Aspects of Research through Design: A Literature Review

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Aspects of Research through Design: A Literature Review

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Abstract
Research through design is, by nature, embedded in the design process. In other words, while its main concern is to inform a research question, it also must be concerned with the end product of the design. As such, designers/researchers become concerned with the same type of “wicked problems” the professional designers are, especially when using research through design. Moreover, they also add a new layer of complications that are inherent to research. Since the approach is quickly gaining in popularity, it is necessary to develop a base of knowledge about it. Thus, this paper’s aim is to present a literature review of texts about research through design to demystify this approach and provide a deeper understanding for future work in the field. The gathered views on the subject are then classified into one of six sets of aspects: ontological aspects, epistemological aspects, methodological aspects, limits and expected contributions.

Keywords
Research through design, methodology, design

Research through design (RtD) is an approach to scientific inquiry that takes advantage of the unique insights gained through design practice to provide a better understanding of complex and future-oriented issues in the design field. RtD is not a new approach. The term itself is two decades old (Frayling, 1993). In recent years, it has mainly been used and discussed in the human-computer interaction field, but it is an increasingly recognized approach to research in any design. The approach acknowledges and embraces professional practice’s contributions to knowledge making it especially attractive in disciplines where designers/researchers are still practicing.

Before going any further, we believe it necessary to situate “research through design” within the academic discussion of research and design. In other words, understanding how RtD relates to other types of design research.

Context of the present paper

From Frayling Onwards
Sir Christopher John Frayling is an important figure of art and design education of our time. He was mainly interested in film studies and held important positions in more than one British College dedicated to art and design. Amongst his influential writings, Frayling introduced, in the Royal College of Art Research Papers (1993), the idea of three different forms of interactions between research and design or art: research for art and design, research into art and design, research through art and design. Spawned from his reflections, the many different combinations of research and design have
been discussed by many different authors. Amongst them, Alain Findeli, then professor at Université de Montréal, redefined the three forms of design research as follows (2004):

- **“Research for design”** aims at helping, guiding and developing design practice. Those researches document the processes and concerns of professional designers and treat designers and their practice as the object of their study.
- **“Research into design”** is mainly found in universities and research centres contributing to a scientific discipline studying design. It documents objects, phenomena and history of design.
- **“Research through design”** is the closest to the actual design practice, recasting the design aspect of creation as research. Designer/researchers who use RtD actually create new products, experimenting with new materials, processes, etc.

Findeli’s proposition was significant because it formalized the academic merit of RtD. This definition is often cited in literature and is the foundation for much work in the field. Consequently, it is adopted for the purposes of this research paper.

**The Problem with RtD**

Where “research for design” and “research into design” rely strongly on the research traditions of other disciplines and, as such, promptly create consensus, “research through design” is still debated and discussed since “no agreed upon research model existed for […] designers to make research contributions other than the development and evaluation of new design methods” (Zimmerman, Forlizzi, & Evenson, 2007, p. 493). This situation makes it harder for designers/researchers to thoroughly understand the current state of the approach through the ramification of publications. Therefore, an aggregation of the different views is needed.

**The Many Faces of Research through Design**

Some authors (amongst others: Chow, 2010; Koskinen, Zimmerman, Binder, Redstrom, & Wensveen, 2011) wrote papers or books introducing new approaches or comparing RtD with other similar types of research, namely: **constructive design research**, **practice-led research** and **project-grounded research**. Although the authors make good points in distinguishing them, they share their most basic considerations and views towards practice and knowledge.

