QUALITY FUNCTION DEPLOYMENT (QFD) WITH A HUMAN TOUCH

Anders Björnfot[1] and Eskild Narum Bakken[2]

ABSTRACT

In the terminology and conceptual approach to human perception of life, there seems to be a gap between the social sciences and the world of engineering. While environmental psychology refers to human experience or needs, the engineer is speaking about technical requirements in a different language. Quality Function Deployment (QFD) can help bridge this gap between customer requirements and technical design alternatives. QFD is a rational tool well suited for the traditional mind-set of engineers, but the structure of the method is also able to contain a holistic approach to human well-being.

The hypothesis proposed in this paper is that QFD, as utilized today, fails to adequately consider human well-being. Well-being is used to "measure" life energy; physical, mental, emotional and physical. From literature studied it becomes clear that the failure of QFD in construction is due to a failure to adequately consider human well-being. It is evident that the end user is inadequately defined. Also, QFD applications in construction have an excessive focus on physical/functional solutions pushed by engineers. There is little evidence that the user's feelings (emotional, mental and spiritual) have any impact on proposed design solutions.

KEYWORDS

Quality Function Deployment (QFD), Interior environment, Kansei Engineering.

INTRODUCTION

In construction, no method of "best practice" seems to exist that help designers to translate construction end user needs to physical design parameters. In the Lean community methods have been proposed that help capture end user values, such as the "Value Universe" (Emmitt et al., 2005), and methods that convey decision making to the last responsible moment, such as set-based design (Parrish et al.. 2008). In general design, QFD is a well-used concept (Wu and Chen, 2002) used to bridge the gap between customer requirements and design alternatives.

The latest QFD reference in the Lean community is from 1999 (Gargione, 1999) and conclude that QFD is a valuable and flexible tool for design. However, after this no more references appear about QFD which is quite surprising as QFD facilitates the customer perspective in design, and a major theme in the Lean community is that of customer value (Salvatierra-Garrido et al., 2012) Although, there are some references that apply QFD in construction (e.g. Lee and Arditi, 2006; Pheng and Yeap, 2001, Yang et al., 2003), its application has been limited (Delgado-Hernandez at al., 2007).

[1] Associate Professor, Department of Technology, Economy and Management, Gjøvik University College, Norway, anders.bjornfot@hig.no

[2] Senior lecturer & architect, Department of Technology, Economy and Management, Gjøvik University College, Norway, eskild.bakken@hig.no

One reason for the difficulty of applying QFD to construction may be because the term customer is ambiguous, on one hand referring to construction participants (Erikshammar et al. 2010) and on the other referring to the end user, a perspective that clearly is in the minority (Salvatierra-Garrido et al., 2012). Although research in environmental psychology has been performed with the perspective of human well-being in regard to living since the 1970's in (e.g. Gifford 2010) and is still undergoing (e.g. Jansen, 2012), this research has so far been sparingly acknowledged in construction research. An important aspect of human well-being is the indoor environment as we spend at least 90 % of our lives inside buildings, of which about 65 % is spent inside our homes (Bakke, 2008).

In general well-being can be characterised in physical, emotional, mental and spiritual factors that contribute to a qualitative life (Björnfot et al., 2013). Physical well-being (clean air, right temperature and humidity, etc.) is the most obvious aspect of living possibly leading to detrimental health effects from emissions, mould, fungi, etc. (Bakke, 2008). What contributes to these detrimental health effects are well understood in both theory and practice. However, subjective (or personal) well-being has received less attention among researchers and practitioners alike. The relation between well-being and construction design is in most cases unclear and worth further investigation (Björnfot et al., 2013).

Wu and Chen (2002) wrote that *"Loosely defined and structured, QFD sometimes becomes an art more than a science, which makes it difficult to use QFD"*. In this paper we argue that the failure of QFD in construction can be attributed to a too extensive focus on physical solutions mainly driven by engineers. The hypothesis proposed in this paper is that QFD, as utilized today, fails to adequately consider human well-being. The hypothesis is explored using a literature survey that reviews how traditional construction design using the QFD method caters for personal well-being in terms of physical, emotional, mental and spiritual factors.

