Hofstede released his cultural dimensions. With his dimensions, Hofstede quantitatively showed that the then-current management strategies needed to change for firms to remain competitive and profitable [37, 38].

The Big Five personality test, an often used tool in American corporations, was correlated with Hofstede's cultural dimensions [39]. Two opposing conclusions have been offered for these results. One view is that personality influences culture while the other is that culture influences personality [40].

Hofstede's dimensions have been used to explain differences in the ethical climates of salespeople in Mexico and America [41]. The researchers believe this is due to different scores on the Collectivism dimension between the two countries. Several other studies have used Collectivism, among other dimensions, to examine multi-cultural team interactions and the problems that can result from culture clashes [42].

In marketing, cultural dimensions have been used to market across cultures [43]. De Mooij and others have been advocating the use of cultural dimensions to explain phenomena and help with determining how to effectively internationalize brands and companies. Many consultants now use methods that de Mooij has encouraged [24].

2.5.2 Examples in Computer Science Cultural dimensions have been applied to many different Human Computer Interaction (HCI) problems including differences in website design and satisfaction while using websites are seen in different cultures [44–47].

Chong et al. found that cultural differences affect on-line trust, the perceived value of goods and services, and the intent to purchase an item on-line [48]. Walton and Vukovic found that there are patterns in the way different cultures browse for information on the Internet and that cultural context-driven website designs may not translate well across cultures [49]. Many other examples of cultural dimensions found in computer science exist in the literature [50–55].

2.5.3 Examples in Usability Engineering and User Interface Design Significant research has been conducted on cultural dimensions in usability engineering, testing, HCI and

interface design [56–62]. While there is an obvious advantage for compatibility with standardizing user interfaces, many have found that creating a standardized user interface design creates usability problems for people in cultural environments other than the original designers' culture. Metaphors, representations, color associations, and navigation logic, among others, are often based on American culture and do not translate to other cultures that are located far away on the cultural dimension axes [63].

Researchers have found that culture affects the usability evaluation process [50, 64–72]. Culture also affects how focus groups function [65]. Further, culture affects the think-aloud protocol [72] and questionnaires [66]. Finally, culture affects how people understand metaphors and interface design [68] among other areas of cognition and social interaction.

The western (and supposedly universal) view that user satisfaction is correlated to efficient and effective task completion was found to be far from true in Namibia. Instead, Namibian users were found to test an information system against their own knowledge. If the users found the system lacking in some areas of information, they lose trust in the system and rejected it [73].

2.5.4 Examples in Other Engineering Disciplines and Other Fields Cultural dimensions have been used in several other engineering areas. These include coastal defense design and robot-human social interaction design [74, 75]. Cultural dimensions have also found use in teaching and learning methodologies [76], public health [77], and other areas [78, 79]. Two illustrative examples are provided below.

Bijker analyzed the differences between the coastal defenses built in the Netherlands and the USA. In the Netherlands, the approach is to keep all water out while the USA focuses on flood hazard mitigation. The USA has a predilection for a brute force approach to coastal defense design while the Netherlands is typified by an adage from Vierlingh that reads "niet met fortsigheit maar met soetigheit" [80]. The adage loosely translates to "don't fight the sea with brute force but with soft persuasion." Bijker concludes that it is cultural differences between Dutch and American societies that make the Dutch focus on keeping all water out and the Americans focus on mitigating flood hazards [81].

Dong presents a potential avenue for appropriate design[1] for culture based on the Capabilities Approach [82], pioneered by Amartya Sen [83, 84] and Martha Nussbaum [85]. Capabilities theorists believe that public policy should be primarily concerned with increasing the capacity of people to live the type of life that they value, whatever that might be [82].

[1]Design in this particular context is used very broadly to encompass architecture, community planning, and a whole host of other areas that are beyond the traditional engineering scope of design.

3 METHODOLOGY AND CASE STUDY

The CNCRI method presented here is a novel tool for reducing product development risk in design for the developing world by highlighting key areas where the design team is likely to misunderstand the needs of end users. The proposed CNCRI method is intended to help NGOs and social enterprises focus their customer needs research on areas where the likelihood of these cultural misunderstandings is most likely.

A fictional case study is presented in this section, along with the description of the CNCRI method itself, to add clarity to the discussion. The fictional design team will be preparing to design a new household water treatment product for use in Kenya. The case study is based loosely upon data pulled from end-user preferences data on household water treatment technologies available in the literature [86].

