Rationality as the Driver of the Creative Process in Architectural Designs

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ABSTRACT

This paper is based on a purely interview-based qualitative study. The research idea was triggered by a diametric theoretical difference in seeing the relationship between rationality and creativity. On one side, some theories suggest rationality inhibits creativity. On the other side, some theories suggest the opposite; rationality encourages creativity. These perspectives were examined through their applications by two Indonesian architects' designing process in their professional practice. The study was conducted to discover the rationality that works in the design process and the rationality dimensions that drive architects' creativity. The design process is limited to the conceptual design stage because creativity determines the design work the most. Two Indonesian architects receiving awards for their work creativities were studied using an exploratory case study. Data were collected through in-depth interviews about participants' attitudes, approaches, and creative operations. The creative processes would be linked to the dimensions of rationality utilized by the architects. Findings related to the rationality dimensions that drive architects' creativity are discussed with Schipper's creative-rationality theory.

Keywords: *Creative Rationality, Conceptual Design, Creative Attitude, Creative Approach, Creative Operation.*

1. INTRODUCTION

The creative cognition process always presents rationality and sensitivity in varying degrees of composition [1, 2]. Various decision-making situations, including creative design decision making, require merging the two approaches [3, 4]. However, every individual always takes a position of self and prioritize rationality or sensitivity. Extraordinary creative works are widely recognized as being born from creative processes relying on sensitivity to taste, emotion, and intuition [5, 6, 7, 8, 9, 10, 11]. Some theorists have even revealed that the rationality process does not support creativity [12, 13]. Research in various fields strengthens the role of intuition, taste sensitivity, and emotion in producing extraordinary creative works [5, 6, 8, 11]. Intuitive sensitivity contributes significantly to creativity, discovery opportunity, and breakthrough decision making [14, 15, 16, 17, 18]. Sensory sensitivity plays a dominant role in human perception of the surrounding spatial environment [19]. As creators, architects interpret

sensory stimuli into the brain to be translated into the design [20]. With emotional creativity, someone feels and expresses emotions uniquely to his work [21, 22].

From a philosophical perspective, what leads to novelty is not rationality but emotional sensitivity [12, 13]. Certain steps must be strictly followed in building rationality, limiting creativity [23, 24, 25]. Architectural creativity is a matter of aesthetic creativity, but there are issues of usefulness and firmness. On the issue of usability and robustness, architects need to build rationality. In the architectural domain, what kind of rationality do architects build when they work? This question is relevant to the development of life in the digital age, including digitization in architecture, which demands rationality. It is an exploratory study aiming to explore the dimensions of rationality built by architects with extraordinary work abilities and to identify whether these dimensions of rationality have relevance to creative rationality to encourage creativity.

2. THEORETICAL PERSPECTIVES

2.1 Rationality

Rational refers to explicit reasons [26, 27]. According to logic or other impersonal normative systems, a person is rational if what he believes in or does has a good reason [28]. Rationality is a component of cognition in the formation of trust or decision making [29], has fourteen different dimensions: personal, impersonal, descriptive, normative, prescriptive, substantive, procedural, theoretical, practical, instrumental, cognitive, algorithmic, judgmental, reflective [24, 28, 29, 30, 31].

For this study, we summarized the theoretical dimensions of rationality from the fourteen dimensions into five dimensions, namely: (1) objectives, (2) conditions, (3) ways, (4) processes, and (5) results. First, the rationality of objectives consists of the creator's personal goals, important goals of work, practical goals related to benefits and advantages, instrumental goals based on available means, cognitive goals based on self-confidence, and environmental support. Second, the rationality of condition embraces normative thinking conditions, prescriptive thinking conditions, substantive conditions according to purpose, cognitive conditions of self-confidence, standard algorithmic formulations, assessment conditions based on general principles, and critical conditions self-reflection. Third, the rationality of ways incorporates personal habits, theoretical ways of describing phenomena, practical ways of decision making, ways of critical reflection on the ability of self and experience. Fourth, the rationality of process comprises an impersonal process that follows logic, and normative theory, a descriptive process of describing phenomena, a prescriptive thought process, a procedural choice of appropriate judgment, an algorithmic process follows a standard formulation, a judgmental process based on general principles, and a reflective process of self-ability and experience. Fifth, the rationality of results includes the results of impersonal decisions, the results of the process and product descriptions, the results of normative thinking, the results of procedural considerations, the results of theoretical logic describing phenomena, useful and beneficial practical results, the results of assessments for decision making, and the results of critical reflection of self-ability and experience.

