

# Reframed Contexts: Design Thinking for Agile User Experience Design

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**Abstract.** The effectiveness of user experience design is dependent on many factors including complete and accurate contextual information, design approaches, and methods followed. The recent HCI literature clearly shows that there is a growing research interest on integration of User Experience (UX) design and agile software development. A framework based on design thinking is proposed that enhances the current user experience design by integration of three design approaches - design thinking, designing for user experience and agile software development. These three different design approaches of the framework complement each other to benefit effective derivation of contextual requirements that include functionality of the system as well as aspects of total user experience based on the shared understanding gained from stakeholders in the context. Implications of each design approach on stakeholders and the context are discussed in detail to show the significance and value of the proposed framework on the whole design and design process. It is expected that the proposed framework is capable of enhancing the design quality and user experience of products, systems, and services created through agile software development approaches.

**Keywords:** user experience, agile software development, human-centered design, human-computer interaction, design thinking.

## 1 Introduction

The recent literature in the field of Human-Computer Interaction (HCI) and Software Engineering clearly shows that there is a growing research interest on integration of User Experience (UX) design and agile software development. UX is a concept central to interaction design and concerns how a user feels about an artifact when using it in the real world [1]. Although the UX evolved from classical usability, the main focus of UX is distinctive in creating positive user experience mainly by means of pleasure, joy, excitement, fun, attitudes, emotions and added values when the user interacts with an artifact. Traditional usability is the practice of making things (products, systems and services) easy to use and it is often equated with user experience [2]. UX has emerged to cover the components of users' interactions with, and reactions to, products that go beyond effectiveness, efficiency, and conventional

interpretations of satisfaction. Similar to User-Centered Design (UCD), the prime focus of UX studies is on the user and the associated context of use. Such studies often take the user into account in the iterative design and evaluation of the product, system or service. Accordingly, a deep understanding of the user and the context of use is important in designing artifacts for optimum UX. Often these studies begin with time-consuming up-front activities such as contextual enquiries, interviews, definition of UX and usability goals, creation of personas and usage scenarios etc., resulting in extensive documentation.

On the other hand, Agile Software Development is light-weight, customer-oriented and a highly collaborative approach that follows a continual exploration of the business need as the basis to gather and refine software requirements to develop quality software. A key objective of the agile software development is to deliver quality software products in a cost and time effective manner through a series of short iterative and incremental development cycles. Each iteration of the agile software development produces a version of working software that emphasizes a business value to the customer ensuring that all agreed requirements have been met.

The integration of UX design into agile software development has been widely discussed in the literature highlighting that UX aspects are not well addressed in agile software development [3]. A recent publication on two case studies of UX design and agile development highlighted the narrow focus of UX aspects in agile development iteration despite the presence of a dedicated UX team in the project [4]. A key challenge faced by UX design for agile software development is the building an in-depth understanding of the user and the context of use in a manner that adds business value for agile software development process and activities. Building of such understanding has to be light-weight, time-optimized and effective with the quick turnaround of simple artifacts that contain easy to understand and ‘just right’ information. The customer-orientation nature of the agile software development emphasizes the customer as the main source of information for software requirements. Accordingly, software developers interact closely with the customer to elicit all types of software requirements including user requirements. The distinction between the user and the customer in agile software development has been identified by many authors. For example, Bayer et al. [5] considers a user is the individual who interacts with the system being designed directly whereas the customer is a larger term that bears one role or many roles such as a user, or an indirect user of a system. The customer can also be a dependent user on the output of the system, or a user who prepares input for a system, decides on the need for a system and approves the purchase of a system etc. Moreover the authors emphasize that understanding the users is key to getting the design right and understanding the other customers of the system may be key to getting the system accepted. In another example, having analyzed few research studies, Kautz [6] points out that although customer representatives act with decision power, they only a possess a limited understanding of the users’ needs because they are not the actual users of the software to be developed, who in turn may have the necessary knowledge, but not the authority to decide on system features.

