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Design for Culture

Abstract

How can cultural factors be put on the agenda of design engineers? Does “design” transcend the universally applicable laws of physics? Much of what engineers do is solve problems and make decisions. In fact the engineering profession is constantly making a series of decisions. The process of *decision making* is far more complex than the process of problem solving. Complicating factors such as culture, ethnicity, globalization, and ethics should play a prominent role. Design, the cross-fertilization of science and art, is a basic function of all species that occupy a masterfully orchestrated and designed ecosystem in which man is but one. On the other hand, culture with its complex mix is the expression of what a group of people creates - arts, beliefs customs, institutions, products and thought - at a particular time within the context of the natural environment. Design and culture therefore are intimately linked and undoubtedly influence each other. This suggests that designers, with their creative problem solving skills and keen interest to preserve nature and advance quality of life are capable of influencing culture in a positive way. This paper highlights some aspects of the design-culture interface and asserts that designers can help fashion a peaceful world. The paper also presents two possible ways to achieve this underlying objective: 1) to develop artifacts that reduce the negative impact of certain cultural practices on the society, and 2) to create educational tools that lead to the realization of the absurdities of some cultural inclinations and their eventual abandonment.

Introduction

The world as we come to know is a great manifestation of design at work. All species, from the tiniest spider weaving elaborate webs essential for its survival to the mighty *homo sapiens* littering the natural landscape with giant structures to move the world forward, are busy designing new things. Some designs are conceived to fulfill a human need and some are created for a need to come, and yet some designs are mere manifestations of “man’s elemental impulse to experiment”. While the mental factor of design is exclusively human, design encompasses all activities of all living things in the universe and plays a vital role in how man’s culture evolves and transform.

Throughout history, the culture of man has experienced many transformations, from hunting to farming, to the modern world we know. Culture and design had influenced each other along the way, and many examples attest to that fact. Like a swinging pendulum, culture inspires designers to create new thing, which in turn influence the same culture it had inspired. It is therefore wise to think that designers and what they design have a great potential at affecting culture, however negatively and positively. The destruction and suffering inflicted by man-made weapons prompts retaliation and foster a culture of hate that threatens to destroy the essence of what is human, all in the name of preserving certain cultural inclinations; a negative outcome of engineering designs. It is author’s belief that world peace is threatened in many ways by negative cultural inclinations such as corruption, nepotism, personal aggrandizement, bribery, arrogance, selfishness, and so on. It is also the authors’ belief that designers can contribute positively to

fashioning a peaceful world. This paper is not intended to sort out the culturally desired from the absurd. Whose culture is it anyway? However, the paper first highlights some aspects of the design-culture interface and then proposes two directions that designers can take to influence culture positively: (1) create artifacts within a cultural context to put unwanted cultural orientations in context to help people realize their absurdity and change negative attitudes that stand in the way of progress and sustainability. Realizing that a certain cultural preference is inherently flawed prompts a paradigm shift that culminates in its abandonment. (2) Circumvent dangerous cultural inclinations to minimize their negative effects on life. Examples of possible engineering design efforts that can change attitudes and affect life positively are presented in support of these two ideas.

Nature, Culture, and Design Chain

Culture, according to the American Heritage Dictionary, is defined as "development of the intellect through education and training" encompassing "the arts, beliefs, customs, institutions, and all other products of human work and thought created by a people or group at a particular time" including "intellectual and artistic taste and refinement". The mix of elements this definition of culture entails evolve not independently from economics, nature, environment, religion, but in congruence with them and all of these forces come to bear.

On the other hand engineering design, a creative mix of art and science, utilizes forms and processes of nature and the forces of the society in a systematic, intelligent way to generate products to satisfy humans' needs of food, shelter, nurturing, procreation, and survival. Attempts to solve these problems throughout history have caused, and in many ways, dramatic changes in culture. While it is a truism that human needs and the basic problems to be solved are forever "constant"¹, the solution methods and the tools used cannot be the same. For example, the need for clothing is now as it was all along, but the type of clothes and the methods of making them have evolved so drastically that it is inconceivable today to roam the streets or go to college with a deer's skin covering the body. Tilling the soil with a plow pulled by oxen for example cannot be used now as it was and expect to provide the proper amount of food to satisfy human need. We cannot move forward and continue to use animals for transportation. Human need to till the soil and move about are constant, but the methods of fulfilling them are certainly not.

