A Hermeneutical Framework Drawn with Measurement Theories to Extend Design Evaluation

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In the 21st century, it can be argued that measurement is considered as the basis of all experimental and theoretical researches including human sciences such as sociology and psychology and natural sciences both physical and life sciences, whereas design process can be considered both in the field of human sciences and natural sciences due to its cross-disciplinary and multilayered constitution. The lexicological history of the Greek word 'metrein' confirms that design evaluation includes measurement inherently since 'metrein' conveys measurement as evaluation and judgment. Thus, discussing the design evaluation obviously necessitates discussions about measurement as well and a cross-disciplinary approach should be adopted for such an endeavor, considering the importance of measurement in design evaluation. There are different approaches to design processes offered by many pioneers of the field such as Alexander (1964) and Archer (1968). This plurality of proposals shows that there is not a singular and absolute consistency while supporting the ambiguous nature of design processes. Design evaluation can be regarded as one of the most ambiguous design sub-processes since it both includes objective evaluations and analysis, yet it includes subjective understandings such as interpretation and abstraction as well. Measurement activity emerges in disparate stages of the design process, such as doing site surveying, calculating project budget and feasibility studies can be considered as objective measurements and making questionnaires, site queries and sustainability outcomes as subjective measurements. Depending on this fact, design evaluation can be regarded as one of the most controversial design sub-processes in terms of its measurability because of the co-occurrence of objectivity and subjectivity. In this regard, the paper aims to clarify a hermeneutical framework to expand the design evaluation process with theories from measurement science since the studies in measurement science can guide the measurement activity in the design evaluation with its constitution of a clear understanding of information and its qualitative features. By doing so, both objective and subjective understandings in the design evaluation are addressed with a hermeneutical process for clarification of the evaluation within the dual nature of hermeneutics. Therefore, a hermeneutical design evaluation process is formulated by using the understanding of measurement theories since they are implicitly active in design evaluation. This paper proposes to retake the problem of measurability, specifically through an examination of evaluation processes, to show that evaluative actions in design processes can and must be re-formulated with the understanding of theories of measurement science and hermeneutics to build up a holistic and integrated negotiation of quantitative and qualitative information in the design evaluation process.

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Tasarım Değerlendirmesini Genişletmeye Yönelik Ölçüm Teorileri ile Çizilmiş Hermenötik Bir Çerçeve

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21. yüzyıla bakıldığında ölçmenin, insan bilimleri ve doğa bilimlerini içeren tüm deneysel ve teorik araştırmaların temeli olduğu söylenebilir. Öte yandan, tasarım süreci disiplinlerarası ve çok katmanlı yapısı ile hem insan bilimleri hem de doğa bilimlerinin anlayışlarını içermektedir. Tasarım süreçlerine Alexander (1964) ve Archer (1968) gibi araştırmacılar tarafından önerilmiş farklı yaklaşımlar bulunması, tasarım aktivitesi için ortaklaşılmış bir payda olmadığını göstererek tasarımın muğlak doğasını ortaya koymaktadır. Çok katmanlı bir yapıya sahip olan tasarım süreçlerinin en muğlak aşamalarından biri, bir yanı ile objektif değerlendirme ve analiz içermesi, diğer yanı ile yorumlama ve soyutlama gibi subjektif yargılar içeriyor oluşu ile tasarım değerlendirme süreci olarak ele alınabilir. Bu çalışmanın amacı, tasarım değerlendirme sürecini, ölçme biliminden gelen anlayışlarla genişletmek için hermenötik bir çerçeveyi açıklığa kavuşturmaktır. Yunanca 'metrein' kelimesinin sözcük bilimsel tarihi, 'metrein' kelimesi ile ölçmeyi bir değerlendirme ve yargı olarak ifade etmektedir. Bu durum, ölçme aktivitesinin bir değerlendirme süreci ile birlikte kurulduğunu göstermekte ve tasarım değerlendirmesinden bahsederken, ölçme bilimlerinden yararlanmanın potansiyellerini açıklığa kavuşturmak amacıyla disiplinlerarası bir yaklaşım benimsemeyi gerekli kılmaktadır. Bu makale, tasarım süreçlerindeki değerlendirici eylemlerin ölçme ve yorumlama teorileri ile yeniden formüle edilmesi gerektiğini göstermek amacıyla, tasarım değerlendirme süreci açısından ölçülebilirlik problemini yeniden ele almayı ve tasarım değerlendirme sürecinde nicel ve nitel değerlendirmelerin bütüncül bir yeniden ele alınışını önermekte olup, halihazırda tasarım değerlendirmesinde örtük olarak kullanılmakta olan anlayışları ölçüm teorilerinin anlayışları ile birlikte yeniden formüle etmeyi amaçlamaktadır.