Even within those papers using the term “research through design”, there is a lack of consensus on how it should be discussed and what issues need to be explored. For example, the works of Wolfgang Jonas on “Research through DESIGN through research” (2006, 2007b) addresses issues, approaches and audiences that have little to do with the work discussed by Zimmerman (2007, 2010), Bowers (2012) or Koskinen et al. (2011). In fact one might notice that Jonas does not cite publications from these other authors (and vice versa). Nevertheless, Jonas talks of “a generic structure of learning / designing, which has been derived from practice” (2006, p. 7) while Koskinen et al. write about research in which “construction […] takes center place and becomes the key means in constructing knowledge” (2011, p. 5). Bowers goes by Frayling’s claim that the artefacts embody the design thinking (although he remarks that “this thinking is typically of a very varied, multi-faceted, heterogeneous sort” (2012, p. 70). As for Zimmerman, he described RtD as the “process of iteratively designing artifacts as a creative way of investigating what a potential future might be” (2010, p. 312).

In their own ways, these authors are all concerned with an underlying shared goal: establishing aspects of research done through the design process and its resulting product. In fact, we found, as it will be discussed in this paper, no vital contradiction between the authors’ claims. Since our goal here is to federate views and conclusions on all fundamental aspects of RtD, it is natural to consider all these publications together and on levelled grounds.

Hence, all these slightly different approaches will be used under one and the same appellation in this paper: ‘research through design’.
Objectives of this Literature Review
This literature review aims at federating views and conclusions from a number of publications discussing the approach itself or relating results of a research using the approach.

Methodology
To fulfil this objective, a literature review was done.
First, a general research was conducted through publication databases searches. Then, the articles and books were analysed to extract information about different aspects of RtD.

Initial selection of articles and books
A series of databases were used to gather publications discussing RtD. Table 1 shows the keywords entered and the databases used; the number of returned articles and books appears at their intersection of the line and column, and the number of articles and books kept for the current research appears at the bottom of the column.
The keywords used are both English and French and were searched as part of the ‘title’, ‘subject’ and ‘keyword’. The use of hyphens did not change the results of the searches; for example, a search for “research through design” returned the same array of publications as a search for “research-through-design”.
The publications were then filtered by three inclusion criteria:
- The publication must discuss RtD (or any of its other name) as their main subject;
- The publication must be concerned with design;
- The publication must be in French or English.
This excluded any publication on researches that used RtD as its approach, publications that discussed research through art only and publications in languages not understood by the authors.
It should also be noted that the French keywords brought up many publications that were rejected. This can be attributed to the relative prevalence of each of the words used. For example, “recherche projet” brings up many results that were research projects, in the broadest sense of the term.
After the filter and removal of duplicates, other readings were added to complement the content of each publication kept, either taking from their references or from the discussed subject (such as epistemological criteria of action research and grounded theory).

Table 1: Databases, keywords and results

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<tr>
<th>Databases</th>
<th>Research through design</th>
<th>Constructive design research</th>
<th>Practice-led research</th>
<th>Project-grounded research</th>
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Extraction of information
The analysis of the selected publications led to information on different aspects of RtD. The following particular subjects were present in the literature and were selected as pertinent categories for organizing and providing a framework for the literature review.

- **Ontological aspects**: what is the “nature of reality” (Creswell, 2003, p. 21)? What reality can be perceived using RtD?
- **Epistemological aspect**: what makes an observation valid? “How we know what we know” (Creswell, 2003, p. 21)?
- **Expected contributions**: what type of results can be expected from RtD?
- **Methodological aspect**: what “process of research” (Creswell, 2003, p. 21) are associated with RtD?
- **Limits**: what issues commonly come up in RtD and what can’t it do?

Aspects of Research through Design
This literature review examined a relatively low number of articles and books. Hence, certain authors appear frequently in this text. Their contributions have however been distributed in the different aspects to provide a clear overview of RtD from each angle.

Ontological Aspects
Every research approach has its specific strengths and weaknesses (Creswell, 2003). These strength and weaknesses are often derived from the ontological standpoint of the approach, in other words: what is the nature of reality that can be perceived through this approach. In this section we will discuss the reality observed through the construction of designed artefacts.