The complex mix of cultural elements suggests that design, is intimately linked to culture. As a corollary, the diverse ingredients of physical and mental constraints from which design draws inspiration suggest that culture undoubtedly influence certain elements of, and the outcome thereof, the design process. According to the National Academy of Engineering², the interstate highway system, the automobile, and the computer are three out of twenty achievements with greatest impact on the quality of life in the twentieth century, all of which could be directly associated with some form of cultural change. The highway system emerged out of necessity for a more sophisticated infrastructure capable of supporting economical growth. The availability and necessity of the automobile and the bypass traffic system enabled people to steer away from crowded city centers and accelerated the growth of suburbia to accommodate people choosing to venture into the newly developed open space. Consequently, many businesses and services

moved out of urban districts and a shift from urban to suburban life emerged, influencing culture in many ways.

Computers had made it possible for people from all cultures to work together on a single project without having to meet face to face. Design teams are formed from individuals that live in various sides of the globe. It definitely changed the way people do business, think, acquire information, and attach values to things. It provided the vehicle by which an idea conceived in someone's mind finds its way to become something meaningful in the lives of many. Computers made it possible for new technologies to emerge with direct bearing on health, architecture, productivity, etc. It helped get humans in close proximity with the universe. Finally, it helped model intricate natural processes that opened new horizons and limitless possibilities to combat diseases.

To discuss design and culture with nature missing from the mix is to navigate desert without a compass. Not only nature plays an inspiration and a guide to solve problems that face humanity, but, in its immense medium optimal solutions to many of those problems lies. Nature had mastered the "the principle of least effort"; It had figured out a way by which ideal solution to any design problem is achieved. Through analogue to nature designers have sought solutions to intractable human problems. Bionics is a successful problem solving strategy by which a nature's efficient solutions in form biological models are adapted to solve design problems experienced by man: Feather oil of ducks inspired the creation of anti-wetting agent, the heart inspired the development of a squeeze pump, beehives inspired the design of storage containers³. Flying birds are inspiring engineers to produce the future aircraft, which mimics the remarkable attributes of maneuverability they possess⁴.

Natural diversity promotes diversity in cultures. Nature is never discriminatory; it preceded culture and thus man had never had the opportunity to adulterate its spirit. It had extended its beauty, mysteries, and bountiful resources in a fair and balanced manner which man can never dream of duplicating. However, a group of people living within a given natural context had constructed distinctive culture, which is influenced by the natural context in which it is conceived. Take for example poetry, an important form of cultural expression. A poem conceived by a dweller of a desert with its manifestations may express the same human rational, logical, physical, spiritual, and emotional dimensions, in the same way as a poem conceived by a poet living in a rain forest does, but using different metaphors and examples derived from the natural surroundings. Those who are in close proximity of the same nature, naturally or by education, will understand those metaphors, but those who are not will try to navigate through some reality gaps to reach the same understanding.

Designers seeking solutions to problems must tap to the resources afforded within the nature-culture context. The desert-like life may be unbearable in many ways, yet in its infinitum it embodies tremendous resources waiting to be tapped to. The immense desert of the southern part of the world (poor countries) is a gold mine for renewable energy seekers where solar power can be tapped most easily. The desert region presents the greatest opportunity for heat-exchange-based energy (Geothermal), with temperature varying by as much as forty degrees between day and night. Brazil runs nearly 80% of its cars on alcohol derived from sugar cane⁵.

The state of the world in which we live paints a dim picture on sustainability. Population growth, regional conflicts, the rise of extremism, increased poverty, dismal sanitation, unsafe drinking water, hunger, injustice, are all manifestations of a troubled world. Some problems are the result of lack of understanding of the relation between man and nature, and education in this context is essential. Yet some other problems are manifestations of man “controlling nature” and exploiting its resources for short term gains in service of the bottom line that often ignores the implications on future resources and sustainability. Sustainable development in proportion to the problems requires the synergetic collaboration of all talents where participation of engineers with their problem solving skills is crucial.

How technology and culture affect each other therefore is not the issue here. They do, but it is important to pursue engineering design with the physical, intellectual, and cultural consequences of the result in mind.