CHARACTERIZING HUMAN INTERACTION

As us human beings interact with the environment, we are affected in ways that are difficult to predict due to, e.g. the kind of environment the interaction takes place in, whether the interaction is active or passive, human individualism affected by for example day-to-day mood, background, culture, etc. (see e.g. Vallacher and Wegner, 1987). This interaction is complicated in many ways as the extensive research into environmental psychology shows (e.g. Gifford 2010). To simplify this complex interaction in the case of housing, the interaction can be regarded as a situation where the internal environment communicates certain qualities with the users' senses.

HUMAN INTERACTION AS A FORM OF COMMUNICATION

Crilly et al. (2004) adapted the well-known communication model of Shannon (1948) to express how visual form is communicated in product design (Figure 1). The source (designer) represents the entity that determines what the product form should visually convey. The transmitter (product) is characterized by geometry, textures, colours, detailing, etc. The channel (environment) represents the context where the product is perceived, e.g. illumination, marketing, etc. (Crilly et al., 2004). The receiver (senses) is perception of product form mainly involving vision. Finally the destination (response) involves an evaluation of the products' perceived qualities.

The response of the interaction can be divided into three parts; Cognition, Affect and Behavior (Crilly et al., 2004). The cognitive response concerns the consumers' judgment about the product (aesthetic, semantic, or symbolic). The affective response concerns the emotions, moods and feelings the product convey to the consumer (emotional, instrumental, aesthetic, social, surprise or interest). The behavioural response is a reflection of the consumer reaction to the product affecting their decision to approach or to avoid the product. However, Crilly et al. (2004) noted that in the case of multiple interacting senses one must turn to perceptual psychology.

- *Basic model of communication adapted from Shannon (1948)*

- *Basic framework of design as communication adapted from Crilly et al. (2004)*

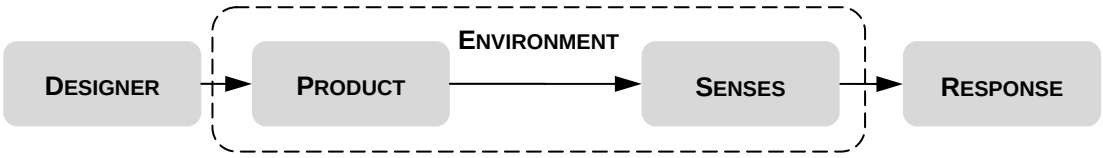

Figure 1: Design as a process of communicating visual form

The development of "Affordance based design" (Maier & Fedel, 2009), originating from perceptual psychology, expresses a complimentary relationship between two separate systems, for example the ability to walk on a floor or gaze though a window (Maier et al., 2009). The viability of the communication model has been criticized because it assumes that consumers are passive recipients of the intended message. Crilly et al. (2008) stated that such criticisms are unfounded because the response considers both cultural contexts and personal characteristics to account for how interpretations vary between (and within) individuals and groups

COMMUNICATING THE INTERIOR ENVIRONMENT

The primary objective of construction design is to fulfil the building regulations demands on utility and safety (Björnfot and Stehn, 2007), i.e. our homes should offer an indoor environment that cater to our needs as well as offer protection from the exterior environment. After having fulfilled these basic demands the interior environment becomes a setting for comfort and recreation. This can be readily compared to how we perceive products. In relation to Maslow's hierarchy of needs, Crilly et al. (2004) stated that once issues of utility, safety and comfort have been satisfied, emphasis may shift towards the decorative, emotional and symbolic attributes of design. In the same regard we can view our interior environment.

The interior design features (transmitter) of housing is a complex mix of multiple physical objects and visual details that communicate with all of our senses (Figure 2). A product is featured by its geometry, dimensions, textures, materials, details, colour, and graphics (Crilly et al., 2004). However, the interior environment is more complex as it's composed of multiple products each with its own features, e.g. different room functions for different purposes (living room, kitchen, toilet, etc.), surfaces (floors, walls, ceilings, etc.), decorations (furniture, etc.) and fixtures (Lee et al., 2008). All

human senses (touch, taste, smell and hearing) contribute significantly to an overall "feeling" of design (Crilly et al., 2004), the response.

