

Rationality and Creativity Interplay in Research by Design as Seen from the Inside

M. Mirza Y. Harahap,¹ Kate Tregloan,²
Anna Nervegna³

¹*Universitas Indonesia
Indonesia*

²*The University of Melbourne
Australia*

³*Nervegna Reed Architecture
Australia*

Abstract

While research by design is critical in the development of architecture and design knowledge, there is still a need to deeply understand the design knowledge about the interplay between rationality and creativity in research-by-design projects. This paper attempts to address this issue by illustrating, rather than conceptualising, the inside process of a research by design project. The inside process will be discussed from three different points of view: (1) research or design interest tendency, (2) the performance of reflective attitude, and (3) a combination of views (1) and (2). The study resulted in an illustration of the interplay that suggests a dynamic forward-backwards act of thinking and making of a research-by-design project.

Keywords: *research by design, inside process, rationality, creativity*

Correspondence Address: M. Mirza Y. Harahap, Department of Architecture, Faculty of Engineering, Universitas Indonesia, Kampus Baru UI Depok, 16424, Indonesia. Email: mirzayusuf@ui.ac.id

Introduction

The practice of research by design in architecture and other design-related disciplines is relatively new compared to the discourse of architecture and design as bodies of knowledge themselves. However, research by design has been practised frequently in many architectural higher education institutions and is considered "an essential element in the emerging academic discipline of design" (Michel, 2007, p. 15). This central role of research by design is also argued by Hauberg (2011), who stated that

In architecture as well as in the society, there have always been revolutions or shifts in paradigms. If we think of architecture today, such shifts must concern globalization and the impact from climate changes. But there is also an ongoing revolution in the tools and processes of architecture, which contributes to a holistic and open approach to design, information, production and materials, and which reaches out for a connection between the academia and the profession. Research by design calls for such a holistic approach to practice as well as to research. (p. 56)

Acknowledging the importance of research by design, this paper will, in particular, try to further explore our understanding of the conduct of research by design. In research-by-design projects within which design is a core activity of the research process (Hauberg, 2011), there is an incorporation of rationality and creativity as the manifestation of research and design portions of the project.

Research by design can be seen as a design activity with which the process is "on positive theory and implemented through rational thinking and creative skill" (Bashier, 2014, p. 427). Rationality in research by design presents itself as a method of inquiry that is essential to face spatial problems which require constant adjustments and are notorious for being wicked (Roggema, 2017). Meanwhile, taking note of the perspective that views the design process as a "transition from art and craft to form of technical and social science focused on how to do things to accomplish goals" (Friedman in Bashier, 2014, p. 425), creativity implies a portion of personal intuition in conducting the transition (Stappers, 2007).

Creativity, however, is usually seen from its material manifestation—the products or artefacts produced during the conduct of a research-by-design project. This is in contrast to the fact that creativity is processed in the human mind (Gnezda-Smith, 1994). The preliminary study presented in this paper attempts to address this particular issue by deeply exploring the incorporation of rationality

and creativity residing in research by design project. A discussion on the interplay between the rational and creative approach in research by design will be presented, followed by the discussion on the role of *inside* as a promising way to dismantle the interplay. Further, a study case which looks at a research by design project will be conducted. In the analysis, this paper will present how the *inside* illustrates the designer's engagement with the project, informing us of how he interplayed the rationality and creativity in the project.

Rationality and Creativity Interplay in Research by Design

On one side, rationality focuses on problem-solving, which is supported by a set of scientific procedures and relevant theories (Plowright, 2014). Problem-solving results in a somewhat "detailed, comprehensive, linear, and universal approach to design, seeing the result as 'solution' to problems" (Plowright, 2014, p. 23). On the other side, an adverse rationality approach known as reflection-in-action further positions the designer as "an individual who adapts and shifts his or her approach based on experience and need" (Plowright, 2014, p. 24). Performing critical reflection is especially central to design research, as adapting and shifting a designer can eventually communicate questions and conclusions of the project (Burdick, 2003).

