

Analysis and Comparison of Prototypes of an Ergometric Step in a Multidisciplinary Design Process

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Abstract : Prototypes can be understood as representations of a product concept. Furthermore, prototyping consists in an important stage in product development and results in better team communication, decision making, testing and problem solving through feedback. Although there are several methods of prototyping suggested by recent studies for designers to choose from, some methods present different advantages, such as cost and time reduction, performance and fidelity, which should be taken in account during a product development project. In this multidisciplinary study, involving areas of physiotherapy, engineering and computer science (hardware and software), we compared four developed prototypes of an ergometric step: a virtual prototype, a 3D printed prototype, a bricolage prototype and a prototype manufactured by a third-party company. These prototypes were evaluated in a comparative-qualitative approach for their contribution to the concept's maturation of the product, the different prototyping methods used and the advantages and disadvantages of each one based on the product's design specifications (performance, safety, materials, cost, maintenance, usability, ergonomics and portability). Our results indicated that despite prototypes show overall advantages, all of them have limitations, thus being crucial to have different methods of testing and interacting with the product. Additionally, virtual and 3D printed prototypes were essential at early stages of the project due to their low-cost and high-fidelity representation of the product, while the prototype manufactured by a third-party company and bricolage prototype introduced functional tests in real scenarios, allowing more detailed evaluations. This study also resulted in a patent for an ergometric step.

Keywords : Product Design, Product Development, Prototypes, Step

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