2.2 Creative-rationality

Before discussing creative-rationality, it is essential to refer to the term rational capacity, engaging in self-critical reflection [32, 33, 34]. The authors further contend that this self-critical reflection empowers one's ability to think out of the box. In other words, reflection encourages creativity because it stimulates thinking beyond what is available, opening up possibilities for novelty, looking at problems from an unusual perspective [24, 29, 34]. Recent research shows that reflective rationality is popular as creative rationality [35, 36, 37].

For some researchers [38, 39, 40, 41, 42], creative rationality refers to the one triggered by problems and is driven by reflective cognition. This cognition is supported by a critical attitude towards oneself to build intentions toward actions beyond the ordinary, uncover hidden things, and convince themselves to determine actions in the new situations encountered. Creative rationality is a cognitive process of combining various knowledge to produce new knowledge based on creativity [35]. Previous studies [24, 29, 34, 35, 36, 37] have identified dimensions of creative rationality such as (1) substantive, which is based on reflective cognition (self-critical ability) to think beyond the ordinary, reveal hidden and responsive things to new situations; (2) integrative, i.e., the integration of knowledge treasures that are triggered by problems; and (3) operative, i.e., creative operations based on new knowledge resulted from the integration of existing knowledge.

2.3 The structure of the creative-rationality process

Based on the previous studies on rationality in design [24, 29, 32, 33, 34, 43, 44, 45, 46, 47], it can be said that an architect's creative process is a unity of construction of creative potential (as a result of accumulated learning processes) and creative operations (incidental processes). It happens when the architect responds, works, and completes a design case. An architect's creative process activates creative potentials into the creative energy triggered by a design task and integrated into a creative operation through the architect's creative attitude towards design tasks to produce novel and valuable work (Figure 1).
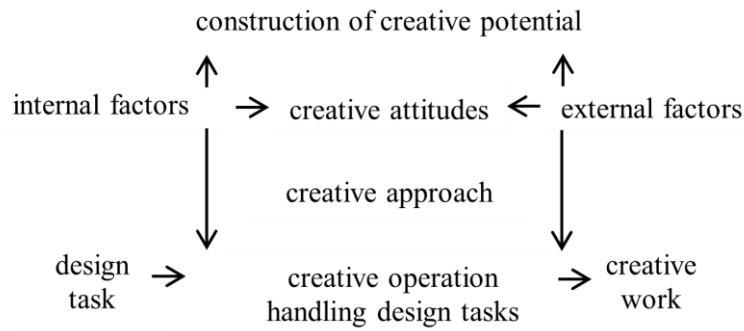
construction of creative potential

Figure 1. Chart of Creative-rationality Processes as a Unit of Potential Construction and Creative Operations.

3. RESEARCH METHODS

This research is an exploratory study to explore rationality in the individual creative process of an extraordinary architect who has strong social concerns. As the subject of this research case (case-1 and case-2), two architects are Indonesian architects who have social concerns, have produced creative works that have an extraordinary influence on the architectural domain, and were willing to participate in this research. The exploration of creative processes is limited to the conceptual design stage, which predominantly contributes to the birth of creative ideas [48]. We divided the creative process of conceptual design into three parts: creative attitude, creative approach, and creative action [43, 44, 45, 46, 47]. Rationality in each part of the creative process of conceptual design was explored, including but not limited to 5 dimensions of the rationality perspectives (objectives, conditions/context, ways, processes, results).

The main research question in this study was: what rationality did the architect build when designing? Data were obtained through in-depth retrospective interviews, exploring the participants' habits in the architectural design process from the beginning to completing a project. Participants were asked to recall their experiences and expressed them verbally and visually. Data were analyzed using thematic analysis [48].

4. FINDINGS AND DISCUSSION

4.1 Attitude determination

Data shows that work values were considered the most important factor in addressing the design task's challenges. The architect in case-1 was highly concerned about humanity's social values that are directed to empower low-income communities. The spirit of empowerment often affects the cognitive process; therefore, in conducting evaluative assessments to determine attitudes towards the design task, we can be sure that the benefits of empowering low-income communities are an important reason. Meanwhile, the architect in case-2 strongly upheld the value of natural harmony - sociocultural for prosperity and a better quality of life. It was very important for him that the work of architecture impacted the community's welfare, realizing the quality of nature for a healthy life at the very least. Although both participants show differences in terms of what they valued, they indicated similarities in that the values they believed were important reasons for striving for their design tasks' success. Both participants also revealed differences in the process of value formation. Life experiences formed confidence in values in case-1, and an academic education strengthened family education in a university. In contrast, in case-2, it was acquired through a strong educational background of architecture in higher education and professional experiences as architects. It demonstrates that the determination of the architect's attitude towards the project in both case studies showed the values of work influence and was closely related to the purpose of the work.