The two rational approaches are distinct, yet together they present an essential method of inquiry. The attitude of reflection upon various acts conducted during the problem-solving process makes possible the counters that are manoeuvring and situating upon the faced problems. It is argued that the continuous adjustments and adaptations occur through the interplay of two different thinking styles embedded in rational thinking approaches. Also, it is vital to note that rational thinking always imposes dual thinking styles, which are diverge-converge, associative-dissociative, analysis-synthesis, generative-evaluative, and inductive-deductive (Plowright, 2014; Stappers, 2007; Rhea, 2003).

Besides developing in a rational sense, research by design also incorporates creativity in the process. Despite the inconclusive discussion on the definition of creativity embedded in a design process (Dorst & Cross, 2001), in a research-by-design project, creativity is indeed central as it is what model making, mapping, sketching and other forms of visually notated material exploration are utilised and performed (Roggema, 2017; Stappers, 2007). However, the question is raised regarding whether creativity is bounded only on its material form. Can we comprehend creativity incorporated in a research-by-design project other than through its

material manifestation? Our concern primarily lies in this manner of seeing creativity. The tendency to understand creativity only by unravelling the products could lead us to fail to perceive its means thoroughly. Products are essential as part of creativity, but there is a need to consider the “internal experiences of creative individuals” (Gnezda-Smith, 1994, p. 138) as well, and thus, a complete understanding of creativity.

Creativity enables designers to determine and respond to design problems through the deployment of various strategies (Dorst & Cross, 2001). Such actions are arguably made possible since the designers have the power to switch their thinking styles actively. We have previously discussed that problem-solving, as one of the rationality approaches in research by design, somehow reflects linearity. However, designers can actively switch their thinking styles, and “thinking styles are preferred ways of using one’s skills ... they are *decisions* about how to deploy the skills available to a person (Sternberg, 2006, p. 89). Consequently, they can flexibly continue their research-by-design project. This kind of flexibility is needed in research-by-design projects in order for a designer to prevail over the predetermined ideas and surpass them (Nijstad, De Dreu, Rietzchel, & Baas, 2010). When designers are flexible with their thinking styles, the conduct rationality, which is seen at first as a linear process resulting from a problem-solving approach but is deformed into a spiral process, as suggested by Plowright (2014) and Stappers (2007).

Furthermore, the flexibility to actively switch between the dual thinking styles, namely “through the use of broad and inclusive cognitive categories, through flexible switching among categories, approaches, and sets, and through the use of remote (rather than close) associations” (Nijstad et al., 2010, p. 43), is arguably made possible because of the reflective-in-action rationality approach. The creative flexibility to switch between styles could be associated with reflective attitude, since when designers reflect, they open their way towards the spreading of activation (Nijstad et al., 2010). It results in a less clear aim and more random process (Nijstad et al. 2010) as the benefit of creativity. “Defocused, random processes would result in the generation of associations that are more remotely related to existing ideas” (p. 40)—the reflection itself.

In retrospect, the spiral-like previously mentioned research-by-design process is the result of performing a reflection attitude which brings flexibility into the process—the creativity itself. In other words, the creativity that is imposed as the internal experience of the designer could be seen from the way the designers conduct

their reflective attitude in the overall research-by-design process. Creativity is interplayed within the rational approach. We believe that this is the kind of creativity that we need to explore further to complement the other way of understanding creativity through the artefacts produced during the process.

Unfortunately, no matter how creativity is employed in the rational development of a research by design project, the design knowledge which lies in the interplay between rationality and creativity can hardly be conceptualised (Bashier, 2014). Nevertheless, there might not be a need to conceptualise them in the first place, since the design is about "making sense of things (to others)" (Krippendorff, 2007, p. 69) through "realisation in-the-world, and proof by demonstration" (Stappers, 2007, p. 82). Because there is a relatively substantial portion of artefact production—which further in this paper referred as making—mingled in a project, one way to better understand the notion is presumably by dismantling the making themselves. The moment the notion is revealed, further conceptualisation could be irrelevant. Retrospectively, one of the ways to understand the relation between rationality and creativity in research-by-design projects might be to look at how rationality is creatively performed. It is argued that by dismantling how various making are incorporated in research-by-design projects, we could better understand the design knowledge of the interplay between rationality and creativity.