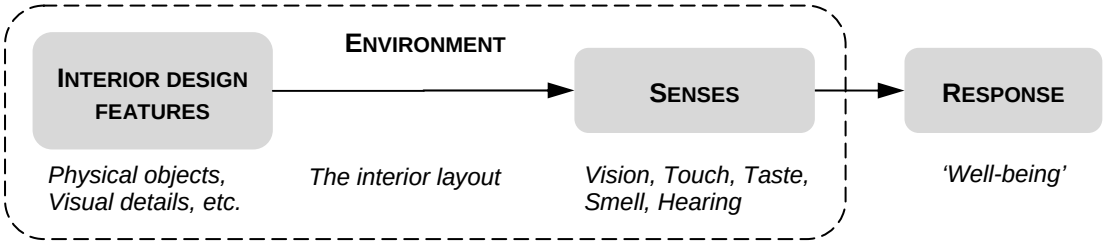

Figure 2: Interior design features as a contributor to 'well-being'

The interaction between the interior design features and the occupant's senses takes place in the interior environment wherein the interior design features are placed and the space immediately adjacent. To these external factors are added subjective preferences based on personality and previous experiences. As the interior environment can be regarded as an environment composed of multiple products that are experienced by all human senses, the response becomes more complex. Besides direct health effects of residing in the interior environment, there are psychological effects that affect the occupants' ability to rest and recuperate. In contrast to traditional product design, the response relates to our ability to lead a qualitative life and not merely a "buy or not to buy" decision.

PERSONAL WELL-BEING, THE RESPONSE OF DESIGN

The World Health Organization (WHO) was first to introduce a holistic definition of health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity as was the current norm (Callahan, 1973). Health is treated as a parallel to well-being, including subjective, objective and interpersonal factors. The identification of a positive component within the health concept has contributed to the present group of terms like well-being, wellness, etc. Following the wellness trend flourishing in the western world since the 1960's, Hettler (1984) presented a wellness model that included physical, emotional, intellectual, spiritual, social and occupational factors (Figure 1).

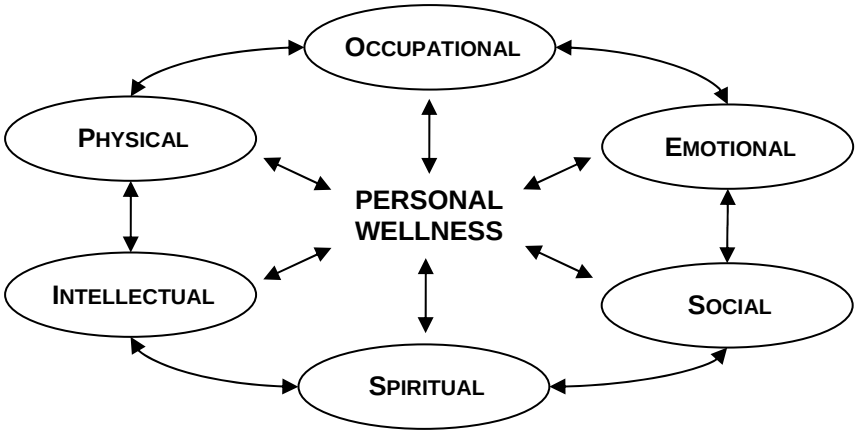

Figure 3: Illustration of the *'Wellness Wheel'* (adapted from Hettler, 1984)

Throughout literature the Wellness wheel (Figure 3) has been applied and presented in many forms. Published literature seems to agree with Hettler (1984) that individual interpretation or subjective well-being includes cognitive evaluations of life as well as emotional states (see e.g. Windle & Woods, 2004). What emerge in literature are four basic dimensions of well-being; physical, emotional, mental and spiritual (see e.g. Anspaugh et al., 2004). These four dimensions are identified in many research projects, partly or completely, constructing a four-dimensional model of the human organism. Silverino (2003) defined the four dimensions of well-being as:

- **Physical well-being** is the ability to do work, e.g. strength, endurance, flexibility, etc.
- **Emotional well-being** is the ability to tap into a full range of emotions, i.e. the ability to let life touch you and move you.
- **Mental well-being** is the ability to intensely focus and perform complex mental tasks when needed and to let our mind rest and do nothing
- **Spiritual well-being** reflects our values, our meaning and our purpose for living the way we live.