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1. INTRODUCTION

While offering an expansion for the design evaluation process with the understanding of measurement science, there is an apriority that presumes a connection between design evaluation and measurement activities. To reveal this assumption, the etymology of the term 'measurement' is examined. The word 'measure' is derived from the Latin word 'mensura' which is the abstract form that comes from ‘mensus’, past participle of the verb 'metiri' derived from 'mitis'. The term meant wisdom which is a measure in the psychological sense. On the other hand, 'metrein', the Greek word, conveys measurement as an evaluation and judgment. It can be considered that measurement in this meaning is then a wise and subjective evaluation. Since measurement includes evaluation inherently and when the design process is considered as a problem-solving activity, there is a continuously on-going evaluation that reveals the very connection of measurement and design process. As it is narrated by Goldsmidth (1992), according to Collins, evaluation and criticism are inherent activities of a design process which is also a limitation for scientific architectural research.

The evaluation process has distinctive constitutions that include both tangible measurement procedures (such as site surveys where the focus is objective, dimensional data) and intangible measurement procedures (such as user analysis where the focus is context-dependent data), which means that there emerge new meanings when applied in different contexts and can be interpreted subjectively. Therefore, there is not a singular and absolute measurement procedure to imply all the stages of the design process since different types of data cannot be valued depending on their correctness or wrongness considering there is not an external rule-set to check if the evaluation corresponds or not, but can be valued by depending on different interpretations of evaluators. Lawson (2005) noted that in the design process, there are so many variables that cannot be measured on the same scale. Moreover, reducing all the criteria to a common scale is a common mistake in design evaluation. Therefore, instead of adopting an approach that accepts a not-fully objective evaluation negatively, different interpretations of different evaluators can be seen as a highly potential space beyond objectivity and subjectivity since interpretation is mandatory where the meaning cannot be clearly understood.

Therefore, as it is discussed in Section 2, instead of trying to approximate design evaluation to a more 'objective' area, the potential of the hermeneutical process can be revealed.

The design process conveys both terminologies and methodologies from natural sciences and human sciences, which is conceptualized by Finkelstein (2003) in measurement science as strongly and weakly defined measurements. The importance of the expansion with measurement science is, since designing is a multidimensional process, it should be supported with related fields that share the related concerns such as a clear understanding of the nature of information and how it is constituted and processed to see different conceptualizations of the same issue in related fields. In the design process, as throughout natural and human sciences, measurement is not just assigning categories or numbers, but rather it is assigning values in a systematic and grounded way that is discussed in Section 3.

Snodgrass and Coyne (1996) argue that rules are not given from an uncanny power, but rather are formulated by humans. As a consequence, the activity of formulation includes interpretation, and criteria are constituted within these interpretations. Objectivity and subjectivity are regarded as two features that exclude each other, saying that if something is not objective, it is regarded as subjective and vice versa. Bernstein (2009) noted that framing problems with an either/or approach is misleading. Any interpretation or understanding can be challenged, criticized and displaced by the better, the clearer and the more appropriate interpretation. It should be avoided the mistake of assuming that there is no rational way of demanding such practical comparative judgments, since there are no fixed, precise rules to distinguish better interpretation from worse interpretation. Thus, instead of placing objectivity and subjectivity in a polarized continuum, this paper proposes to improve a hermeneutical approach to comprehend understanding in its relation with interpretation and implementation that is discussed in Section 4.