The Interplay as Seen from the Inside

Several pieces of literature have discussed the position of research and design, which implicate the rationality and creativity by explaining how the projects were conducted. Some of them disembarke their study from the first-person point of view. For example, Donahue (2003) extended his argument that "the form of designed objects has taken in the past does not predefine what we are able to create in the present or future" (p. 170) by explaining his making experience when conducting his design research project. The same approach is also adopted by Zimmerman (2003) when discussing iteration, not just as rational making to produce artefacts, but instead as a creative process. Zimmerman, however, explored the topic by referring to more than one project, all of which were his personal experiences.

Other studies went further by incorporating their first-person perspectives into time-based analyses. The design research projects were seen in a timely manner as a sequence of artefacts production. Basballe & Halskov (2012), for example, went in-depth with their

explanation on the design research process. They sequentially explained how each creative production in the process contributed to either research or design interests. Exploring the three phases of research by design, namely *coupling*, *interweaving*, and *decoupling*, their study reveals how each creative production has a portion of contribution to either research or design interests. A similar approach is also presented in Carey's (2018) study, which informatively connects us to his practice through narration. His study is full of words which tell us about the time, process, as well as duration.

More on the discussion about design as seen through its process is the protocol analysis study. In particular, the study reveals that despite the inconclusive definition of creativity, there is an agreement about recognising the implementation of creativity in a design process (Dorst & Cross, 2001). Delft Design Protocols Workshop is a well-known initiative that explores the process of a design in a framework. It is notable though that "the Delft Design Protocols Workshop was concerned with analysing design activity across a broad spectrum of approaches; it was not concerned specifically with analysing creativity" (Cross, 1997, p. 314). In retrospect, the exploration of the interplay between rationality and creativity in research by design might be conducted by adapting the protocol approach suggested by the Delft Design Protocols Workshop.

Those studies inform us that design knowledge, arguably including the interplay between rationality and creativity, is probably best done from the interior of the process, the *inside*. Data on what have been done throughout a project as well as their contribution to the production of artefacts, and also their position in the timeframe are the three types of core data which could inform the inside. They all are considered to be inside because their roles are as the syntax, which defines the boundary and discourse of (architectural) design (Plowright, 2014). However, the understanding of the inside can only be acquired when the data are projected into a framework that actualises the development of both research and design (Gero & McNeill, 1998). It is why the protocol analysis is considered relevant for conducting the study on the inside. Nonetheless, the inside is also considered relevant in revealing the interplayed creativity in the rationality of research by design, as what is offered from the inside reflects the internal experience of a designer argued from the previous creativity-rationality discussion.

To disembark from the above thinking, this paper attempts to study the analyses of the inside of a research-by-design project. In particular, the study explores the creativity that is emitted from the reflection-in-action attitude. By doing so, the study aims to

reveal and illustrate—rather than conceptualise—the knowledge reflected from the interplay between rationality and creativity embedded in research-by-design project.

Attempt to Reveal the Inside

In order to reveal the design knowledge of the interplay between rationality and creativity, our study looks at the conduction of one of the creative forms of making. The study looks at the records of an interior architectural research-by-design project that Harahap (one of the authors) had conducted during his study at the Master of Design programme (interior architecture stream) at Monash University, Australia. The records that were studied are in the form of a logbook that documented what Harahap had done in his second semester. The logbook entries are comprised of various making records. In this study, the logbook was viewed as a form of making itself—as one of the artefacts.

The contents of the logbook were analysed as well. While the logbook itself is a product of creativity, the contents of the logbook informs us on the internal experience. The study performed upon the logbook can then be seen as an attempt to understand how creativity interplayed with the rationality of the conducted research through its inside. Eventually, the inside illustrates the design knowledge of the interplay between design and research.