The data indicates that project conditions/contexts are not the primary reasons for attitudes in architectural practice. For the architect in case-1, the project conditions and context were not a concern in determining his attitudes. He would respond to any projects through his management skills, regardless of their circumstances, to empower low-income communities. Concerning projects with absolutely no objectives for the empowerment of low-income communities, this architect built the rationality of managing non-empowerment projects to support the

empowerment projects they were handling (at least partially sustaining financial issues). Meanwhile, in case-2, the architect highly appreciated the project's condition/context that offered something new or something that could provide learning. Also, in case-2, the architect applied compelling ways to clients (and other stakeholders) to support the goal of strengthening community welfare and developing healthy environmental qualities.

Architect 1's rational choices in the design tasks were stemmed from his intentions to adjust himself to the project (external orientation), while architect 2's judgments were based on his preferences (internal orientation). Both architects' decisions were influenced by the values of work and the goals to achieve.

The process of designing a project plays a significant role in determining the participants' attitudes toward the design project offered. Case-1 and 2 architects expected that the conceptual design process was a collaborative process between architects with clients and other stakeholders to contribute to the design process. The participants further claimed that both clients and they had an equal chance of making decisions regarding a project design while considering both parties' suggestions. The case-1 architect positioned himself as a translator of the client's needs and expectations (external factors). In contrast, the case-2 architect acted as a director of the design process on the right achievements based on the

architect's review (internal factors). Thus, this architect required self-confidence and readiness in handling the challenges of the design tasks. This confidence and readiness needed to be supported by the architect's professional knowledge and self-experience on projects relevant to the task challenges.

The type of work produced in a project serves a critical role in determining the architects' attitudes. For the case-1 architect, the main reason for accepting a design project was the potential impact of the work, whether on the domain (the work as domain learning material), as well as the impact on community empowerment (the work has components that can benefit local communities, especially low-income communities). As for the case-2 architect, the environmental-related impacts had been the primary consideration in project design. The architect's rationality in evaluating a new project to be executed was greatly affected by the work's values.

Both cases show that the dimension of rationality based on an architect's values was the most powerful rationality in forming attitudes. It is in agreement with the theory of the Planned Behavior of Ajzen [48]. Values that are identical to subjective norms are cognitive aspects that directly influence attitudes. The architects' orientation in the rationality of design attitudes indicated external factors (outside oneself) or internal factors (inside oneself), encapsulated in Table 1.

Table 1. The dimensions and substance of the rationality of the architect's work attitude

Dimensions of rationality	Substance of rationality	
	case-1	case-2
value	human values; social value	the value of natural - sociocultural harmony
aim	Architecture for poor community empowerment.	Architecture for a better quality of life
condition/context	-	build positive emotions; build a pleasant atmosphere of work; provide learning opportunities; offer something new
way	empowerment management; empowerment project; project for empowerment costs.	building persuasive client support; build client acceptance on the values of the architect's work
tool	-	-
process	collaborative process; client participation, architect participation, client decisions, architect decisions.	Confidence in the task; prepare to complete design tasks;
result	work influences the domain; works to empower local communities.	The work does not cause problems in the environment.

4.2 Approach

When determining the creative attitude facing the design task's challenges, an architect conducts an evaluative assessment, producing a predisposition or approach that is the key to opening the gate to the creative design (operation) action. The creative approach serves a vital role in determining attitudes. The architects' approach to work refers to the results of evaluative evaluations of design tasks. In case-1, the design approach's rationality was influenced by humanity's social values that were transformed more concretely into respect for public rights over architectural space. The form of its application was the architectural design approach using urban design values. Architects in case-1 used reference values of praxis formed during academic education in university and were applied to all design cases that they encountered. When building approaches, architects looked at project conditions/contexts to get something different or something that challenges thought, 'energize think.' In case-2, the architect applied a new approach through experimentation. The architect strived to use approaches with the rationality of values unique to each design case to produce novelty. His spirit of novelty grounded in his family education background that respected differences and innovations. Based on the data's discussion, it can be said that several aspects considered by the architect included: the tendency of clients to accept the values of the architects' work; opportunities to empower local communities; alignment of project conditions or contexts with the passion of the architect.

In developing a design approach, the case-1 architect considered techniques such as: 'try and error,' analogy, a transformation of natural phenomena. The case-2 architect challenged himself for cutting edge ideas.