DESIGNING FOR A QUALITATIVE LIFE

The basic notion of everything Lean is to never lose sight of the value of the end customer as it is the end customer that ultimately decides if what we produce actually is of value. Taking the customer perspective in interior design is a great challenge as there are almost as many valuable designs as there are people. Interior design involves turning an interior space into an effective setting for the range of human activities that are to take place there (Björnfot et al. 2013). However, the question is if construction design actually takes the perspective of the human being and personal well-being? How customer oriented is Quality Function Deployment in reality?

QUALITY FUNCTION DEPLOYMENT (QFD)

Quality Function Deployment (QFD) was developed from Kansei (or Affective) Engineering originating in Japan in the late 1960s and early 1970s as a means of product designers under the total quality control movement to improve their work (Wu and Chen, 2002). The basic interpretation of QFD is that of a house, the *'House of Quality'* (Figure 4). It is interesting to note the similarity between the *'House of Quality'* and the traditional interpretation of the Lean organization as a *'Lean house'* composed of a foundation, roof and pillars to carry the roof. In order of the working process, the contents of the 'House of Quality' are (Delgado-Hernandez et al., 2007):

- **Customer needs and benefits.** Contains the list of customer wants.
- **Planning Matrix.** Assessment of customer wants against competitors.
- **Technical characteristics.** Transformation of customer expectations into technical terms.
- **Relationships.** Correlation between customer wants and technical responses.

- **Technical correlations.** Details the extent to which the technical responses support each other.
- **Technical targets.** Prioritization of technical characteristics, information on the competition and technical targets.

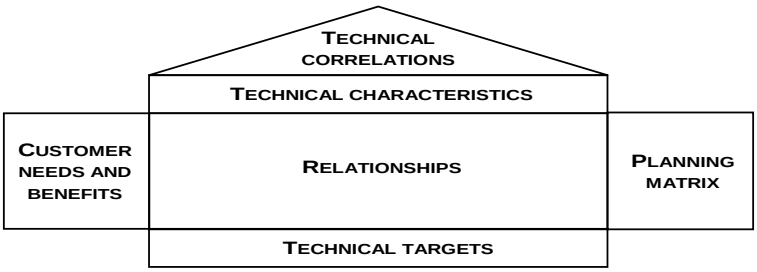

Figure 4: The *'House of Quality'* (adapted from Delgado-Hernandez et al., 2007)

Wu and Chen (2002) performed an extensive literature survey on the application of QFD. They found that there are at least nine functional fields of QFD, namely Product development, Quality management, Customer needs analysis, Product design, Planning, Engineering, Decision-making, Management, and Teamwork, timing, costing, etc. Obviously, it is in the first step (customer needs and benefits) where customer value is defined through a customer needs analysis. Wu and Chen (2002) stated that QFD literature in this field of research is quite rich mainly focusing on collecting/translating customer needs and satisfying customer needs.

THE CONSTRUCTION END USER IN QFD

There are a few case studies available that have applied QFD in order to design new construction products from the point of view of the customer (Table 1). However, these references fail to adequately define who the end user really is. Dikmen et al. (2005) presents the only study found that adequately identify the end customer of a housing complex as middle and high income people who are seeking differentiation through aesthetics, location, etc. However, mostly supporting functions such as facility management (Delgado-Hernandez et al., 2007) and owners (Gargione, 1999) are described as customers. Consequently, user needs are mainly evaluated from other than the end user, such as real estate agents and architects (Gargione, 1999).

Commonly, customer requirements (or end user values) are evaluated (Table 1) using focus groups, interviews and questionnaires. Eldin and Hikle (2003), for example, used focus groups to define critical items in classroom design. Dikmen et al. (2005), on the other hand, used a form of Post Occupancy Evaluation (POE) based on a database containing customer surveys, interviews with potential buyers and complaints from previous projects. POE is a systematic diagnostic tool to identify and evaluate critical aspects of building performance (see e.g. Preiser, 1995).

End user values captured with QFD (Table 1) are mostly physical, i.e. temperature and ventilation (e.g. Delgado-Hernandez et al., 2007) having a direct effect on health. Also, room size and maintainability (e.g. Azam Haron and Mohd Khairudin, 2012) are typically physical as moving around drains physical energy. However, the physical characteristics of interior design have psychological effects as well but these effects are barely recognized. Exceptions are the studies by Eldin and Hikle (2003)

and Dikmen et al. (2005) who identified pleasing architecture, aesthetics and pleasant scenery as customer values. However, it remains unclear how this leads to personal well-being and the mental and spiritual side of living are not explicitly considered.