There are 48 entries, each of which consists of two sides (Figure 1). The first side displays a specific making which had been conducted. The second side displays a six-part reflective writing about the displayed work on the first side. The reflective writing consists of six responses towards six specified questions which inform how the making contributes on the project. The six questions are as follows:

- Question 1: What do you think (about it)?*
- Question 2: How do you feel (with it)?*
- Question 3: Does it help you with your design?*
- Question 4: Does it help you answer your research question?*
- Question 5: What could be improved?*
- Question 6: What should we do next?*

Out of the six questions, the third and fourth questions relate the conducted making with the design and research interests of the project. Meanwhile, other questions are related to the conducted making itself: its presence and its possible future development. Unfortunately, there is no record on exactly when each entry was added into the logbook. However, the entries were added

sequentially as indicated by the number on each entry. Each entry is accompanied with a note indicating whether or not they relate to other entries which had previously added.

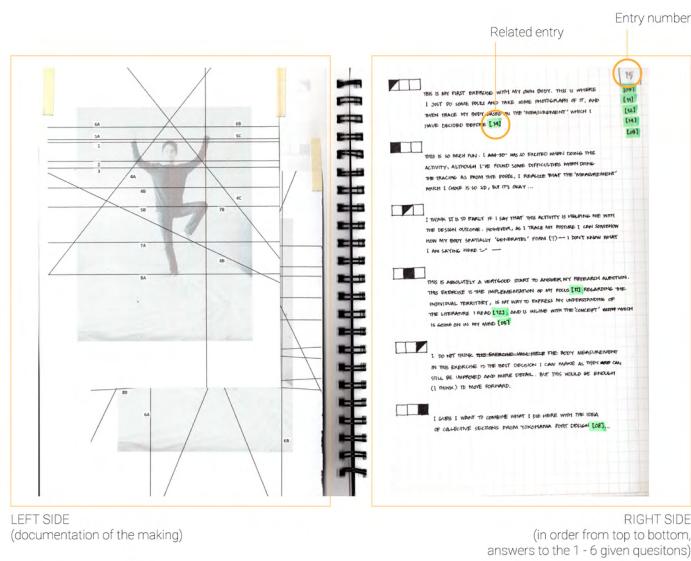


Figure 1
Example of
an entry in the
logbook

In order to reveal the inside process of the project, we performed a three-part study. The first part of the study was drawn upon the perspective of the *coupling-interweaving-decoupling* process between research and design interests suggested by Basballe & Halskov (2012). Each entry was reviewed based on its contribution to research and design interests. It is argued that the result of flexibility implicated from the creativity interplayed in the rationality is the distinction in the research and design interests. In other words, they are the traces of solution, the responses regarding design issues and the answers to the research questions—a form of rational aspect of the research by design. This analysis results in the inside pattern, which shows how each documented making roles in the overall design by research project.

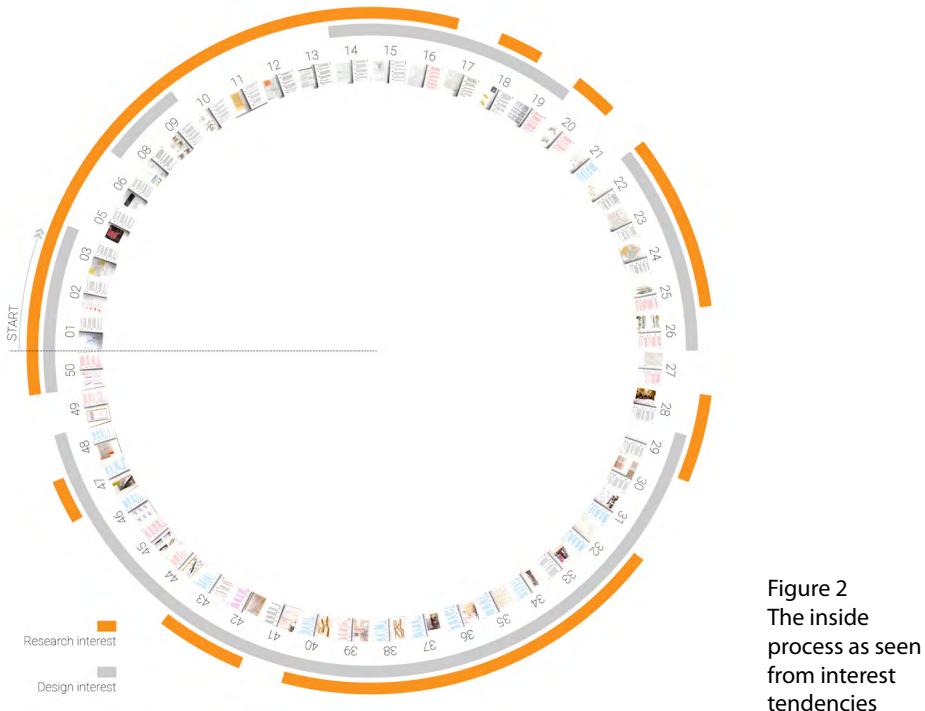
The second part of the study looks at reflection-in-action approach throughout the semester. In this part, the study illustrates how the reflection was performed as shown from when the numbering on each entry actually occurs. Instead of looking at the entries individually, the study attempts to see them as a whole. This part of the study adopts the linkograph analysis performed by Goldschmidt that interlinked the important design statement by individual designers to reveal the creativity leap during the design process