Cartwright, Bradburn, and Fuller (2006) propose three steps in which a qualified measurement should satisfy, that are characterization, representation, and procedures. In the scope of this paper, the proposal for a qualified measurement in general is combined with the terminology of measurement science in order to obtain a flexible basis

to be used in the design evaluation process. In the first step, characterization, the criteria and their boundaries should be defined and the decision of what features belong to the criteria and which do not should be decided as well. In the process of representation, a metrical system that appropriately represents the criteria that are defined in the process of characterization is revealed and in the last step, which is procedures, rules to apply the metrical system to tokens to produce the measurement results should be formulated that is discussed in Section 5.

2. AMBIGUITY IN DESIGN EVALUATION

Lawson (2004) states that what designers solve are not well-formulated problems but rather they are the ones which are ill-structured, open-ended and often referred as 'wicked'. This ambiguous nature of the design process leads to the emergence of different proposals for the design process such as the ones offered by Alexander (1964) and Archer (1968) which ends up with the objectification of the design process assumes that the design process is objectifiable and that it can be reached by revealing objectification processes, such as using scientific models. As Moles (2018) notes, an excessive passion for precision sterilizes innovation more than a lack of any method. Snodgrass and Coyne (1992) have challenged the logically deducible structure of design science considering the affirmation of a scientific model cannot be determined by referencing the criterion of logical deductibility since the explanandum and the explanans are constructed in logically incompatible languages. Hesse (1964) adopts a similar approach and discusses that the explanandum is expressed through the language of observation whereas the explanans is expressed in the language of theory, so that the language of two systems, explanandum and explanans are not the same. Different domains of explanandum and explanans make them incommensurable. Snodgrass and Coyne (1992) take this discussion into the design field that there are two diverse languages, one is the design process which is to be explained (the explanandum); this first language cannot be assumed only and straightforwardly from the second language (the explanans) by way of logic, rather it can be done by translating meanings from one to another. Since this translation inherently consists of judgments, it cannot be consulted only by logical rules. Therefore, the affirmation of a scientific model cannot directly be determined by referencing the

logical deductibility of the explanandum from the explanans. Bernstein (2009) argues that when analyzed correctly, incommensurability does not lead to or does not contain relativism, on the contrary, incommensurability explains the obstacles that are faced for the clarity of language and communication. To overcome incommensurability problem in measurement procedures as much as possible, Stevens (1946) has offered a scaling system where it is not necessarily adhered to in a single comparing system that is discussed in Section 3.2.

3. EXPANSION OF THE DESIGN EVALUATION WITH MEASUREMENT SCIENCE

3.1 Representational and Pragmatic Approaches

Representational measurement and pragmatic measurement are two main approaches in measurement theory. Representational measurement theory is based on the work of Tarski on relational systems and model theory. According to this approach, measurement is understood as a homomorphic mapping of a certain empirical relational system onto some numerical system (Berka, 1983). In representational measurement theory, by definition, there must be something to be represented in the physical world and can be considered as a direct mapping of the physical phenomena to numbers via a model that shows empirical relationships. An example from the design field can be given from the RIBA Architectural Practice and Management Handbook (2020), such as the surveying processes. Thanks to the recent innovations, including point cloud surveys, photogrammetry, lidar, the ability to mount cameras on drones, and even city-wide infrastructure models, have made it possible for accurate and detailed 3D site surveys. The results of these site surveyings can be tangibly represented with a mapping of the features of the physical world to a numerical system.

On the other hand, in the pragmatic measurement, there is nothing in the real world to be represented, but it is the evaluator who constitutes what and how it is going to be measured. Hand (2016) defines pragmatic measurement theory as it is designated for a specific aim, rather than being a numerical representation of the physical world. Therefore, pragmatic measurement both defines and measures what it defines and since it defines the attributes to measure and specifies how to measure, this measurement is closely related to operationalism. To

give an example, in case of measuring the level of the fire safety of a building, the criteria may be listed as the accessibility of the building, risk analysis within the external area, existing compartmentation arrangements, site appraisal to determine fire safety suitability which does not have a direct numerical representation in the physical world.