Adaptation: towards a concern of the real
Research in design is not concerned with the “true”, but with the “real”. Wolfgang Jonas (2006) proposed a macro model of knowing in design inquiry that provides insights on how designers actually transition their focus from the true to the real. In the model, Jonas sets three steps:

1. Analysis, which is concerned with how things are currently (the truth);
2. Projection, which is concerned with how things could be (the ideal); and
3. Synthesis, which is concerned with how things will be (the real).

Design is therefore more closely related to anthropology than most other sciences (Zimmerman et al., 2007). Where design could be perceived as following the processual steps of evolution (variation – selection – re-stabilization), the theory of autopoiesis proposes that a transformation is “the result of internally generated change” (Jonas, 2007b, p. 1366). Adaptation and selection are not triggered by outside forces but by the “co-evolution of independent systems” (Jonas, 2007b, p. 1367). The co-existence and interaction of the independent systems better define the role of each of them (Morgan, 1986, cited by Jonas, 2007b). This facilitates change towards a more significant and/or efficient accomplishment of the role. In other words, the adaptation, created by the design, is a change of states, towards a preferred one in which the role of the designed artefact will be more significantly or efficiently fulfilled.

This statement applies to other levels of reflection as well:

- First, contributions of RtD, as design theories, should also follow this statement. “[A] good design theory, as a designed artefact, should be able to explain its own
emergence” (Jonas, 2006, p. 2). The contribution should, in itself, spawn from the co-evolution of design practice and design research and lead towards a better fulfilment of their respective roles.

- Then, the design-research relationship set in place by the RtD approach must also be understood from the above statement. In the case of RtD, “research is guided through design process logic and design is supported/driven by phases of scientific research and inquiry” (Jonas, 2007b, p. 1378).

**The Real that Will Be**

Knowing that design provides adaptation to individual systems, we can better understand that “changing existing situations into preferred ones” (Simon, 1996, p. 111) or “improving ‘quality of life’” (Jonas, 2007b, p. 1363) is intrinsic to both the research objectives and the design goals of RtD. Consequently, it “provides an opportunity for the research community to engage in discourse on what the preferred state might be” (Zimmerman, Stolterman, & Forlizzi, 2010, p. 310), bringing the ethical consideration of creation and design to the forefront. This is a fundamental aspect of the critical design approach that produces, often by using RtD, artefacts “that encourage complex and meaningful reflection on inhabitation of a ubiquitous, dematerializing, and intelligent environment” (Dunne, 2006, p. 147, cited by Bardzell, Bardzell, Forlizzi, Zimmerman, & Antanitis, 2012, p. 288).

The “real” by which RtD is concerned therefore transcends inquiries to describe ‘how something is’ and focuses on ‘how it will be’ as well as ‘what this future preferred state should be’.

**Epistemological Aspects**

Building on our clearer understanding of the reality perceptible to RtD, we can now establish what we can learn from this reality and how. Jonas (2007a) suggests that we turn to grounded theory and action research for inspiration on the epistemological aspects of design through research. Grounded theory “aims at theory building, while accepting the modification of its subject matter” (Jonas, 2007a, p. 192). Meanwhile action research aims to “modify reality, while observing and processing theoretical modifications” (Jonas, 2007a, p. 192).

The following paragraphs will cover literature concerned with the learning and validity aspects of RtD.

**How Do We Learn in RtD?**

Using Schön and Wilke’s works, Wolfgang Jonas writes that “‘Design through research’ assumes that the ‘swampy lowlands’ of uncertainty will be subsequently replaced by well-grounded knowledge. But exclusively scientific research is unable fully to recognise the implications of acting in a space of imagination and projection. The ‘knowledge base position’ needs to be complemented by the ‘unknowledge base position’ or by the competencies to deal with not-knowing” (2007a, p. 202). This competency resides in the design process which provides unequalled insight into the future: the real that ‘will be’.

To do this, RtD favours a constant realignment of the construction of artefacts, based on trial and error, to better tackle complex design problems (Toeters, ten Bhömer, Bottenberg, Tomico, & Brinks, 2013).