(Cross, 1997). This part of the analysis is, in particular, reflects the creativity this paper is concerned with: creativity that lies beyond the material manifestation of a research-by-design project.

In the final part, the study explores the *inside* that combines the analysis from the first and second parts. This part reveals the interrelation between reflection-in-action attitude with the research and design interests. The result of this final part of the analysis informs us how the interplay between rationality and creativity occurred.

Inside #1: Research and Design Interests

The inside of a research-by-design process can be substantially illustrated by uncovering how the making within the process was performed, whether they are for the importance of either research interests or design interests. The analysis, in particular, disembarks from the notion that research by design imposes three phases, which are *coupling*, *interweaving*, and *decoupling* (Basballe & Halskov, 2012). Here, each of the documented entries in the logbook is reviewed. Responses to the third and fourth questions are mainly examined since the two suggest how central each documented making towards the research and design output was.



For example, by reviewing the logbook entries, the entry numbers #45, #05, and #23 suggest that the making was more relevant towards the design outcome and output, towards attempting to answer the research question, and towards both design and research interests, respectively. Accordingly, by reviewing all of the logbook entries, the research-by-design process can be illustrated in an inside diagram in Figure 2.

The diagram informs the contribution tendencies of each documented making in the whole process. The tendencies appear as follows: (1) At the beginning of the semester, the making was dominated with producing research by design artefacts that focused on research interests rather than design purposes. It is notable though that the four first logbook entries inform that making was conducted with consideration towards both research and design interests. Arguably, this is where the *coupling* process performed; (2) In the middle of the semester, there was a dynamic of tendencies as indicated by the mixed-purposes of making. The dynamics can especially be seen between entries #14 to #32. Some tend to contribute more towards answering the research question, some lean towards the design interest and some which appear as attempts which help both research and design importance. The dynamics reflect the occurrence of the *interweaving* between design and research interests; (3) As the semester's end came closer, many of the making were producing artefacts that are more related to the importance of design.

The indications shown from the inside diagram in Figure 2 are generally informing us that in a linear form, the project does reflect the *coupling*, *interweaving*, and *decoupling* phases. The beginning of the process is signed by the *coupling* between design and research interest, followed by the *interweaving* in the middle and ending with the *decoupling*.

Inside #2: Reflective Attitude

Following the analysis of the contribution of making towards research and design interests, the inside is also seen from the perspective on the reflective attitude performed in the process. To reveal such performance, the study looked at how the logbook entries were noted. Each of the entries were numbered, indicating when each entry's conducted making is related to one another, either affirming or negating. A simple statement and indication of the number of related entries inform the reflection act. As a result, the study can illustrate the findings in a diagram, as shown in Figures 3 and 4.