Representational and pragmatic measurements can be considered as two extremes of a continuum. Even though Hand (2016) drew a clear demarcation between representational and pragmatic measurements, he states that in most of the cases the measurement contains both of the approaches. For instance, in case of measuring the sustainability outcomes, site information and spatial requirements can be investigated which both can be measured within representational measurements since there are elements in the physical world that need to be represented numerically. However, how to combine and interpret these numeric values are parts of pragmatic measurement since all criteria to be included to measure the sustainability outcomes may not carry the same weight of importance.

3.2 A Need for a Scale

According to S. S. Stevens (1946), who offered four categories for scaling, numbers are not present in naturally occurring phenomena inherently that comprise the empirical context of measurement. With the words of Michell (2020), numbers are not essential parts of the universe and did not exist before humans 'invented' them. Following this approach, Stevens offered four categories to evaluate the phenomena as these phenomena do not emerge in a categorized way (Table 1).

scale	true zero	equal intervals	order	category
nominal	no	no	no	yes
ordinal	no	no	yes	yes
interval	no	yes	yes	yes
ratio	yes	yes	yes	yes

Table 1: Stevens' categorization of scales (Stevens, 1946).

Ratio scales are quantitative scales that the difference between two variables is equal, and there is an order between each stage. For example, 2 meters is the duplicated version of 1 meter. If something does not have any length, then it can be considered as 0 meter which is the absolute zero. In a parallel way, ratio scale emerges when

switching into scales in architectural drawings. In the same sized paper, the 1/200 scale plan shows 2 times more extended area compared to the 1/100 scaled plan. This approach is not valid when years are examined. For instance, it cannot be said that the year 2000 is 2 times more than the year 1000 since the defined year 0 is the common era which is the incarnation of Jesus and so that cannot be accepted as a true zero because of its arbitrary nature. This kind of scaling is called an interval scale. In the ordinal scale, differently from the interval scale, there are not equal intervals. The relationship between objects is represented by the relationship between numbers according to their order relationship. For example, if people are expected to score their experience of satisfaction on a scale from 1 to 5, a person who scores 4 does not mean that this person is satisfied 2 times more than someone who scores 2 since the intervals are not equal. As Lawson (2005) noted, ordinal scales are commonly used when the evaluation depends on many factors or when the factors cannot be easy to define. They contribute with acceptable information about the order of choices, such as in a customer satisfaction survey when the distance between variables cannot be calculated. Lastly, on a nominal scale, the categories only represent the difference.

4. A HERMENEUTICAL APPROACH TO DESIGN EVALUATION

Broadly speaking, two general features can be considered as a result of measurement, which are objectivity and inter-subjectivity. Objectivity can be gained when the information provided from measurement is independent of the evaluator and when the result equals the measurand. On the other hand, inter-subjectivity occurs when interpretable results are gained by different evaluators. Gadamer (1975) claims that prejudgments and preconditions are prerequisites for understanding, and both negative or unfounded prejudgments, as well as positive or legitimate preconditions together, are the founders of understanding. Gadamer (2009) continues by stating that understanding exhibits its full potential when pre-understandings are not arbitrary pre-understandings. Therefore, the evaluators should be aware of the origin and the validity of their pre-understandings and what is crucial for the evaluator is to become aware of their inevitable horizons. In accordance with this view, Snodgrass (1996) argues that objectivity in the evaluation of design is unattainable, and he reasons his claim with firstly because the selection and interpretation of the

criteria involve judgmental processes, and secondly, the procedural rules for the application of the criteria cannot be specified. He adds that to point out that the design evaluation cannot be objective, does not necessarily mean that it does not include any norms or criteria since it still has constraints. The reason to polarize objectivity and subjectivity in two extreme points in a continuum is a result of the subject-object dichotomy. Although design evaluation cannot be regarded as a wholly objective process, evaluations are made to implicit criteria in the hermeneutical process (Table 2).

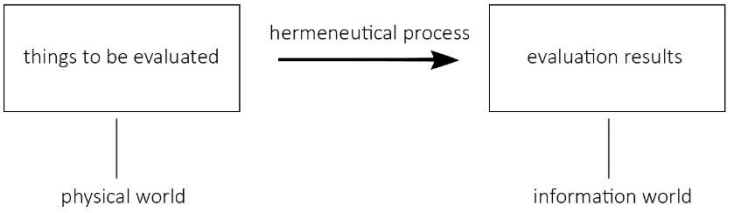

Table 2: An abstracted diagram of an evaluation process.