This paper proposes a rapid, solution-oriented framework to simulate the contextual environment in which key stakeholders and users can develop a shared understanding of the whole experience which then can be used as the main source of information for agile software development. The framework is based on three design approaches: design thinking, user experience design and agile software design.

The paper is organized in the following order. Following the introduction, Section 2 presents a brief overview of Design Thinking, concept of design, design thinking process models, empathy in design thinking, and reframed contexts in design thinking. Section 3 details the design of the integrated framework of design thinking, user experience design and agile software development and how the proposed framework will add business value by means of rapid contextual analysis and solution design.

## 2 Design Thinking

In the last two decades, ‘design thinking’ has matured immensely to gain a wider popularity in many fields even outside the design profession and considered as an exciting new paradigm for dealing with problems in many disciplines [7]. Design thinking has been recognized as a widespread approach to solve socially ambiguous design problems [8]. An early definition of design thinking by Cross et al. [9] outlines design thinking as a study of the cognitive processes that are manifested in design action, as well as something inherent within human cognition [10]. According to Dunne and Martin [11], design thinking is the way designers think and apply their mental processes to design objects, services or systems, as distinct from the end result of elegant and useful products. A widely cited definition by Brown [12] describes design thinking as an approach of human-centered innovation that uses the designer’s sensibility and methods to match people’s needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity. The emphasis of the Brown’s definition highlights two important points. Firstly, design thinking is an approach to creating a new or enhanced feasible solution situation meeting customer needs with added value. Second, design thinking is an approach for designing; hence design is an integral part of design thinking. Accordingly, the main idea behind design thinking is how designers progress the design process with a creative mind towards design solutions discovering new opportunities.

For a deeper understanding of design thinking, it is important to gain a clear view of what is meant by design, the concept of design and how design and the concept of design relate to design thinking. There are many definitions of design given by many authors in different disciplines because design is multifaceted and not limited or belongs to a particular field or discipline. Design is a broad concept which has developed a very substantial literature over time across a variety of disciplines

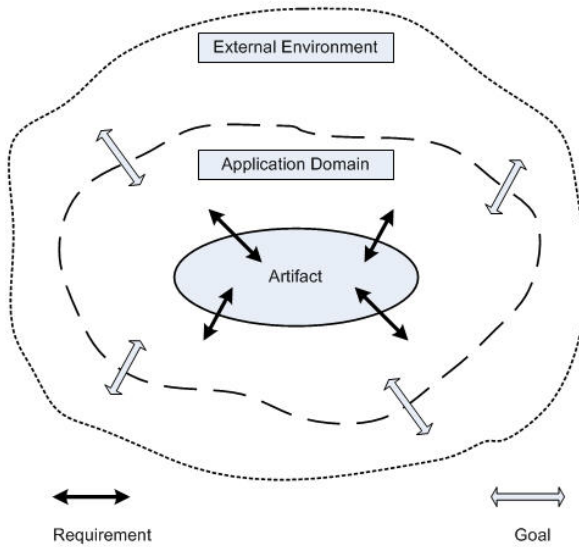
and fields [13]. Accordingly, design has been conceptualized differently, such as a process (action), a creation (artifact, product, system or service), as planning, as intention etc. In the literature, the design has been widely and mostly defined as a process as well as a creation. For example, an early definition of design specified by IEEE standard IEEE 610.12-90 [14] outlines that design is both the process of defining the architecture, components, interfaces, and other characteristics of a system or component and the result of that process. Another example [15] states design refers to the creative process of specifying something new and to the representations that are produced during the process. These definitions clearly point out that design is both a process and a creation.