The advantages of researching, or learning, through construction is also discussed in education. Constructionism, an instructional method promoted by Seymour Papert (1983), sets
the learner (in Papert’s discussion: a child) in a dialogue with its environment and with the construction. Papert goes as far as calling this, very appropriately, “learning by design” (Papert, 1983, cited by Lebrun, 2002, p. 28). This perspective on learning is also applicable to RtD; in which researcher learn about the object of their inquiry through the constant evolution of the artefact, i.e. it “allows for creating a dialogue with the material” (Toeters et al., 2013, p. 116). This dialogue and constant realignment, however, generates issues in insuring validity in its results.

**Validation Insights from Action Research**

Much like for action research, validity in RtD cannot be evaluated by the reproducibility of the results since “[t]here can be no expectations that two designers given the same problem, or even given the same problem framing, will produce identical or even similar artefacts” (Zimmerman et al., 2007, p. 499). Action research has its own validity criterion to make-up for replicability: *recoverability*. This means that the designer/researcher must make sure that “the process is recoverable by anyone interested in subjecting the research to critical scrutiny” (McNiff, 2013, p. 18). This criterion can also be applied to RtD. In a compatible mindset, Michael A. R. Biggs and Daniela Büchler propose that “rigor in research is the strength of the chain of reasoning, and that has to be judged in the context of the question and the answer” (2007, p. 69). Therefore, if one would recover the RtD process and judge its chain of reasoning strong, then the process would be considered rigorous. Now, rigor and validity may not be the same, but they are directly linked. Indeed, argue Biggs and Büchler, “[w]e say the process was rigorous, and therefore validates the claims of the outcome” (2007, p. 67). This would mean that a rigorous process leads to valid outcomes and therefore recovering the process and establishing its rigor would lead to granting validity to the outcomes of the research.

Owain Pedgley (2007) provides a list of best practice that could help ensure recoverability of the project. These best practices should then be used in RtD.

- **Chronology**: “Describe work in the same sequence that it occurred, ideally as bullet-points” (Pedgley, 2007, p. 473);
- **Clarity**: “Keep entries intelligible, insightful and honest” (Pedgley, 2007, p. 473);
- **Focus**: “Keep entries succinct: they should not be a crafted essay” (Pedgley, 2007, p. 473);
- **Record images**: “Record still and moving images of developing and completed physical models” (Pedgley, 2007, p. 473);
- **Out of hours**: “Account for instances of ‘out of hours’ designing in the next day’s diary” (Pedgley, 2007, p. 473);
- **Diary admin**: “Ensure that all diary sheets are numbered and dated” (Pedgley, 2007, p. 473);
- **Modelling admin**: “Ensure that all modelling outputs are numbered and dated to aid cross-referencing (e.g. ‘LB1:22’ refers to log book 1, page 22)” (Pedgley, 2007, p. 473).

**Validation Insights from Grounded Theory**

Contrarily to action research that puts the burden of validity on anyone who would challenge it, grounded theory prefers to keep the responsibility of demonstrating validity on the researcher. Although “grounded theory was developed to provide a basis for predicting cause and effect relationships within the postpositivist paradigm” (Hall & Callery, 2001, p. 257), Bryant’s repositioned grounded theory, which is ontologically similar to research though design in that it
considers reality as multiple and subject to redefinition, states that a rendering of an experiment is “a representation of experience, not a replication of it” (2007, p. 51, emphasis from original text).

The weight of validity, then, falls back onto the researcher’s ability to use what is being observed: theoretical sensitivity.

Theoretical sensitivity is defined as “the investigator’s ability to use personal and professional experiences and the literature to see the research situation and data in new ways and exploit the potential of the data for developing theory (Strauss & Corbin, 1990, cited by Hall & Callery, 2001, p. 263) and should be demonstrated in a RtD publication or report.