Kuhn (2018) emphasizes the role of social constructions in scientific groups by stating that there is a social dimension of the scientific groups and without this dimension, it is insufficient to understand scientific progress by just analyzing it in an abstract environment where only logic and rationality are valid. The subjectivity of the evaluator does not need to be understood as full subjectivity since a hermeneutical process also has its own restrictions. The root of the word 'hermeneutics' refers to the activity of interpretation. As Gadamer (1975) states, the understanding of hermeneutics is not received with an objectivist 'neutrality', it is neither attainable nor necessary that putting the evaluators themselves within brackets. The attitude of hermeneutics expects that the individuals self-consciously designate their opinions, prejudgments, preconceptions and qualify them and so that strip them of their severe character. This qualification also enables the individual to distinguish between what Gadamer calls 'blind prejudices' and 'prejudices that illuminate'. By raising the level of consciousness which governs understanding and therefore something can be understood in its own otherness since 'the thing itself' is where every hermeneutical understanding begins and ends. Before all else, as Gadamer (2009) states, pre-judgment means the judgment given before all of the elements that determine a situation are finally reviewed. Thus 'pre-judgment' does not necessarily mean wrong judgment, since it is an element of thought that can have both positive and negative values.

The only thing that gives the judgment its value is that it has a basis which is a methodological justification. The hermeneutical equipped evaluator has to be sensitive to the difference of what is to be evaluated from the very beginning. Moreover, this type of sensitivity requires neither 'neutrality' in regards with content, nor one's epoche; on the contrary, this type of sensitivity requires the transformation and appropriation of one's own pre-meanings and prejudices and what is crucial is being aware of these pre-understandings. As reported by Dilthey (1999), in accordance with the principle of inseparability of comprehension and evaluation, the hermeneutical process and criticism are necessarily interdependent and intrinsic to each other. Therefore, a hermeneutical process is valid where humans are included, and so in measurement and correspondingly in the design evaluation as well.

Kuhn (1973) states that there are diverse established usages of the word 'subjective'. Firstly, there is the one that is opposed to 'objective' and in another, it is opposed to 'judgmental'. He explains the way he uses the word 'subjective' in a way, that includes judgments but not tastes, since tastes are undiscussable whereas judgments are discussable. In the scope of this paper, it adopted a hermeneutical approach that both includes objectivity and subjectivity in a Kuhnian way. The subjective attitude does not mean that evaluators make their choices according to their tastes, but to assert their judgments and to create a space for discussion makes the design evaluation beyond objectivism and subjectivism.

As Snodgrass and Coyne narrated (1996), according to the hermeneutical circle, the whole and the part are the ones that give meaning to each other, therefore understanding has a circular structure. With the same approach, on contrary to the approach of Alexander that aimed to decompose design problems into small and manageable parts to later on revealing an evaluation based on logical and transparent criteria, due to the characteristics of hermeneutics, it is not proposed to decompose the design evaluation into manageable parts since the design evaluation is an integrated and holistic process, but rather, as explained by Gadamer, the criteria as a whole is what makes each criterion understandable and vice versa. Gadamer narrates that, for Aristotle, the idea of a single method, that a method which could be established even before having penetrated the thing, is a quite

fatal abstraction since the object itself must establish the method of its access. Every design evaluation process should be understood in itself and should not be presented to the measures of an external rule-set which is possibly extrinsic to its access. What the dangerous about the usage of the same rule-set on non-homomorphic structures are, when general explanations are made through homomorphism, singular processes, their specificities and distinctions are ignored or at the best condition, these specificities and distinctions are accepted only as insignificant appearances and reject both the uniqueness, and the uniformity of the design evaluation processes. Therefore, to assign external rules to design evaluation does not correspond to the nature of the design evaluation since each criterion can be understood by all criteria and all criteria can only be understood in regard to each criterion. How evaluators comprehend each criterion and so that all criteria depend on their preconditions. Schön (1983) discusses a similar approach while stating that the principle is that one works contemporaneously from the part and from the whole and next goes in cycles-back and forth, back and forth. The hermeneutical process operates in such a way that, in the design evaluation, the hermeneutical process again reveals a 'conversation with the situation'. Since all design problems are unique and so that all design solutions are unique and therefore all criteria to evaluate the design should be unique as well. Hence, no external rules can be applied to construct the criteria but rather they should be constructed in the hermeneutical process in a context-dependent way.