Based on a research study towards a clear, unambiguous and a formal definition of the design concept, Ralph and Wand [16] concluded that although there are many varying definitions given for design by many authors, there is no clear, precise and generally accepted definition available for the concept of the design. According to their analysis, they see the design activity as a process aimed at generating a specification of a design object. These include the environment in which the object will exist, the goals ascribed to the object, the desired structural and behavioral properties of the object (requirements), a given set of component types (primitives), and constraints that limit the acceptable solutions. The design object is the design outcomes such as an artifact, product, system or service. This design view on the concept of design from an artifact point of view is shown in Figure 1 where the artifact is situated in the application domain which is essentially a part of the external environment. We consider the application domain as an activity system and the artifact as an artifact of the activity system.

Figure 1 shows a view of concept of design that can be interpreted as a representation of creating an artifact that meets the design requirements of the application domain in order to accomplish design goals ascribed by the external environment. There are many other systems in the external environment which may or may not be interacting with the application domain (activity system). These systems in the external environment collectively ascribe the goals of the activity system. Hence, a holistic system view of design is essential for the design and for the implementation of system artifacts of any activity system. This systems view of design is shown in Figure 2.

Systems and associated components such as users and stakeholders are different in nature and behavior. Accordingly, design thinking requires specific focus to gain a deeper understanding and an extended view of the whole systems landscape holistically in capturing contextual information as much as possible to identify system issues, constraints, system goals and requirements. Explained as a design thinking capability framework [12], these focus areas are:

- Empathy - view contexts holistically from multiple human perspectives
- Integrative thinking - see all of the aspects of a situation for creative solutions
- Optimism - optimize one potential solution over other alternatives
- Experimentalism - explore the situations in creative ways to-wards new directions
- Collaboration - collaborate with interdisciplinary actors for innovative solutions.



**Fig. 1.** The Concept of design – artifact, separate domains, goals and requirements [16]

## 2.1 Design Thinking Process Models

In this section, we analyze three designs thinking models reported in the literature to highlight the similarities between these models and how they relate to problem solving leading to creativity and innovation.

Eris [17] presented a model named Divergent-Convergent Inquiry based Design Thinking Model (DCIDT) that describes design thinking as divergent and convergent inquiry associated with two fundamental modalities: divergent and convergent questioning. The DCIDT model is shown in Figure 3.

In this model, design requirements are transformed through Generative Design Questions (GDQ) into a series of design concepts. GDQs are used to create, synthesize and expand concepts, which subsequently transformed into design decisions or specifications through Deep Reasoning Questions (DRQ). The purpose of the DRQs is to analyze, evaluate, and validate design concepts (Cs) towards viable design decisions specifications. The model presented by Dunn and Martin [11] consists of four activities namely: Abduction, Deduction, Test, and Induction (see Figure 4). In this model, the Abduction activity focuses on generating ideas and during the Deduction activity, those ideas will be analyzed to predict likely consequences. All predictions will then be tested and valid outcome will be generalized during the Induction stage.

The design thinking model presented by Brown [21][26] details how design thinking happens by means of three overlapping spaces namely: Inspiration, Ideation and Implementation. There are a number of sub activities in each space, which are described as a system of spaces rather than a pre-defined series of orderly steps. These activities and how they overlap between spaces are shown in Figure 5.

The ‘inspiration’ space motivates to explore the context with empathy and human-centeredness to identify problems and opportunities through direct observation and understanding; ‘ideation’ is for generating, developing, and testing ideas towards solutions, and ‘implementation’ is the space that realizes the viable solutions for the context.