Table 1: Documented customer values in construction QFD literature.

Reference	End User	Voice of end user	End user values
Delgado-Hernandez et al. (2007)	Children (*Unspecified*)	General staff, facilities manager, receptionist, teacher, cook, mother	Temperature, daylight, ventilation, size of rooms, security & safety
Gargione (1999)	Families (*Unspecified*)	Real estate agents, architects, engineers, owners	Size of rooms and choice of surface materials that are easy to keep clean
Eldin and Hikle (2003)	Classroom users (*Unclear*)	Professors and teachers, students, facility service and maintenance	Comfortable seats/desks, air quality, temperature, aesthetically pleasing.
Abdul-Rahman et al. (1999)	Low cost flat dwellers (*Unclear*)	Housing developers and questionnaire to low-cost flat-dwellers	Air quality, noise, security and safety, flat layout, ventilation, temperature
Dikmen et al. (2005)	Middle and high income people	Post occupancy user evaluations, project and site management	Quality materials, security and safety, aesthetics and scenery, social facilities
Azam Haron and Mohd Khairudin (2012)	Residents (*Unspecified*)	Contractors, consultants, developers, apartment residents	Ventilation and daylight, room size and orientation, easy to maintain floors

DISCUSSION AND CONCLUSION

The rarity of papers on QFD in construction is evidence by itself that the construction industry has failed in adopting QFD to support design. A reason for this failure is the extensive focus on physical/functional solutions, e.g. room size, maintainability, material choice, size of doors, etc. that are of interest to engineers. Consequently, many of the design solutions to appear from a QFD exercise become obvious, e.g. for accessibility we need a certain size door and a specific layout. However, dwellings are constructed for the residents and, consequently, there is no value per se from support functions such as facility management even if these services is important.

From literature studied it becomes clear that in most cases the end user is not adequately defined. Clearly, a house is constructed so that people will feel safe and have a place to recuperate and not so that we will have a building to maintain. Compare to the goal of a company that does not exist so that its workforce will be happy or to have a good throughput. However, these effects are required to reach the end goal of making money. In construction QFD literature (Table 1) there is very little evidence that the end user's feelings (emotional, mental and spiritual) have any impact on the proposed design solutions. Thus it can be concluded that *the failure of QFD in construction is due to a failure to adequately consider human well-being*.

A renaissance of QFD in construction requires a way to properly define the end user and the voice of the customer, a design process that emphasize that a good dwelling is not only composed of a floor, a roof and four walls but is a heaven where

we can recuperate our physical, emotional, mental, and spiritual energies. Kansei (or Affective) Engineering, developed in Japan in the early 1970's, can be used to explore a "human touch" in construction design.

KANSEI ENGINEERING, QFD WITH A HUMAN TOUCH?

Kansei, means a consumer's psychological feeling and image regarding a new product (Nagamachi, 1999, is used to design new products based on consumer feelings and demands, or to grasp vague consumer demands and develop products based on the user's words (Jindo and Hirasago, 1997). Using Kansei Engineering, Tanoue, et al. (1997) explored 'roominess' and 'oppressiveness' of a vehicle interior while Jindo and Hirasago (1997) used Kansei Engineering to analyze four design elements of an analog speedometer (the design process is illustrated in Figure 4).

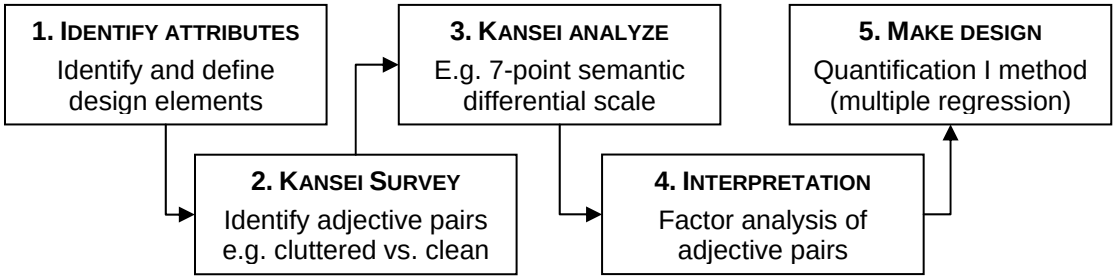

Figure 4: A Kansei Engineering process (examples from Jindo and Hirasago, 1997).