**Validation Insights from Design**

Finally, Findeli suggest the simplest yet most elegant validity criterion of RtD: « notre chercheur sera imputable tant de l’aboutissement de son projet scientifique que de celui du projet professionnel qui lui tient lieu de ‘terrain’ » (Findeli, 2003, p.170, cited by Cournoyer, 2011, p. 55).

In other words, the designer/researcher is using the project as her or his field for data collection and the validity of the choice of this field comes with the success of the design project. Simply put: in accord with Biggs and Bütchler’s proposition that the rigor of the process validates the outcome (2007), if the project works and the artefact produced is acceptable, then knowledge produced through the process is also valid.

**Expected Contributions**

Having established that RtD deal with the reality that ‘will be’ and that we learn from it through the dialog and constant realignment of the project, the designer/researcher must now determine what exactly she or he wants to know by the means of her or his specific RtD.

Nigel Cross (1999, p. 6) proposed that design research falls into one of three main categories:

- “Design epistemology – study of designerly ways of knowing”
- “Design praxiology – study of the practices and processes of design”
- “Design phenomenology – study of the form and configuration of artefacts”

Although Cross does not discuss which of these categories is possible through each of the types of design research as described by Findeli (2004), design praxiology is the most discussed in RtD literature.

**Reflexive Practice, a Design Praxiology Framework**

As suggested by a number of authors (amongst others: Nimkulrat, 2012; Zimmerman et al., 2007), Schön’s works on reflexive practice (Schön, 1983) can improve design methodology.

According to Schön, there are many different contributions that can spawn from reflexive practice. Here is a list of these possible contributions as synthesised by Chiapello (2012, p. 73):

- **Means**: Any tools that can be used by the practitioner to articulate his thoughts, such as plans;
- **Language**: All means of communications (oral or not) and terms used by a professional community;
- **Repertoire**: Any inspirational solutions and experiments that were either performed by the practitioner or that are known to her or him;
- **Appreciative system**: A system of values or criteria by which the practitioner judges a solution or work accomplished;
- **Global theories**: Theory that can guide the practitioner in her or his actions, reflection or understanding of a situation;
- **Role**: The role a practitioner sees herself or himself as occupying in a project and which has an influence on the type of solutions or scope of action she or he is allowed to take. Reflexive action can also occur in two different timeframe (Schön, 1983). Reflection-in-action happens during practice, for example, when a decision or an action is made and relies more heavily on tacit (non-explicit) knowledge. Reflection-on-action happens later, as the practitioner thinks about what she or he has done or decided. Regardless of the moment the reflexive practice happens, the PRT (Dalsgaard & Halskov, 2012) supports research inquiry based on Schön’s reflexive action.

### Evaluating Contributions

Discussing interaction design specifically, Zimmerman and his collaborators, propose a set of four criteria to evaluate the contribution of a research (2007, pp. 499-500):

- **Process**: The research contributes to the “rigor applied to the methods and the rationale for the selection of specific methods” (Zimmerman et al., 2007, p. 499);
- **Invention**: The research situates its contributions in the current state of knowledge and provides “significant advancement” (Zimmerman et al., 2007, p. 499);
- **Relevance**: The research contributions lead to, or support, a preferred state of the world. Also, the research must explain why the state is preferred (Zimmerman et al., 2007, p. 500).
- **Extensibility**: The research contribution must be usable as a basis for new research, i.e. it must be “described and documented in a way that the community can leverage the knowledge derived from the work” (Zimmerman et al., 2007, p. 500).

### Methodological Aspects

The next logical step to having established what the designer/researcher wants to know is to establish how she or he will gather the necessary data to extract that knowledge from. In their critique of research through design, John Zimmerman and his collaborators mention that “there is a need for serious development of RtD into a proper research methodology that can produce relevant and rigorous theory” (2010, p. 316).

As described in this section, the methodological aspect of RtD has however been discussed from different angles that are coherent with the approach’s ontological and epistemological position described earlier. The methodological aspects covered in this section cover the expected steps of the research all the way down to tools suggestions for data collection.