Figure 3 is a more straightforward illustration of how the reflective attitude was performed in the observed research-by-design project. Compared to Figure 4, which shows the overall inside that is seen from the perspective of reflection-in-action, the diagram in Figure 3 tries to show distinct features in terms of the reflective number. It appears that entry #05 is one of the most reflected-to entries in the whole process. Entry #45 is one of the most reflected-on. The overall illustration, as shown in Figure 4, reflects the frequency of reflected-to and being reflected. Through the illustrations, we can see that there is no restricted distance as to how far the reflection could be done. One making can be related to another making completed just one step earlier; yet another or even the same making can also have a relation with a making that was done much earlier in the overall research-by-design process.

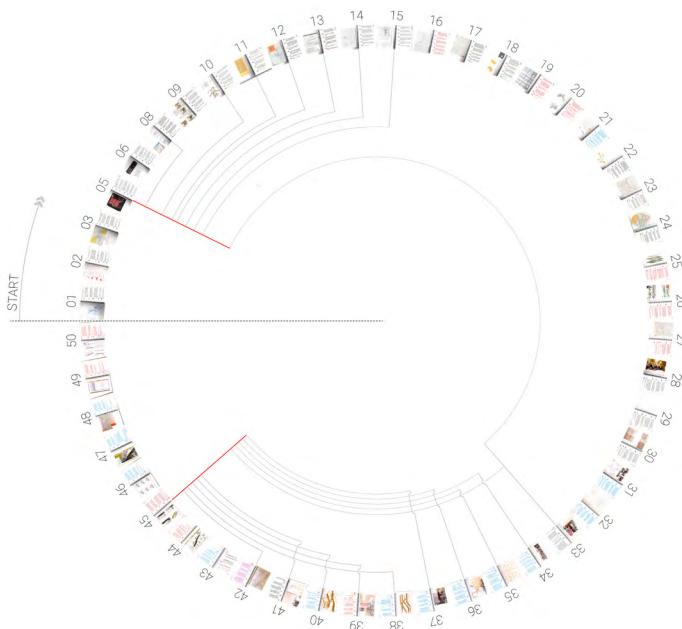


Figure 3
Example of
the analysis
of the inside
process through
reflection-in-
action

Notably, the analysis shows how the making and design development demonstrates the reflective attitude in the process of artefacts' authentication and re-authentication (Gowans & Wright, 2007). The analysis also suggests a form of creativity that was previously argued. The analysed reflection-in-action shows an instinctive act that somehow fights logic through associative thinking that interrelates various elements (Canaan, 2003), and it gives a space

for an in-depth engagement with the design experience by making an order upon the experiences themselves (Barnett, 2007). They are clearly shown from the frequency of entries reflected-to and being reflected. Different amounts of reflection not just demonstrates the significance of the making; however, it shows how making an order and interrelating various elements make sense of what have been done in the project. Making with fewer numbers of entries reflected-to or being reflected might inform how insignificant they are in the overall process. However, this is considerably less important than knowing the position of each making towards another making and each artefact towards other artefacts.

Furthermore, in retrospect towards the spiral model of design process that has been previously discussed, the reflection-in-action indeed played a significant role in transforming the linearity of the design process into a spiral one. However, based on the observation, as the reflection was characterised through the frequency and the distance of the reflection, it could be argued that the spiral model of the design process is actually not rigid and appeared as a distorted spiral instead, implicating the personalisation of the project.