Proposed Models for Design for Culture

Many calls for Design for Culture have surfaced over the past few years. Ellsworth et.al.⁶ proposed to introduce the Design for Culture as another design paradigm, DF(X). However the proposed paradigm is economically driven aiming at integrating certain cultural tastes in the design to realize products that can sell in a given cultural context. For example, to be able to sell a refrigerator in Japan it must conform to certain size and taste constraints. Watermelon has been genetically altered to grow as a cube instead of a spherical shape to utilize space in a small refrigerator more effectively. While this is important, it is rather a call to enhance the chances of a product being sold in a given market rather than a call for design to have a positive cultural impact.

Meaningful solutions to local cultural problems become possible when the efforts of all groups in the culture are synergized to achieve the desired results. This is probably one of the greatest challenges that many cultures face. In her study on product design in the least industrialized economies (LIEs), Donaldson⁷ indicated that solutions intended for an LIE community but realized by someone else from a distant culture are not sustainable due to corruption and other negative cultural inclinations. Most of the available yet meager resources are usually lost to corruption instead of being spent to educate the workforce on relevant design tools. We propose the following paradigm: Through design, engineers can play the role of the “trim tab” factors to help filter out the truly absurd and obscene cultural traits such as corruption and prevent its propagation to future generations. In support of this paradigm we propose the following two ideas toward design for cultural difference.

Design to minimize the impact of negative cultural inclinations. The thesis of this paradigm is to develop artifacts, especially for the communities in the developing countries that curb the destructive influence of certain cultural negatives such as corruption, alcoholism, destructive driving habits, environmental exploitation, child trades, modern-day slavery, and so on. An example to explain this point is the inclusion of a breath test on some modern automobiles models to determine the blood alcohol level of the driver. If the level of alcohol in the driver’s blood is above the accepted safe norm, the car would not start, preventing the driver from becoming a lethal weapon and minimizing in the process the negative effects of alcoholism on

the community at large. The case study below provides an example on how, through design projects, to engage students in support of this idea.

Education. Education is the most important vehicle to shape human attitudes for a better community. Curricula in universities are emerging to help fashion a sustainable world. The earth science engineering (ESE) initiative at the University of Colorado at Boulder⁹ aims at providing engineers with the necessary tools to “address the interactions between the anthrosphere and natural and cultural systems.” Many engineers focus on appropriate technologies that address the needs and problems of developing communities⁹.

Universities from various sides of the globe can foster cross cultural cooperation to solve community problems through engineering design. Through the use of IT and the internet it is easy to form cross-cultural teams of students to create products that are meaningful to a given culture with tools and resources that are available in another culture. The need and problem definition must emanate from the cultural context in which the artifact is to be deployed. Not only this helps solve problems, but also bridge the cultural gaps that exist between cultures. Bringing people closer together and providing them the opportunity to engage in a meaningful design experience without pre-conceived notions about other’s culture promotes peace. Peace is a necessary condition for a sustainable world.

The curricula and physical infrastructures of schools can be tailored to promote principles of sustainability and contribute to world peace. Designers can help in educating the mind in many ways. For example, engineers may design toys, games, playground infrastructure, and artifacts, for children to be used in schools such that when played the students realize the negative effects of certain cultural negatives to be avoided. A case in point is a monopoly-like game the aim of which is to make students realize the detrimental impact of bribery to quickly get them through a situation, a tremendous problem in third world countries. Corruption has been cited by Donaldson to have many negative effects on product design and the use of technology in promoting a better life in the (LIEs)⁷. Other games may be designed to promote the principles of democracy, communications, and cooperation for a better community.

Case Study

A major problem in developing countries is the traffic mess that plagues communities. Traffic regulations are not enforced due to lack of resources, law enforcement tools, or corruption. As a result, most drivers think that they own the road and their driving habits are nerve wracking, resulting in fatalities, destruction of properties, and pain. The published Wales road accident statistics for 1996 stated that 38% of all fatal accidents were speed related⁸. A problem statement was posed to a group of students to develop a cost effective traffic regulation system that would reduce the effects of the bad driving habits. The system would safely take away control of the car from offending drivers if they engage in destructive driving habits, especially at road crossings and at near populated areas such as hospitals, malls, and schools where high traffic death rates occur.