Step 1: Develop an Understanding of Customer Needs

After it has been decided to produce a product for a different culture, the first step of this method is to develop a detailed, ranked list of customer needs. Using research data, interviews, or other well established methods the design team prepares a clear list of the most critical needs. A set of representative, ranked customer needs from the case study is presented in Table 1.

Step 2: Correlate Customer Needs to the Nine GLOBE Categories

The next step is to correlate customer needs with the nine GLOBE cultural dimension categories. An example of categorizing the customer needs presented in the previous step is shown in Table 1. As an example, durability of the product should be valued by cultures with a strong propensity to save for the future leading the design team to match the "is durable" need with the Future Orientation GLOBE cultural dimension. Cultures with low levels of In-Group Collectivism tend to value a faster pace of life and place personal needs above community needs. These distinctions lead the design team to link the need for home use and short cleaning time with In-Group Collectivism. Similar logic was used to assign the remaining needs to GLOBE Categories.

It is important to note that some customer needs will be difficult to categorize due to the extremely broad characterizations of the GLOBE Categories. For example, the needs for clarity and good smell/taste of water are difficult to fit in any category. After discussing this, the team chose to place these items under the Power Distance category. Power Distance was chosen on the logic that these items were not critical to health, but are "nice to haves" that could be used by members of the community to show upward social mobility. Therefore, high power distance cultures in which there is strong differentiation of classes would value these characteristics in a fundamentally different way than low power distance cultures. As with many design methods, the

TABLE 1. INITIAL CUSTOMER NEEDS RANK ORDERED BY IMPORTANCE AND CATEGORIZED USING GLOBE CATEGORIES [86]

Rank	Need Statement	GLOBE Category
1	Can be used at home	In-Group Collectivism
2	Makes drinking water safe	Uncertainty Avoidance
3	Makes water clear	Power Distance
4	Doesn't make the water taste/smell bad	Power Distance
5	Easy to use	Uncertainty Avoidance
6	Cleans water quickly	In-Group Collectivism
7	Is durable	Future Orientation

discussions sparked by this process of characterization may be more important than the actual characterization output itself.

Step 3: Determine the Differences in the Cultures of the Engineers and the Customers

Now that customer needs have been correlated with the nine GLOBE cultural dimension categories, the cultural dimension scores for each culture involved in the project are listed and the difference between the cultures is determined. The Globe study reports both "value" and "practice" scores for each of the nine dimensions assessed. Practice scores are used in the proposed method because they are indicators of what survey respondents believe to be, rather than what is aspired to be. Table 2 demonstrates the differences observed between the US-based design team and the Kenyan customers. Included in the table is the global mean and standard deviation (STDEV) value for each category. In addition, the individual country scores for the USA and Zimbabwe are given.

Due to the fact that no GLOBE data was available directly for Kenya, information from Zimbabwe was used by the design team as a proxy since it was the closest country to Kenya with data available. An alternative approach could be to take the average scores of countries in the region. This highlights one of the major challenges to the proposed method, which is the lack of country specific data for rural areas of the world. Since the GLOBE study was intended to aid leaders in a globalized world, the data is clustered in more urban, affluent parts of the world. Unfortunately, the authors have not found a similarly thorough cultural dimensions study with data in the developing world. This could be an important area for future work.

Based on a review of the relevant attributes, there is a greater than one standard deviation difference in In-Group Collectivism and Power Distance scores. Future Orientation shows less than one standard deviation difference and the two cultures' Uncertainty Avoidance scores are similar. This finding could be used to flag all customer needs in these categories for further analysis. However, it may be cost or schedule prohibitive to further explore and/or reconsider that many customer needs. Instead, a weighting system is needed to prioritize areas that need further investigation.

TABLE 2. GLOBE CULTURAL DIMENSION CHECK [87, 88]

GLOBE Category (Mean, STDEV)	Anglo Cluster (USA)	Sub-Saharan Africa (Zimbabwe)
Perf. Orient. (4.1, 0.4)	4.5	4.2
Future Orient. (3.8, 0.5)	4.2	3.8
Assertiveness (4.1, 0.4)	4.5	4.1
In-Group Col (5.1, 0.7)	4.2	5.6
Social Col (4.3, 0.4)	4.2	4.1
Gender Egal (3.4, 0.4)	3.4	3.0
Humane Orient. (4.1, 0.5)	4.2	4.5
Power Distance (5.2, 0.3)	4.9	5.7
Uncertainty Avoid. (4.2, 0.6)	4.2	4.2