Both architects adapted rationality to effectively communicate their ideas in communicating their decision-making processes to their clients. In case-1, the architect always started with understanding the context of the design case. In contrast, in case-2, the architect started with the design project's issues/problems, the design project's mission, and conditions/client preferences. The design results were taken into consideration by both architects.

This research indicates that the objective dimension was integrated with the value dimension in the approach's rationality. Rationality to build a design approach led to uniqueness or novelty. It is summed up in Table 2 below.

Table 2. The dimensions and substance of the rationality approach to architect work

Dimensions of rationality	Substance of rationality	
	case-1	case-2
value	The application of urban design values to architectural design, the representation of the rights of the public in a new form	The application of the value of harmony of nature - sociocultural that is experimental with novelty
aim	-	-
condition/context	Projects open up opportunities to make something different; the project provides something that can move the interest in work, "energizing think."	projects that can bring passion, or; the project opens the client's awareness of the values that the architect stands for, or; the project presents challenges for empowerment for local communities
way	Application of the 'try and error' method; analogy way; how to adapt natural phenomena	The analogy method; how to use signs and symbols; ways of physical representation; unusual way (anti-mainstream)
tool	-	-
process	The process starts with understanding the context	rational process, starting from the issue, the mission, the problem, or the client's condition/preference.

result	organic design; design matches nature, natural sustainability for well-being.	The work has novelty, or realize the vision, or realizing the results of design research.

4.3 Operation

Rationality rooted in values is important in the practice of an architect's creative operations. In case-1, architects tended to apply human and social values in a unique, new, unusual perspective. These values are not always completely new and different but can be modified from the existing values to generate advantage values. In case-2, the architect transformed philosophical values - praxis values - the vision of working into awareness, becoming tastes, into something inherent in every design action.

The project conditions considered and attempted by the architect in case-1 were conducive for the parties' participation related to the project. In case-2, creative operations required consideration of the suitability of the architect's knowledge and experience with the conditions and context of the design project. In case-1, rationality was built by measuring the project conditions following the operations to be carried out by the architect. In contrast, in case-2, rationality was built by measuring the architect's readiness to deal with the project conditions and context.

The interview data suggest that both architects carried out design operations by applying collaborative design decision-making methods (involving various stakeholders) or closed (internal design team). Both architects conducted design operations as a process of evaluating, testing, and developing forms using visual presentation tools, including manual sketches, digital three-dimensional simulations, models, and mock-ups (for special conditions).

The architect in case-1 considered iteration for refinement of design ideas. A rough idea of the initial design was done with a quick visual presentation technique using hand sketches. The design evaluation results were based on hand sketches, then presented using rough digital 3D simulations. The design was constantly and thoroughly refined using mock-up media. In case-2, the design operation was also performed through an iterative process and thoughtful consideration in communicating ideas to his clients. The iteration process in creative operations evaluated the refinement of ideas or communicating ideas to be accepted by various parties.

The interview data represents both architects' design operations in both cases in which final product designs were carefully pondered. Both architects expected to produce architectural works that have a visual aesthetic, were unique, impacted empowerment for local communities, or had novelty, harmony with nature - social – culture. The strength of creative works suggests uniqueness, novelty, and impact.

This study's empirical exploratory result shows that external design-oriented architects were exposed to external aspects and vice versa. The difference on the rationality of design-operations between the focus on achieving design quality (architect's self-expression efforts) and design acceptability by stakeholders (efforts to satisfy stakeholders) is compliant with the difference on the focus between creator's self-expression and responses to stakeholder's problems (see for examples [49, 50, 51, 52]. It is recapitulated in Table 3 as follows.

Table 3. The dimensions and substance of the operation rationality of architects

Dimensions of rationality	Substance of rationality	
	case-1	case-2
value	human values, social values in the perspective of novelty - uniqueness - unfamiliarity	based on awareness of the value of harmony of nature - sociocultural, inherent in the behavior of the work
aim	-	-
condition/context	involvement of project relevant parties	the readiness of project relevant knowledge and experience.
way	collaborative decision making	brainstorm with the design team; other suitable methods.
tool	visualization/simulation tools including sketches, perspectives, digital three-dimensional simulations, mock-ups, to test and mature design solutions	visualization/idea simulation tools include sketches; 3D with Sketchup; model; mock-up (for special conditions) to test and finalize the design solution
process	The operation starts from rough ideas (sketches), reveals more detailed tests (with mock-ups and three-dimensional digital simulations), is performed cyclically (iteratively) until optimal results are achieved, then orthogonal drawings are made.	The iterative process includes idea searching, discussion of various parties; evaluation/testing; improvement.
result	have a visual aesthetic; impact empowerment for the community; unique	realize the harmony of architecture - nature-culture - social welfare; contains novelty; impact local communities' empowerment.