5. AN INTEGRATED METHODOLOGY

Cartwright, Bradburn, and Fuller (2016) offer three steps that a qualified measurement should satisfy, which are categorization, representation, and procedures. Even though these steps are proposed for a quailed measurement in general, this research proposes to integrate the offered steps with the terminology of measurement science to be used as a flexible ground for the design evaluation process. In the first step, categorization, the concept, and its boundaries are defined, and the decision of what features belong to it and what does not are decided. In the second step, representation, a metrical system that appropriately represents the concept is defined and in the last step, procedures, rules to apply the metrical system to tokens to produce the measurement results are formulated. The

defined three stages are re-formulated with methodologies and terminologies from measurement science with a hermeneutical approach. Even though there is a proposed method for the design evaluation with the terminology of measurement science, this search for a method is not designated as a precise and external rule-set since understanding and correspondingly evaluation is not attached to a special rule-set. The methodology proposed that integrates the proposal of Cartwright, Bradburn, and Fuller, hermeneutical process and the terminology of measurement science (Table 3) can be regarded as a flexible ground to operate with, and depends on their interpretation, evaluation, and specific preferences and decisions based on evaluators. Since none of the criteria are untouchable, all the time they can change, be renovated, and even be removed depending on the context.

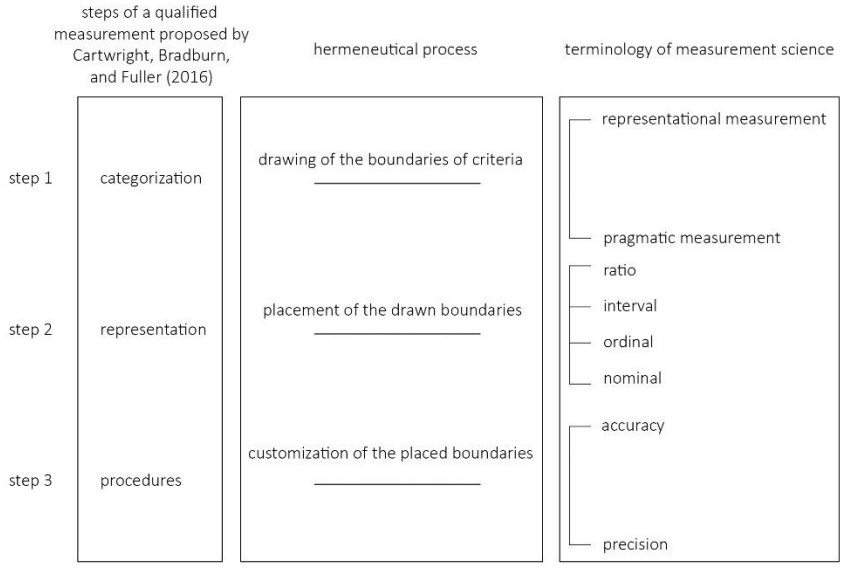

Table 3: The methodology that integrates the proposal of Cartwright, Bradburn, and Fuller, hermeneutical process and the terminology of measurement science.