Step 4: Calculate Risk Indicators

At this point, customer needs weighting, as most likely was determined by the capture of customer needs by using HCD, QFD, or other customer needs capture tools during Step 1, is integrated into the table. Customer needs statements are ranked with the most important need being assigned the most points. For example, for the water purification product there are seven customer needs so the most important need would be assigned a seven, the second most important need a six, and so on. The customer needs weights are then multiplied by the number of standard deviations difference in cultures for each of the GLOBE cultural dimension categories, found in Step 3. The resulting number is a Risk Indicator of the degree of risk present in the project for the specific customer need. This Risk Indicator number signals the product design team that a deeper understanding of the customer need and the cultural differences is needed. Table 3 demonstrates how this is done.

Step 5: Understanding the Source of Risk Indicators

The risk indicators generated from Step 4 can now be rank ordered to determine which customer needs the design team will

TABLE 3. CALCULATION OF RISK INDICATORS

Customer Need (CN)	CN Weight	GLOBE of STDEV Delta	Raw Cultural Risk Indicator Value
Can be used at home	7	2.0	14.0
Makes drinking water safe	6	0	0
Makes water clear	5	2.6	13.0
Doesn't make the water taste/smell bad	4	2.6	10.4
Easy to use	3	0	0
Cleans water quickly	2	2.0	4.0
Is durable	1	0.8	0.6

start with achieving a deeper understanding of the issue causing the high Risk Indicator value. By normalizing the customer needs weights and the GLOBE cultural dimension difference data on a 0-10 scale, it quickly becomes clear where the risk lays in the customer need. Normalizing the customer needs weights does not imply that the highest customer need is the highest possible but instead indicates the highest customer need present. Table 4 shows the normalized data. Note that the Normalized Cultural Risk Indicator values are rounded to the nearest integer value.

Therefore, three of the customer needs clearly flag as possible areas where the cultural differences between the design team and the end-user may cause misunderstanding.

The primary customer need for home use rises to the top due to its high ranking on the list of importance and the fact that there is a difference of cultural indicator values of two standard deviations. The choice to design a of point-of-use water treatment solution may be based on direct requests from customers or simply on the numerous studies that have found point-of-use treatment effective in fighting disease [89, 90]. However, based on the findings listed in the normalized data it is important for the design team to confirm their understanding of the actual need. Failed attempts at point of use products such as the LifeStraw personal device should be closely reviewed by the design team before moving forward [91]. As a design team, it is important to understand why widespread adoption of point-of-use products has been poor [92].

Studies of end user preferences for household point-of-use water treatment products have indicated unexpected user behavior regarding turbidity and taste [86]. Regarding turbidity, it has been suggested that users often selectively source input water to fit the type of water treatment option they have available. This approach controls water turbidity at the source and therefore there may be little customer preference given to products which filter turbidity more effectively. While the data is not conclusive, and there appears to be a strong effect in user preference based on the local water sources available, this area may be worth further research before moving forward. This is particularly true if creating a product which produces slightly more clear (reduced turbidity) causes significant effect on cost or other needs.

While lack of noticeable taste and smell effects may seem like an obvious, universal need surveys in Kenya have called that assumption into question. In one study, when households were asked to explain their preference for filtration solutions over chemical treatment of water less than 4% cited taste or odor concerns. Instead, the dominant feedback of over 67% of those surveyed was that ease of use was the primary reason for preference towards filtration [86]. Again, this data supports the possible need for caution on the part of the design team as they explore design trades in any proposed solution.

Step 6: Driving Down Risk Indicators to Acceptable Levels

Based upon the information in Step 5, the design team has several choices for driving down Risk Indicators to acceptable levels. The team can either examine competing products for additional insights into customer needs or the team can take a deeper look at the customer needs. To better understand customer needs, the team may elect to return to the customers and attempt to better understand customer needs. Alternatively, the team may decide to bring in a cultural expert either in the form of contracting out specific portions of the product design to a design firm with relevant cultural knowledge or the team may choose to bring in a cultural expert to the design team to address specific customer needs. Figure 1 shows the method inserted into the HoQ. The relationship between competing products and customer needs is clear in the HoQ. The authors of this paper advocate bringing in cultural experts when possible rather than relying entirely upon analyzing competing products in an attempt to better understand customer needs.