### Flow of the Research through Design

Basballe and Halskov distinguish three dynamics that appear in sequence during a RtD project (2012):

- **Coupling**: The initial step that “unites research and design interests” (Basballe & Halskov, 2012, p. 65). During coupling, the basic frame and constraints of the project to serve both level of interests.
- **Interweaving**: At this point research interests and design interests influence each other and the project as processes, methods and validation are established.
- **Decoupling**: Decoupling appears at later points of the project when the designer/researcher must focus on one of the interest set (design or research). For example, decoupling appears during the production phase since it focuses on the design
process, but is also appears during the final evaluation and inquiry when the research interests become the focus of the work.

From One to the Many
Having understood how the workflow will progress through the project, we must now establish what should be observed. Although we know that RtD takes place within a design project, we will discuss the different types of projects that could be tackled in RtD. Bowers promotes the use of many artefacts of the same studio or designer for a RtD. This series of linked designs, once combined, constitutes what he calls a ‘portfolio’, which presents interwoven features that can be used for analysis or any other form of research inquiry, making the portfolio an ‘annotated portfolio’ (Bowers, 2012).

In a somewhat opposed trail of thought, Alex Wilkie and his collaborators (2010) propose that the creation of one artefact (or maybe of a portfolio, the authors do not discuss the issue) might not need to be jealously developed far from sight. They suggest that RtD projects have “two underlying dimensions of ‘looseness’ and ‘openness’” (Wilkie et al., 2010, p. 99). Looseness refers to the number of outcomes targeted or allowed by the project and the designers/researchers. Openness, on the other hand, relates to how ‘secret’ the project is. An opened project can allow public participation, media attention, etc. A loose project could accommodate interdisciplinary teams working on a single project, which effectively transforms the designed artefact into a boundary object (Star & Griesemer, 1989).

Documentation and the Process Reflection Tool
Knowing what will happen and which project to observe is obviously not enough: we must also determine how the observation will be most efficiently recorded. One of the main concerns regarding methodology of any RtD resides in a “more rigorous documentation of progress and evolution of RtD projects” (Zimmerman et al., 2010, p. 316). This section does not provide a prescriptive method of documentation, but proposes some of the methods discussed in the literature.

Owain Pedgley (2007) provided key elements of a good documentation methodology:

- **Solo effort**: Since the designer/researcher will undoubtedly be alone at certain part of the project, a good method will take into consideration that documentation might be a solo effort;
- **Endurance**: documentation must be able to account for months if not years of design/research work;
- **Subject delimitation**: As not all aspects of a project can be accounted for, a focused area of data must be established as the subject to prevent data overflow;
- **Mobility**: Because the design process does not necessarily stop when the designer/researcher leaves the studio, the documentation method must be mobile.

In an attempt to minimize this type of issue, Peter Dalsgaard and Kim Halskov (2012) introduced the Process Reflection Tool (PRT), a web-based system designed specifically for documenting the design process of a project. The tool allows designers/researchers to enter details about any event (and sub-event) in the process or take informal notes on conversation, decision or other significant step of the project. Those events and notes are organised according to their timestamp to visually show the evolution of the project.

There are some important challenges to the use of the PRT, such as the immediate capture of information, the perceived importance of entering data by the designers and some difficulty on determining what and how to document events. The authors argue, however, that the use of the tool supports better cooperation between actor of a project, invite discussions on the research
agenda and help keep better records of events in long-term projects (Dalsgaard & Halskov, 2012, pp. 434-436).

In line with the looseness dimension described above, Mithra Zahedi’s doctoral thesis discusses the use of multidisciplinary cooperation on RtD projects (2011). She promotes the use of triangulation in data collection (as per Van der Maren, 1996), joining observation of the designers work and interviews with them.

**Limits of RtD**

Even the most informed and prepared designer/researcher cannot exceed the limits or ignore the challenges of RtD. This section is probably the least internally coherent since the limits are not necessarily linked to one another. It does, however, provide a list of possible issues that should always be kept in mind while planning and executing a RtD.