5.1 Characterization

In the design process, characterization in the beginning is often open-ended, context-sensitive, and difficult to determine explicitly, which Finkelstein (2003) called 'weakly defined measurement', or simply, soft measurement. According to Finkelstein, weakly defined measurements have characteristics such as they are based on ill-defined concepts of quality and there are uncertainties in the empirical relational systems that it represents. Firstly, when characterizing all design criteria in the beginning, it should be decided under which scale that criterion should

be considered since there are both qualitative and quantitative measurements included. According to Gadamer (2009), the meaning to be understood can be fully grasped only by being embodied in the interpretation, but the interpretative activity sees itself entirely dependent on the meaning. For instance, the word 'performance' may mean differently depending on its usage, such as if it is used in the context of 'the quality of a building in terms of its usage strategies' or in a more tangible and quantitatively measurable way 'the robustness of the structure'. To measure the performance of a building in the process of evaluation, the definitions should be made as clearly as possible to evaluate if the criteria are satisfied. To continue with the same example for clarification, to measure the performance of a building, firstly the demarcation between its representative and pragmatic definitions should be made. Some concepts in the design process are based on a set of criteria that are loose or hard to express precisely, such as while robustness can be more well-defined than sustainability as what is understood from sustainability is comparatively more context-dependent and theory-laden compared to robustness.

The combination of the process characterization with measurement science is, in this step while defining characteristics of the criteria, the scale to measure them should be considered as well since reducing all the criteria to a common scale is a prevailing mistake in design evaluation. Another remarkable point is about deciding the weights of importance of each criterion, this decision-making process should be considered in the process of characterization. The word 'subjective' is used in a Kuhnian way as it is discussed in Section 4. Therefore, the process will not operate such as 'I prefer criteria A should have more weight than criteria B in terms of importance', but rather 'I prefer criteria A should have more weight of importance than criteria B in terms of X, Y and Z.' and 'X, Y, and Z' have judgmental characteristics that is to be discussed and defined. Therefore, the aim is, as Dilthey (1999) emphasizes, expanding the understanding to see things with their own singularities as much as possible and then making comparisons between these singularities.

It is possible to compare different criteria in various ways; therefore, it is needed to avoid the notion that there is only one ultimate 'grid' for comparison. This notion is what gives importance to the characterization process the most, since the more detailed the

characteristics of criteria are defined, the more explicitly representation and procedures can reveal.

5.2 Representation

Representation of the well-defined and quantitative concepts is generally driven by using some metrical system with an underlying numerical structure. Stevens (1946) introduced four kinds of representations that are nominal, ordinal, interval, and ratio as it is discussed in Section 3.2. In the first step of evaluation, that is characterization, the characteristics of each criterion are described and in the representation stage, they are positioned under a measurement procedure that is representational and pragmatic and the sub-categorization of Stevens should be decided as it is seen at Table 3.

Two vertically hierarchical categorizations can be considered, the first and main categorization is if each criterion should be considered under representational measurement or pragmatic measurement or which features of the same criterion should be made under which measurement procedure. After this demarcation has been made, the sub-categorization that includes scales offered by Stevens reveals. Even though the ratio scale may seem to belong to representational measurement, and the interval, ordinal and nominal scales may seem to belong to pragmatic measurement, they can be incorporated context-dependently.

One of the most crucial stage is, as Lawson (2004) noted, design activity is characteristically holistic, whereas a single feature of a design solution can contemporaneously solve more than one aspect of the problem. Design problems and solutions do not correspond to each other in predictable or theoretically definable ways which means that designers cannot indeed break the problems down in such a way that classical natural science researchers do. The holistic and integrated nature of design indicates that, mostly a single design solution simultaneously solves many parts of the problem, therefore in the evaluation process, the criteria evaluates not a single part of the solution but since a solution corresponds more than a single problem, criteria should be considered with the same approach as well.

5.3 Procedures

In setting up procedures, it should be ensured that if they both are accurate and precise. While accuracy is about if measurement results correspond to the true values, precision is about how specific a measurement result is (Cartwright et al., 2016). In the design evaluation, after criteria are categorized under representational or pragmatic measurement in the representation process, then if a criterion is considered under representational measurement, considering accuracy is possible since what is represented has a corresponding in the physical world and therefore it can be checked whether the representation corresponds the real world feature or not. For instance, in site surveys, it can be checked if the numbers that are measured with any kind of tangible measurement instrument correspond to real numbers since when a quantity is measured, the observations are mostly done by using an instrument that is calibrated to a metrical system that represents the quantity and can be transformed into several metrical systems by using algorithms. In pragmatic measurement, since there is not a 'true value' to be measured, but instead, the evaluator constitutes what to measure and how to measure for a specific purpose, therefore the more parameters are designated to constitute the system, the more accurate results can be obtained.