5. THE RATIONALITY THAT DRIVES THE ARCHITECT'S CREATIVITY

This study equally confirms theoretical rationality (goals, conditions/context, ways, processes, results) discussed by the theorists [24, 28, 29, 30, 31]. Two dimensions of rationality in the practice of two participant-architects that have not been discussed by the theorists mentioned above are the rationality of values and tools. Theoretical rationality that arose at all stages of the conceptual design was the rationality of means and results. These rationalities seem to be related to the architectural cognitive process orientation in designing, namely: extrovert or introvert. The rationality of values that appeared at all stages of the conceptual design was a rationality that has not been questioned in theoretical studies. In this study, architects' values were significant sources of creative rationality and shaped through long-term cognitive processes.

This study reveals that exploration in the two Indonesian architects' practice shows that not all dimensions of rationality were creative rationality that drove architects' creativity in their work. Only three dimensions were substantially relevant to creative rationality: values, conditions/context, and outcomes. These three dimensions can be said to be dimensions of creative rationality because they can encourage creative exploration (the search for special knowledge, new reasoning patterns, and breakthroughs to produce novelty) and creative transcendence (a big leap to create a maze of new solutions to problems), relevant to Schipper's theory [24].

The value rationality between stages of the conceptual design process changed: (1) from general/universal to specific/unique; (2) from ordinary perspective to extraordinary/novelty; and 3) from understanding to awareness/habits. The rationality of values that drove creativity included the substance of uniqueness - extraordinariness - novelty.

The rationality of values and goals arises at the stage of taking the attitude as a whole. At the stage of the approach and operation of the value's design, the rationality of values still appears, but the goals' rationality does not arise. It is not consistent with Weber's theory of rationality (Weber in Rutgers and

Schreurs [53]), which separates and describes diametrically between value-oriented rationality and goal-oriented rationality. Value rationality and goal rationality do not exist concurrently but as choices. Rutgers and Schreurs [53] maintain that the rationality of goals is motivated by an external orientation. In contrast, the value rationality is motivated by an inner (intrinsic) orientation, usually derived from ethics, aesthetics, religion, and the like, dogmatic without conditions. In the case of the practice of Indonesian architects: (1) value rationality can be combined with internal orientation with external reflection, which results in encouraging creativity, or (2) value rationality is built as a habit of work that does not encourage creativity but is a hallmark of the work.

The rationality of conditions and contexts from stage to stage of the conceptual design process does not demonstrate a substantial continuity. In building rationality, both architects in this study utilized conditions and contexts to motivate and open opportunities for a breakthrough encounter or considered conditions and contexts for exploration towards newness; the intrusion of work values; deemed opportunities as sources of knowledge development and personal growth.

Creative activities are not carried out in a vacuum; therefore, conditions/contexts must be carefully considered. In decision making, both architects appeared to apply knowledge and skills from external and internal sources to interpret contextual data as 'strategic stimuli', which confirms previous research (see: [54, 55, 56]). The dimensions of the 'strategic stimulation' context include (1) strength, which is the function that drives the priority of action, and (2) structure, the accuracy of the problem definition function [30, 56, 57]. The results of this study indicate that strategic stimulation from contexts acts as an architect's creativity driver.

This study shows that both architects interpreted their work results as an expression or representation of the values held at work. The rationality of this case study results did not demonstrate substantial continuity between the conceptual design process stages. However, the architects always built the rationality of results to obtain: impact, extraordinary, and novelty.

6. CONCLUSION

In the findings and discussion of the analyses, it is clear that the architects in this study indicated the conceptual design process involving rationality both to respond to the design project, determine the design approach, and take design operation. The rationality embraces seven dimensions, namely: values, goals, conditions/context, ways, tools, processes, and results. However, not all dimensions emerge at every stage of the conceptual design. Only three out of the seven dimensions of rationality encourage architect creativity, namely: values, conditions/context, and results.

The architect's rationality in determining design projects' attitudes is dominated by the value rationality that affects other dimensions. The rationality of values strongly encourages creativity, both in attitudes, approaches, and design operations. The developed creative rationality is open for each architect to be oriented to extroverted or introverted attitudes.

This study explored only two participant architects so that the results are still preliminary findings. Further research by exploring more Indonesian architects is needed to produce knowledge findings that represent the creative rationality dimensions of Indonesian architects.

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