TABLE 4. TABLE OF NORMALIZED DATA

Customer Need (CN)	Raw Cultural Risk Indicator Value	Normalized Cultural Risk Indicator Value
Can be used at home	14.0	10
Makes water clear	13.0	9
Doesnt make the water taste/smell bad	10.4	7
Cleans water quickly	4.0	3
Is durable	0.6	0
Makes drinking water safe	0	0
Easy to use	0	0

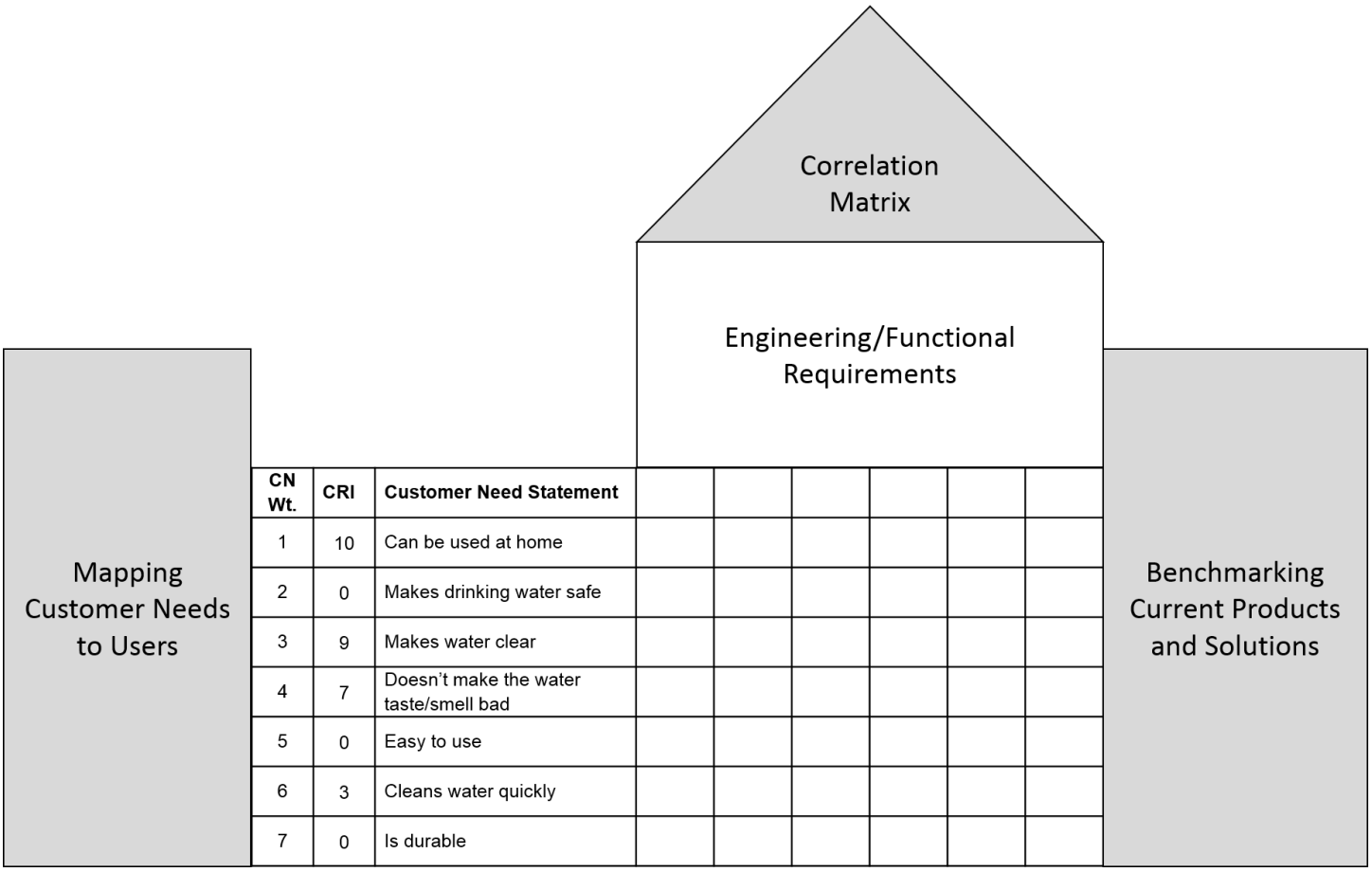

FIGURE 1. HOUSE OF QUALITY AND CULTURAL RISK INDICATORS

From the previous discussion, several areas stand out including a possible lack of understanding of the users, a concern that previous attempts and competing products are properly understood, and a concern with what design trades will be made as part of the design process. All of these areas can be nicely captured and analyzed in a House of Quality Diagram. By bringing the Cultural Risk Indicator value into the HOQ, the design team can more thoughtfully plan how to move forward in the design

process.