In the manner of precision, both representational and pragmatic measurement can be detailed and specified since it is about specificity. For representational measurement, the bigger scales are used, the more precise numbers can be attained and how to choose which instrument to use for needed precision is context-dependent. For example, 5 cm may not be crucial if it represents the diameter of a tree trunk, but if 5 cm is thought under the construction of the openness of a wall, then it may not be negligible. So that, if 5 cm difference is under the threshold, which is 'sufficiently' convenient, is acceptable and hence negligible since it will not cause crucial changes in the design, but if 5 cm difference in the openness at the wall will be over the threshold, that is not 'sufficiently' convenient and therefore cannot be neglected. Therefore, precision for representational measurement procedures can be designated by investigating the characteristics of the criteria. For pragmatic measurement, the more precise, and thus more specific defined procedure, the more aimed results can be attained.

The problem of nomic measurement (Chang, 2004) emerges in the step of the procedures as well. The projection of the problem of nomic measurement into the design process can be seen more in qualitative aspects of evaluation. The problem of nomic measurement can be summarized with an example from the design field such as the 'user friendliness (X)' of a building cannot be directly measured. To measure it, a directly observable feature (Y) should be chosen and a function between them (X = f(Y)) should be constituted. However, the problems arise here, which are, how it can be known if directly observable features (such as making questionnaires to the users of the building) represent the non-directly observable feature (user-friendliness of the building) and if the function works precisely? This problem of justification can occur in all measurement methods that depend on empirical laws. Thus, while procedures are revealing, it should be considered if what is aimed to be measured and what is 'really' being measured corresponds or not carefully in the process of characterization, since they may not overlap, so that it should be controlled if two systems of knowledge can be mapped directly onto each other. For instance, in the case of measuring the satisfaction of the users with an atelier building, the question should be as specific as possible since the conceptions of users for the term 'satisfaction' may not be the same and therefore what is measured may not correspond to what is aimed to be measured.

As Cartwright, Bradburn, and Fuller narrated (2016), Campbell and Fiske advocated a multi-layered method approach for unobservable concepts to validate them. Therefore, concepts can only be accepted if they can be measured by various different methods and with distinctive representations which is an example of the back-and-forth process of clarification, that is often called triangulation, among characterization, representation, and design of procedures. In the hermeneutical process, the proposal of Campbell and Fiske for unobservable concepts is used inevitably since all the evaluators who attend the hermeneutical process have their own understandings and their judgmental-subjective arguments may open space for what Campbell and Fiske proposed, 'measuring by various methods', since each interpretation is the interpretation of the interpreter and by overlapping all the judgments that are offered by distinctive interpreters, so-called evaluators, the procedures can be done in a hermeneutical way that is beyond objectivism and subjectivism.

6. CONCLUSION

Objectivity and subjectivity are constitutional features of the design evaluation process. The acceptance of objectivity and subjectivity as two contrary features is an outcome of the object-subject dichotomy. In this current study, subjectivity is not regarded as an undesirable feature since the word subjective is not used to indicate 'personal tastes' but to highlight its 'judgmental' essence which carries the hermeneutical process beyond objectivity and subjectivity.

To have different proposals for the design evaluation such as Alexanders' (1964) and Archers' (1968) reveals that there is not a singular and absolute procedure to adopt for all design evaluations and shows the ambiguous nature of the design evaluation. The importance of the expansion of the design evaluation process with measurement science is, since evaluation inherently includes measurement and hereby measurement science has a strong potential to project its terminology and methodologies to design evaluation process in accordance with their similar concerns. Cartwright, Bradburn, and Fuller (2016) propose three steps that a qualified measurement in general should fulfill, which are characterization, representation, and procedures. In the scope of this current study, an understanding to be used as a flexible ground for the clarification of the design evaluation that integrates the proposal of Cartwright, Bradburn, and Fuller for a qualified measurement in general with a hermeneutical understanding and with the terminology of measurement science to reveal the potentials of a cross-disciplinary study for design evaluation process.

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