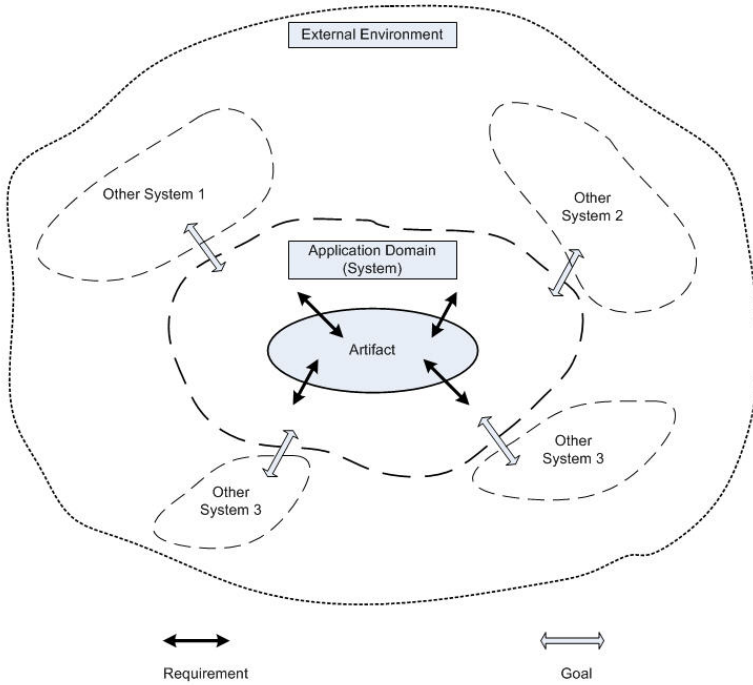


Fig. 2. Systems view of design - artifact, separate domains, goals and requirements

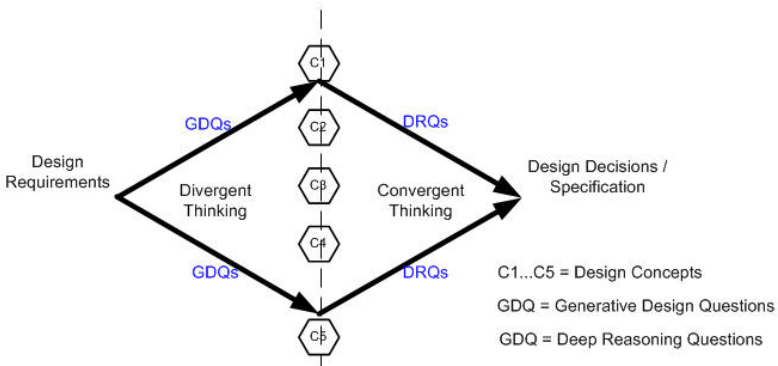
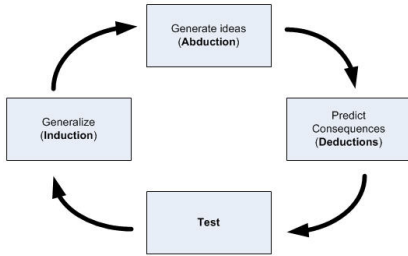
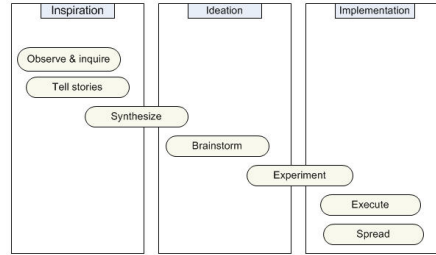


Fig. 3. Divergent-Convergent Inquiry based Design Thinking Model [17]



**Fig. 4.** Design thinking process model proposed by Dunn and Martin [11]



**Fig. 5.** Design thinking process model proposed by Brown [26]

All these three models share common characteristics such as holistic contextual exploration, integrative thinking based idea generation, creation and evaluation of viable solutions and realization of solutions in the context. The nature of the design thinking process poses the natural potential to reframe new solutions or enhance solutions with better ideas, hence the innovation-centered design solutions for contextual problems.

## 2.2 Empathy – An Important Challenge in Design Thinking

Much of the design thinking is impacted by many mental aspects such as cognition, affection and conation. Moreover the emotional concerns of all system users have been acknowledged as important in design [18], which leads to empathy as the focus of design. This informs and inspires designers to create designs matching user needs and wants [19]. Importantly, design thinking is considered to be a complex design behavior within a complex context and the actual behavior is determined by combined cognitive, motivational and emotional processes in the context [20].