4 DISCUSSION

The CNCRI method and case study presented in the previous section gives designers a tool to determine where cultural risk lays in a design for the developing world situation. Paul Polaks estimation of only 10% of design time being set on 90% of the worlds customers, "the other 90%," demonstrates that the vast majority of product design efforts goes to support the richest 10% of the worlds population [1]. Most of the designers doing design work are from wealthy populations and are often blind to developing world cultures. The One Laptop per Child initiative failed in part due to the cultural divide between the designers and the end users that led to fundamental misunderstandings in customer needs [2]. Had the method presented in this paper been used, perhaps some of the pitfalls that plague large product design for the developing world efforts could have been avoided.

In successful instances of design for the developing world, designers tend to have deep knowledge of the areas they are designing for. For any designer designing a product to be used in another culture it is critical to both know what you know and to be aware of the biases and assumptions you are bringing to the table. By using GLOBE cultural indicator data and slight modifications to the existing HoQ work flow, it is the intent of the authors to provide a way for designers to:

1. Provide an opportunity, early in the design process, to double check their work for biases which could drastically affect the success of any proposed solution
2. Provide a simple way to capture their work in an existing design tool (HoQ) so that cultural considerations can be addressed in an existing engineering work flow
3. Couch the discussion of cultural considerations in a risk-mitigation mindset/approach so that designers can choose mitigation approaches that are appropriate to the risk to a successful outcome.

There are several limitations to the CNCRI method presented in this paper, chief of which is the quality of the GLOBE data. Of the three major quantifications of culture (GLOBE, Hofstede, Schwartz), GLOBE is the most accepted and has the highest statistical significance. However, all of the mainstream cultural quantification methods come out of the business literature and primarily target people living above $10/day even in developing world cultures. This can skew the results away from what people living on less than $10/day might answer. In spite of the shortcomings of GLOBE, insights into customer needs and identification of Risk Indicators is possible and useful. An important area of future work for designers working on design for the developing world issues is a cultural dimensions survey in the tradition of Hofstede, Schwartz, and GLOBE that is more suitable for design for developing world applications.

Another issue with the GLOBE and other cultural quantification methods is a lack of discretized data for many countries and cultures. A majority of countries are currently not covered by GLOBE and many cultures are lumped together into higher-level cultural groupings. While the cultural groupings are statistically sound, nuances of individual cultures and regional differences within cultures can be lost. The CNCRI method is not a replacement for knowledge of the customer but CNCRI does provide important Risk Indicator information to alert design teams to potential cultural risks to which design teams otherwise might be blind.

The development of normalized cultural risk indicator values limits the ability of designers to compare risks between projects. Some designers may also be led to believe that the normalized cultural risk indicator values show the highest normalized score to be the most critical risk factor possible while the normalized value really shows the most critical score present. This is an important distinction that must be remembered while using the CNCRI method. In future work, a method using a ratio, logarithmic, or similar scaling method will be investigated to overcome these shortcomings.

5 CONCLUSIONS AND FUTURE WORK

The CNCRI method for identifying cultural risks embedded in customer needs information in the early phases of product design was presented in this paper. CNCRI is useful for design teams working on design for the developing world problems. Risk Indicators provide a design team with information on what customer needs might be a risk in the design process based upon importance of the customer need and distance of the culture being designed for from the designers culture on the cultural dimension axes from the GLOBE Survey. Design teams can then focus on the customer needs with largest potential for cultural misunderstanding by either: 1) going back to customers in order to better understand identified high cultural risk customer needs, 2) examining competitor products to understand how customer needs were satisfied by other design teams, or 3) hire or outsource to designers with cultural expertise for high cultural risk customer needs.

Future work includes developing a product design and customer culture-specific survey similar to the GLOBE Survey. While the GLOBE Survey provides valuable information to design teams using CNCRI, the GLOBE Survey was created from interviewing businesspeople who most likely are not living on less than $10/day, the often-cited target population of design for the developing world work. In the absence of a team of hundreds of researchers and tens of thousands of survey respondents, the GLOBE Study is an acceptable tool to quantify culture for the CNCRI method to be useful to design teams designing products for the developing world.

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