Recognizing that the problem is a major undertaking requiring major amount of resources and possible redesign of related infrastructure, changes in traffic rules, and public education, students were required to use their engineering design skills to propose a solution and prove the concept.

The proposed solution (Figures 1 and 2) uses microcontroller-based wireless technology that is applied on a model car driven by a DC motor¹⁰. A transmitting/receiving base station is strategically located at the entrance of a populated area where speed is to be maintained. When a car enters a designated area, the speed of the car is transmitted to the base station through an onboard transceiver. The controller at the base station takes appropriate actions according to the speed limit and control requirements. If the speed of the car is higher than the speed limit, the speed limiting control system takes speed control of the car away the car driver until the car moves away from the control zone. Figure 1 shows a concept of the system and Figure 2 shows components and lab implementation.

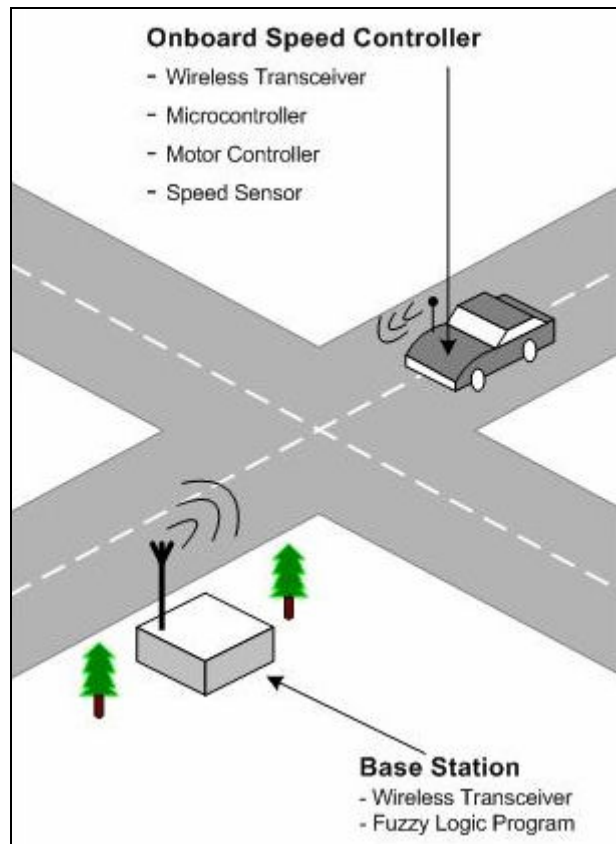


Figure 1 Concept of the traffic regulation system



Figure 2 Implementation of the traffic regulation system: (a) base station and (b) model car

Closing Thoughts

Correlating design to culture is not seemingly what engineers are trained to do. The subject transcends many fields of knowledge and experiences that engineers traditionally do not venture into unless to understand the world of business, entrepreneurs, and innovators, only to return with an amazement of the complexity of issues and the absolute impossibility for a man to absorb, let alone analyze. But in a world that is threatened from within and without, and the unholy things humans do to exacerbate the threat and make it closer to reality, the paper serves as an eye opener to the fact that man and his intellect is largely influenced by his culture and that engineering designers should play a role in reshaping cultures to combat the threat we all face. It represents a meager and unsatisfactory introduction to subject that should command more interest from the engineering community.

Design engineers are endowed with the special gift of problem solving skills directed to benefit mankind. However, the potential use of those skills would not be realized if the designer's preoccupation is confined to products and technological advances truncated from social concerns. Designers must use their intellect and set free their innermost concern and emotions for sustainable nature and mankind to compose a symphony of meaningful things from myriad of tools and techniques at their disposal without disfiguring the environment or cause harm to future generations, and must play that symphony out in substantive form with flare and style for all to feel and ascribe to. If designers step out of the design cubicles and transcend their role to where it is capable of reaching, then design become one of the most powerful forces with which tools, environment, and society, can be shaped.

We close with Lord Kevin's discourse on the language of mathematics used by scientists which, in the context of this paper, applies metaphorically:

I often say that when you can measure what you are speaking about and express it in numbers you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind: it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science (Quoted from Dorf⁵).

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