Karlsson et al. (2003) used Semantic Environment Description, the third step in Kansei Engineering (Figure 4), to evaluate the pleasantness, complexity, unity, potency, social status, enclosedness, affection and originality of a vehicle interior. It was concluded that it is possible to obtain values on important 'intangibles' in the impression of an interior. In the same fashion a Kansei engineering process may take its origin in different functions of the interior of a home (Table 2).

Table 2: Relations between home functions and life energy (Björnfot et al., 2013)

Life energy	Main goals	Work areas
Spiritual	Purity, refinement, reflection, human development, inner peace. Avoid disturbance through sense stimulation. Symbolism according to belief or spiritual practice.	Structural harmony and clarity in form, sound, light, color, etc. Organic as well as geometric forms, reflecting nature and creation (the human organism has no straight angles or flat planes).
Mental	Clarity, logic form, placement according to function, environment and users. A meaningful place. Suitable for mental work, reasoning, discussion etc.	Logic and reasonable combination of aesthetics and function. Logic solutions. Ethical approach, choosing the right projects and working the good way, according to chosen moral standards.
Emotional	Harmonious, beautiful, appealing, comfortable, suitable for social life.	Aesthetics, color, indoor and outdoor design, building shape etc.
Physical - practical	Energy efficient, safe, solid, clean, warm, light. Physical necessities organized in a practical way.	Accessibility, acoustics, heating/cooling, light, air, water, waste, economy, etc. Basic Needs of shelter and safety.

REFERENCES

Abdul-Rahman, H., Kwan, C.L. and Woods, P. (1999). "Quality Function Deployment in Construction Design: Application in Low-cost Housing Design." *International Journal of Quality & Reliability Management*, 16 (6) 591-605.

Anspaugh, D., Hamrick, M., and Rosato, F. (2004). *Wellness: Concepts and Applications*. 6th ed. Boston: McGraw Hill.

Azam Haron, N. and Mohd Khairudin, F.L. (2012). "The Application of Quality Function Deployment (QFD) in the Design Phase of Industrialized Building System (IBS) Apartment Construction Project." *European International Journal of Science and Technology*, 1 (3) 56-66.

Bakke, J.W. (2008). *Indoor Environment in University Buildings. Assessment of Subjective and Objective Parameters and Outcomes*. PhD Dissertation, University of Bergen, Norway.

Björnfot, A. and Stehn, L. (2007). "A Design Structural Matrix Approach Displaying Structural and Assembly Requirements in Construction." *Journal of Engineering Design*, 18 (2) 113-124.

Björnfot, A., Narum Bakken, E. and Storm L.E. (2013). "Assessment of Construction End-user Values." *Proceedings of the 7th Nordic Conference on Construction Economics and Organization*, Trondheim, Norway.

Callahan, D. (1973). "The WHO definition of Health." *The Hastings Center Studies*, 1 (3) 77-88.

Crilly, N., Moultrie, J. and Clarkson, P.J. (2004). "Seeing things: Consumer Response to the Visual Domain in Product Design." *Design Studies*, 25 (2004) 547-577.

Crilly, N., Good, D., Matravers, D. and Clarkson, P.J. (2008). "Design as Communication: Exploring the Validity and Utility of Relating Intention to Interpretation." *Design Studies*, 29 (2008) 425-457.

Delgado-Hernandez, D. J., Bampton, K. E. and Aspinwall, E. (2007). "Quality Function Deployment in Construction." *Construction Management and Economics*, 25 (June 2007) 597-609.

Dikmen, I., Birgonul, T. and Kiziltas, S. (2005). "Strategic use of Quality Function Deployment (QFD) in the Construction Industry." *Building and Environment*, 40 (2007) 245-255.

Eldin, N. and Hikle, V. (2003). "Pilot Study of Quality Function Deployment in Construction Projects." *Journal of Construction Engineering and Management*, 129 (3) 314-329.

Emmitt, S., Sander, D. and Christoffersen, K. (2005). "The Value Universe: Defining a Value Based approach to Lean Construction". *Proceedings for the 13th Annual Conference of the International Group for Lean Construction*, Sydney, Australia.

