

Collaborative product design processes of industrial design and engineering design in consumer product companies



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This study aims to elucidate how industrial designers and engineering designers collaborate, and how such an alliance reflects in the design process. We conducted in-depth interviews about actual product design projects with 34 industrial and engineering designers from six consumer product manufacturers. We firstly identified individual design processes from the interview data. Secondly, we then compared and merged the design processes into collaborative processes using a mosaic method. We finally simplified the collaborative processes to create representative process models. As a result, we discovered four types of typical collaborative product design processes and their characteristics – Type 1: ID-led Concept-driven Process, Type 2: ID-led Combined Outside-inside Process, Type 3: ED-led Inside-first Process, and Type 4: ID&ED Synergetic Process.

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Integrated contribution of engineering design and industrial design is essential to launch successful products to the market. Product design can hardly be explained from a mono disciplinary perspective. However, it is known that engineering design and industrial design have considerably different design practices (Pei, 2009; Persson & Wickman, 2004), and their design approaches are in some ways opposite to each other (Eder, 2013; Hosnedl, Srp, & Dvorak, 2008; Pahl, Wallace, & Blessing, 2007). The industrial designers' role includes enhancing user experience of a product and developing its outside form and interface (Ulrich & Eppinger, 2012). They employ knowledge and skills in aesthetics and ergonomics (Eder, 2013; Pahl et al., 2007). Under the interaction with industrial designers, engineering designers take part in implementing the design concept developed by industrial designers (Persson & Warell, 2003). Engineering designers provide a means for the product to be functioning, reliable, and manufactured (Hubka & Eder, 2012; Pahl et al., 2007). This leads to different approaches

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between industrial and engineering designers (Cross, 2008; Hubka & Eder, 2012).

It is often argued that engineering designers use an ‘outward approach – developing from function to appearance’ whereas industrial designers follow an ‘inward approach – developing from appearance to functions’ (Eder, 2013; Hosnedl et al., 2008; Pahl et al., 2007). With these notions, the following two design strategies were proposed: one is the ‘inside-out’ strategy that is defined as designing the inner working parts first, and thus constraining the outside shape, and the other is the ‘outside-in’ strategy where the envelope was defined first, and thus constraining the inside parts (Hubka & Eder, 2012; Kim & Lee, 2010). These design strategies refer to combined design processes that a company should take for a specific purpose with particular conditions. However, little is known from empirical evidence about how these two strategies are applied in projects in industry. There have been few attempts to view the design process from an integrative perspective of engineering design and industrial design. In this regard, we investigated the collaborative design processes of both disciplines in the industrial context.

The research questions were: 1) what types of collaborative product design processes exist, and 2) what conditions drive a company to adopt a particular type of process. Based on the two designer groups’ roles and characteristics, we hypothesized that there would be different types of outside-in and inside-out design approaches. We assumed that the outside-in approach would be characterized by an industrial design-led design process, thus generating industrial designer’s role as a requirement and criteria provider, and the inside-out approach would be an engineering design-led design process, where engineering designers restrict industrial designer’s task range by providing initial requirements for industrial designers’ responsibilities. In order to succeed in a highly competitive market, companies should create collaborative processes of industrial design and engineering design by properly adopting outside-in and inside-out approaches to match their situations and objectives.

This paper serves two goals: firstly, to shed light on the form of the original collaborative product design process applied in practice, and secondly to determine different types of processes used for different purposes under different conditions. For these purposes, we conducted in-depth interviews with industrial designers and engineering designers from six consumer product manufacturers. We determined each company’s product design processes using a ‘*mosaic method*,’ where individual design processes drawn from interview data were combined to complete a collaborative process. As a result, we identified four types of typical collaborative product design processes and their characteristics.

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