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Framework of Awareness: for the analysis of Ergonomics in Design

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Abstract

The present paper introduces the Framework of Awareness to the analysis of ergonomics in design. The framework is part of a doctoral research that took the Lean Thinking perspective by adopting the concept of *MUDA* and its set of principles as dimensions to study designers' behaviour in industry. Results were integrated into a Framework of Awareness to critical situations and crucial actions in design, with application in the research field of design and product development for managerial support, and of particular interest for the analysis of ergonomics in design. The framework is the result from detailed non-participatory research across five design disciplines. The framework proposes a mindful approach to the analysis of critical situations through a structured procedure but without requiring specific technical knowledge. The framework aims to support designers and developers to the awareness of critical situations and opportunities, through a set of principles-based, iterative and momentarily application. The Framework is proposed to the design practice to nurture a culture of awareness and provide guidelines to support designers' framing their interventions and eventually change previously identified less successful behaviour.

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1. Introduction

In the past, design awareness was defined as the ability to understand and handle ideas expressed by the means of doing and making [1]. Nowadays, design awareness has become a relevant design aptitude in the context of complex

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and collaborative processes of design and product development. As these processes are taking place in a certain social and societal environment the context of the design activity plays an important role increasing influences and consequences in designers' behavior and the design performance while managing the underlying mechanisms of *Value* creation in design. These situations take place due to unforeseen influences and consequences, lack or excess of prevention, a mind frame that does not allow to see further or refuses a sudden aspect. Inherent to the occurrence of downside consequences is the risk to diminish designers' input of *Value* for the creation of design results in circumstances comparable to the concept of *MUDA*, in situations of value waste. The research-based framework [2] places in perspective the Lean Thinking concept of *MUDA* [3, 4] as a key dimension to study designers' behavior in such situations and provide managerial support in the research field of design and product development. On a daily basis designers have to keep one's countenance and stand for situations such as, postponement, hindrance and emergency. Occasionally some of these situations lead to valuable inputs essential to the design process, though, designers are not always prepared to attempt and succeed in taking the best from these circumstances. The concept of *MUDA* is reinterpreted and defined in the context of this research, as critical situations in designing. Such situations emerge and designers' behavior is twofold: designers do not grasp a reaction to cope with the difficulties leading to missteps; designers are able to evaluate the dynamics of the situation and make the appropriate decisions to proceed. The first case was the main concern, the second case was the goal: support designers with empirically derived knowledge on adaptive behavior to improve performance towards decision-making in critical situations in design.

As Lean Thinking embodies a motivational approach to keep procedures of value creation at high standard, this research proposes and extends such motivational approach with a framework of awareness to keep designers behavior and design artifacts in high performance.

2. Theoretical Background

From the literature in design research few attempts provide further understanding of the sources of fruitless or successful performance. In most contributions focus on downside aspects of specific issues such as stuckness [5], non-generating alternatives [6], inappropriate focus of attention [7] and confirmation bias [8].

Design and product development research has paid little attention to these design management issues on an empirical basis. The traditional prescriptive models such as the Basic Design Cycle [9] but also newer approaches such as the VIP approach [10, 11] and other product development structured methods [12, 13] do only partly represent the sources and possible effects of critical situations that designers and developers might have to cope with, as well as actions to improve performance.

Taking the Lean Thinking perspective to study designers' behavior and performance, was seen as a challenge, similar to identifying the pathologies of designing, its causes, effects, typical behavior and coping measures. For the unacquainted, Lean Thinking (LT) is a domain-independent philosophy of Management that was brought from Japan to USA and Europe. It was originally based on five principles, namely *Value*, *Value stream*, *Flow*, *Pull* and *Perfection* with the purpose of eliminating *MUDA* in any value creating activity. *MUDA*, the Japanese word for waste, is defined as 'specifically any human activity which absorbs resources but creates no value' [4, p.355]. *Value* is defined at the start of any process and *MUDA*, if inevitable, is converted into *Value*. Lean Thinking was initially derived from the manufacturing context [14], however its philosophy of guiding principles of behavior has applicability to a large variety of processes, people and organizations [15], with demonstrated practical results. Progress has been made in implementing and raising awareness of LT in several fields of practice and research, and it has been expanded to Lean Product Development (LPD) with contributions on techniques [16], sub-systems [17], principles [18], management domains [19] knowledge domains [20], system design framework [21] and the Lean Advancement Initiative several contributions [22]. However, a gap in the understanding and linking Lean Thinking and its principles to the creative dimension of design and product development has been identified. Though, as a motivational framework, LT provides concepts, which are relevant to the design activity and to designers' behavior and performance such as the dimension of *Flow* [23]. At the same time, designers' sustainability concerns and talent to create *Value* from waste, unintentionally makes them Lean Thinking enablers [24] in a world that disregards and keeps generating *MUDA*.

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