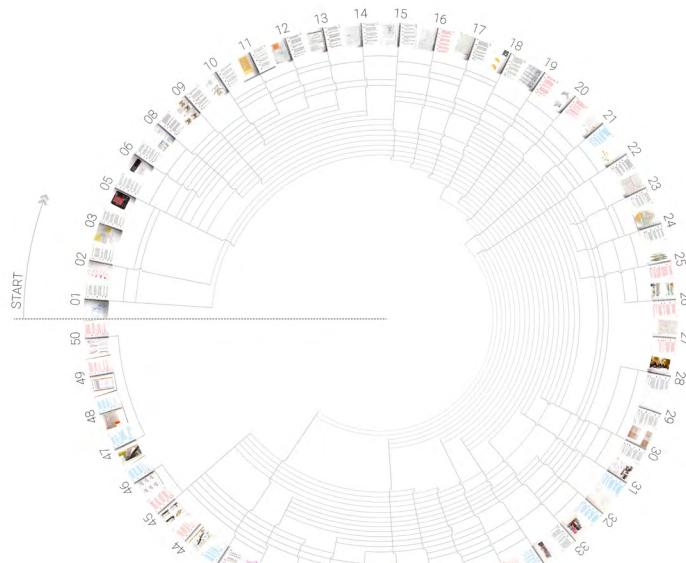


Figure 4
The inside
process as
seen from
the reflective
attitude

Inside #3: An Interplay between Rationality and Creativity

Deeper in the analysis and discussion of the inside process of a research-by-design project is an attempt to see the relation between reflection-in-action upon each making conducted during the project with its purpose tendencies that are either for the importance of research or design interests. The attempt was based on the argument that design activity incorporates inseparable rationality and creativity within (Bashier, 2014). Here, the inside process which sees the tendencies of interests is argued as a result of performing rationality. Meanwhile, although the reflection-in-action is also a form of the rational approach of a research by design, its nature which penetrates the uncertainty to make way for design development through making relation and dependency among the produced artefacts reflects how creativity is performed. In other words, this part of the study attempts to illustrate an integrated design paradigm "in which rational-based design decisions and creatively generated ideas as well as reflective interpretations complement each other that none can individually produce complete designs" (Bashier, 2014, p. 430).

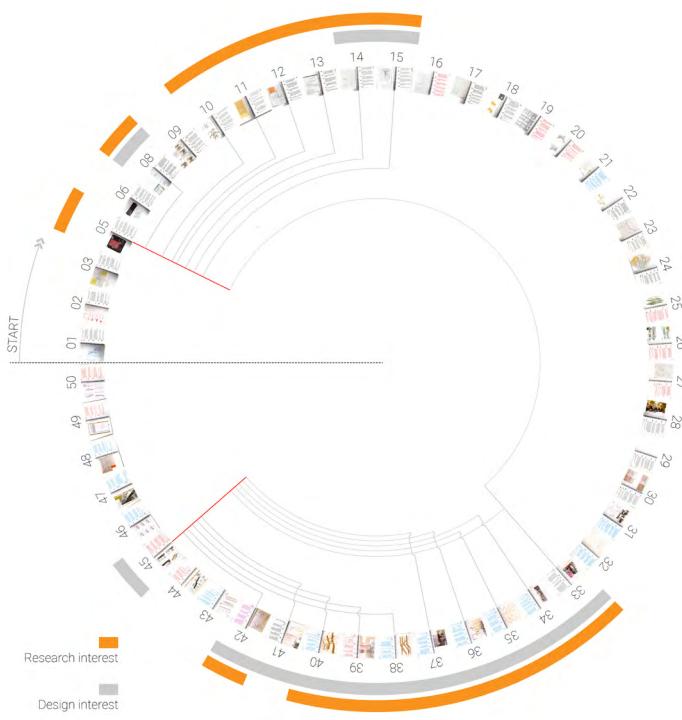


Figure 5
Analysis of the
inside process
as an interplay
between
rationality and
creativity

Figure 5 shows an example of the analysis of inside as seen through its interest tendency and as seen through the performance of reflection-in-action. Here, we can recognise the interesting tendency of the entries #05 and #45, which are frequently reflected-to and being reflected, respectively. What we need to underline here is that we can also recognise the interesting tendency of the relevant making with entries #05 and #45. From just looking at these two entries, we can see that entry #05, which was more about research interest, tended to be reflected with several other entries which mainly contributed to answering the research question. Meanwhile, the making in entry #45, which solely contributed to the design development was being reflected to several other making conducive to both research and design interests.