Erikshammar, J., Björnfot, A. and Gardelli, V. (2010). "The Ambiguity of Value". *Proceedings for the 18th Annual Conference of the International Group for Lean Construction*, Haifa, Israel.

Gargione, L. A. (1999). "Using Quality Function Deployment (QFD) in the Design Phase of an Apartment Construction Project". *Proceedings for the 7th Annual Conference of the International Group for Lean Construction*, Berkeley, USA.

Gifford, R. (2007). "*Environmental Psychology: Principles and Practice*". 4th edition. Optimal Books, Victoria, BC.

Hettler, W. (1984). "Wellness: Encouraging a Lifetime Pursuit of Excellence." *Health Values: Achieving High Level Wellness*, 8 (1984) 13-17.

Jansen, S. (2012). "What is the Worth of Values in Guiding Residential Preferences and Choices"? *Journal of Housing and the Built Environment*, 27 (2012) 273-300.

Jindo, T. and Hirasago, K. (1997). "Application Studies to Car Interior of Kansei Engineering." *International Journal of Industrial Ergonomics*, 19 (1997) 105-114.

Karlsson, B., Aronsson, N. and Svensson, K. (2003). "Using Semantic Environment Description as a Tool to Evaluate Car Interiors." *Ergonomics*, 46(13-14), 1408-1422.

Lee, D-E. and Arditi, D. (2006). "Total Quality Performance of Design/Build Firms using Quality Function Deployment." *Journal of Construction Engineering and Management*, 132 (1) 49-57.

Lee, H-K., Lee, Y-S. and Kim, J-J. (2008). "A Cost-Based Interior Design Decision Support System for Large-Scale Housing Projects." *ITcon*, 13 (2008) 20-38.

Maier, J. and Fedel, G. (2009). "Affordance Based Design: a Relational Theory for Design." *Research in Engineering Design*, 20 (2009) 13-27.

Maier, J., Fedel, G. and Battisto, D. (2009). "An Affordance-Based Approach to Architectural Theory, Design,, and Practice." *Design Studies*, 30 (2009) 393-414.

Nagamachi, M. (1999). "Kansei Engineering; the Implication and Applications to Product Development." *IEEE International Conference on Systems, Man, and Cybernetics*, Tokyo, Japan.

Parrish, K., Wong, J-M. and Stojadinovic, B. (2008). "Value Propositions for Set-based Design of Reinforced Concrete Structure". *Proceedings for the 16th Annual Conference of the International Group for Lean Construction*, Manchester, UK.

Pheng, L.S. and Yeap, L. (2001). "Quality Function Deployment in Design/Build Projects." *Journal of Architectural Engineering*, 7 (2) 30-39.

Preiser, W. (1995). Post Occupancy Evaluation: How to make Building Work Better. *Facilities*, 13 (11) 19-28.

Salvatierra-Garrido, J., Pasquire, C. and Miron, L. (2012). "Exploring Value Concept through the IGLC Community: Nineteen Years of Experience". *Proceedings for the 20th Annual Conf. of the Int. Group for Lean Construction*, San Diego, USA.

Shannon, C.F. (1948). "A Mathematical Theory of Communication." *Bell System Technical Journal*, 27 (1948) 379-423.

Silverino, G. (2003). "The Energy Factor". http://www.masteryourwellness.com/uploads/The.Energy.Factor.pdf (accessed 2013.03.25).

Tanoue, C., Ishizaka, K. and Nagamachi, M. (1997). "Kansei Engineering: A Study on Perception of Vehicle Interior Image." *International Journal of Industrial Ergonomics*, 19 (1997) 115-128.

Vallacher, R. and Wegner, D. (1987). "What Do People Think They're Doing? Action Identification and Human Behavior." *Psychological Review*, 94 (1) 3-15.

Windle, G. and Woods, R. T. (2004). "Variations in Subjective Wellbeing: The Mediating Role of a Psychological Resource." *Ageing and Society*, 24 583–602.

Wu, L-K. and Chen, M-L. (2002). "Quality Function Deployment: A Literature Review." *European Journal of Operational Research*, 143 (2002) 463-497.

Yang, Y.Q., Wang, S.Q., Dulaimi, M. and Low, S.P. (2003). "A Fuzzy Quality Function Deployment System for Buildable Design Decision-makings." *Automation in Construction*, 12 (2003) 381-393.