As highlighted in [21], a successful design program should focus on three mutually reinforcing elements: insight, observation, and empathy with the aim of translating observations into insights and insights into design solutions thus leading to products and services. Accordingly, we consider that empathy as the most important challenge in design thinking that reflects emotional aspects and experience of all users in context.

## 2.3 Reframed Contexts in Design Thinking

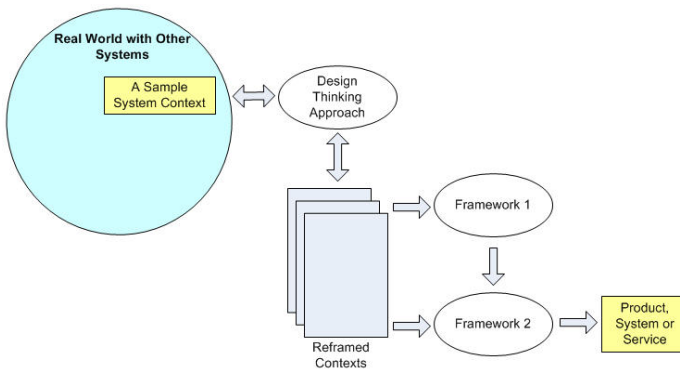
Framing and reframing of problem situations have been stressed as a process of reflection that is presented through appreciation, action, and re-appreciation [22]. Whilst framing is the cognitive process that explores a contextual situation in capturing, analyzing and creating knowledge, the reframing is the process of exploration of the same contextual situation from multiple perspectives to create new knowledge. Reframing allows visualizing how the users in a different or changed or less contextual situation might complete their tasks in achieving user goals. A recent publication [23] detailed reframing as a method of synthesis through highlighting the following strengths to see a different reality:

- recasting an existing frame in a new perspective
- shifting cultural perspectives to a different cultural domain
- uncovering associations and hidden links to and from the center of focus

Reframing a contextual situation in a new perspective highlights different or changed user needs, wants, and goals as well as different insights and implications as a result of the changed contextual situation.

### 3 Integrated Design Thinking Framework for Agile UX Design

Adikari et al. proposed a UX design framework titled ‘Design Science Research Framework for Designing and Assessing UX [24]’ as well as another framework for integrating usability into agile requirements engineering [25]. In this section we propose an enhanced framework that integrates the concept of design thinking and reframed contexts with designing for UX framework (designated as Framework 1) and usability in agile software development framework (designated as Framework 2). The proposed enhanced framework based on design thinking is shown in Figure 6.



**Fig. 6.** Integrated framework for agile UX design

Figure 6 shows a sample system context being explored with other relevant systems in the real world using design thinking approach to create reframed contexts. The important emphasis is that the design thinking approach is not only limited to the sample system context, but also considers a holistic view of all relevant and interacting systems in the real world (systems view) for the contextual exploration and to create reframed contexts. The new knowledge of the reframed contexts are subsequently used by Framework 1 (designing for user experience) and Framework 2 (usability in agile software development) to create enhanced products, systems or services. Emphasis of a systems view extends the focus on the broader areas of the problem situation within the context of the sample system context.



## 4 Conclusions

In this paper, we have presented an enhanced framework based on design thinking and reframed contexts for agile user experience design. The concept of design thinking, design in general, the design process and three design thinking process models discussed are to emphasize the importance and the significance of design thinking towards solutions for contextual problems. Existing frameworks proposed by Adikari et al. on designing for UX and usability in agile software development is also used as part of the enhanced framework.

The main contribution of the paper is to highlight a new approach of contextual exploration using design thinking and holistic systems view to create reframed contexts and generate new knowledge. Reframing contexts for different situations highlights a broader focus of the problem to reveal hidden issues, hidden links and unclear systems interactions etc. It is expected that the proposed framework is capable of enhancing the design quality and user experience of products, systems, and services created through agile software development approaches.

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