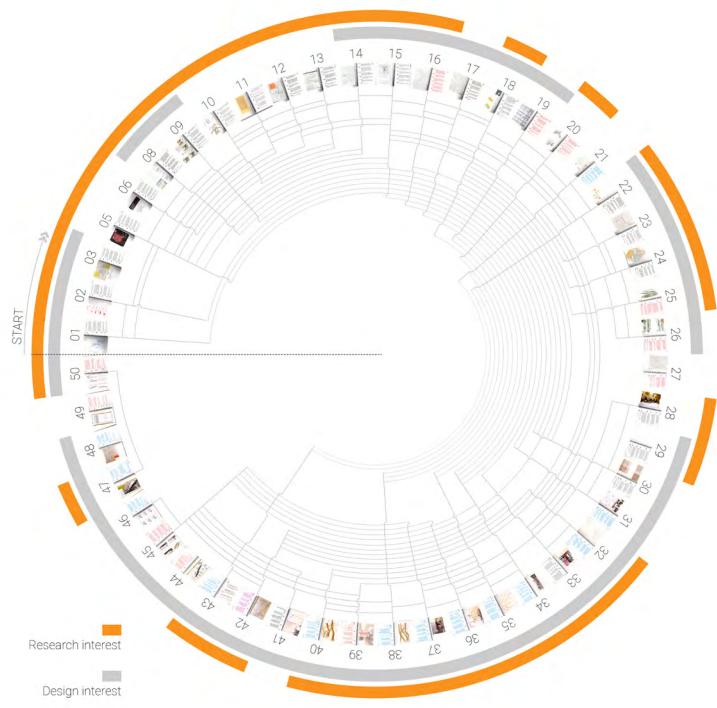


Figure 6
Final diagram
of the inside
process

When the analysis was performed to all of the logbook entries, the result is shown in Figure 6. The diagram reflects the very illustration of the rational and creative interplay during the project. It turns out that the interplay this study is sought after it appears as a complex and dynamic inter-relational making that is relative towards the reflective thinking performed, which is that it affects the making themselves consequently, and thus, the unrigid spiral process. The interplay also suggests what was argued by Plowright (2014) that

learning how to do architectural design is, first and foremost, learning how to think. This isn't meant in terms of intellectual capacity or ability – being smart doesn't necessarily make one a good designer. Thinking, in this context, means becoming skilled at applying *different styles of thinking* within the same process and towards the same goal. (p. 73)

The final diagram of the inside process implies Plowright's argument. The inside that is revealed in this part of the study informs us the conduction and the thinking in the project. It shows how a research-by-design project as a series of making that incorporates various degrees of thinking styles is conducted. The incorporation means knowledge is embedded into design activities, hence the escalation of the project (Faste & Faste, 2012). Therefore, in a sense, the result of the study may as well reflect that research by design is not merely about the study of design but also about the process through which knowledge production is performed through design activities (Roggema, 2017).

Conclusion

Based on the three-part analysis of the inside process of a research by design project, it is argued that the importance of conceptualising design knowledge, as the interplay between rationality and creativity suggested, can be altered by dismantling how a research-by-design project is performed. Dismantling the process by reviewing documented making as performed in this study reveals that the inside process can be a powerful tool to inform us about what is occurring in a research-by-design project. Research-by-design projects indeed involve creative making, producing artefacts which contribute to both the research and design portions of the project. It is also true that within research by design is the performance of rationality approaches and thinking styles. Overall, they inform us about what is going on in the interior of a research-by-design project.

However, it is through the analysis which combines the two that we can understand the extent of the interplay between rationality and creativity. The study found that the interplay of rationality and creativity is a collection of a complex forward-backwards act of thinking and making, a reflection, that suggests a spiral design process model in which dynamicity is a form of personalisation of the project, hence the possible distinction of one project to another. In a sense, this reflects the interiority of research by design. What happens in the interior—the inside process in this case, somehow affects and controls its appearance—the product of the project itself (McCarthy, 2005).

The study presented in this paper, however, only examines one project. As this paper only presented a preliminary study, further research on this topic is needed to strengthen the findings. A sufficient number and a variety of research-by-design projects being analysed will further inform us of the pattern on how the interplay between rationality and creativity occurs. Doing so, maybe we can return to our point of departure. The illustration of the inside process may then develop into a conceptualisation.

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