**The Knowledge, Not the Product**

Frayling (1993) made a point to distinguish RtD from researched art or design, advocating that, in the case of researched art or design, “the goal here is art rather than the knowledge and understanding” (Frayling, 1993, p. 5). Research through design’s goal should be the knowledge and understanding, but this knowledge and this understanding result from the making of an artefact that, as stated earlier, is embodied in the artefact created or designed.

**Tacit Knowledge**

“Designers are not used to accounting for what they know or do” (Pedgley, 2007, p. 466). This type of knowledge is described by Schön as “implicit to our patterns of action and in our feel for the stuff with which we are dealing” (1983, p. 49). This might not be a problem when practicing design, but it becomes problematic as soon as we need to explicitate said knowledge, for example when teaching or, in the case of research, when we need to publish or at least document research results and analysis.

**Timeframe**

“It has been argued that a comprehensive understanding of design decision making cannot be formed solely from time-restricted studies and the un-naturalistic interactions that they involve” (Dorst, 1995, cited by Pedgley, 2007, p. 467). The timeframe of the study is especially important to RtD since smaller timeframes tend to lead to less leveragability in the results. To provide useful results, then, the research project must allow for the natural unwrapping of design project to take place.

**Conclusion**

The aggregated views on RtD draws a coherent research philosophy ranging across many years of articles and books about the design discipline.

The reality described by RtD is the one that ‘will be’, the preferred state. It is one that comes naturally out of the interaction of the current state with its environment.

RtD implies creating an artefact that cannot be wholly described and that enables the designer/researcher to dialog with the situation and learn from it.

Research contributions can range across many aspects of design (including the designer, the process and the artefact itself) but design practice seems to be the main concern of
designers/researchers using this approach. Reflexive practice (Schön, 1983) seems to be the most complete framework to categorise potential contributions. RtD is very similar, in appearance, to a regular design project. Its goals, however, are different and the influence of the research inquiry is present at most steps of the project. Documentation of the process is a key concern for designers/researchers using this approach. Finally, RtD can easily be defined by what it is not. First, the artefact is not the goal of RtD; knowledge and understanding is. Second, RtD is not able to provide predictability. Finally, it is riddled with issues that come with its heavy reliance on design.

Possible Further Research
Possible further research should critically validate the portrait of RtD proposed in this paper against actual publications on performed RtD. We also noticed that the rigor aspect of RtD is not thoroughly discussed. Questions like “could we enhance the rigor of RtD and how?” remain to be answered.

References


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Danny Godin is a professor of game design at Université du Québec-en Abitibi-Témiscamingue (UQAT) where he teaches both game design and video game development. He is also responsible for UQAT’s Montreal centre and 3D creation programs. His previous teaching experiences range from pre-university to post-graduate education. Danny has completed a master in Instructional design in video games and is currently conducting a doctoral research on the influence of game mechanics on game dynamics. Prior to teaching, Danny has worked as a professional game designer at Gameloft, designing and producing mobile and Nintendo Wii games. He also organizes local discussion groups for game researchers, developer and enthusiasts in Montreal. His research interests include system and instructional design for all types of games, design education, strong immersion technology as well as the motivations and perceptions of women in games.

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Mithra Zahedi is a professor of design and a researcher at the Université de Montréal, Canada. Her academic background is in Product design and Educational technology, followed by her PhD, which focused on Interface design and user-centered approach. Her research interests include collaborative design among interdisciplinary team, with particular interest in the impact of team’s implication in early stage of design process of user-centered design. She favors research-through-design approach and acts as a designer/researcher. She has presented and published papers in International design conferences, and has run design workshops in the context of professional projects as well as in conferences. Prior to being fully employed at the university, Mithra worked as a design practitioner in the area of Product design, Graphic design and Interaction design for more than 18 years, and has developed an expertise in design and ergonomics of HCI. In this role, she worked with a verity of industries and with educational
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