

## وضع منهجية للتجميع الهيكلي للمكونات سابقة التجهيز في منتجات ونظم التأثيث والإنشاء المعدني

### Developing a Methodology for the Structural Connection of Prefabricated Components in Metal Furnishing and Construction Systems

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#### Abstract

Design for assembly (DFA) refers to the processes through which the product is designed to be assembled with ease. It also aims at design simplification by reducing the number of connection and installation processes required for the assembly. Design for assembly (DFA) techniques are integrated into the methodology of reverse engineering, re-design and re-application which ultimately leads to reducing the number of final product parts while observing user's needs and the functions associated with them. The new structure affects the structure of the product customized for assembly. The structural connections should allow easy replacement and installation as inherent properties within them, utilize minimum parts for their construction, and meet the structural, the functional and the aesthetic requirements for the improvement and development of metal furnishing and construction systems.

The reverse engineering and re-design methodology presented in the research aims primarily at reducing the number of components of the product. This is done by following the procedures and methods of analyzing the component composition, and if applicable removing one or more of these components as well as identifying the logical approach for finding more about the removal of an element or component and its effect on potential assembly processes. This methodology allows quantitative evaluation of designability which accelerates the re-innovation process, and consequently improves and develops metal furniture products. The research also provides a method for evaluating the structural connections of prefabricated components to be utilized in the systematic and comprehensive selection of design assumptions, which enhances the structural integrity of metal furnishing and construction systems.

The research problem can be summarized in the following: How does the application of a methodology for prefabricated components assembly affect the restructuring of the product? What are the evaluation methods used to evaluate structural connections as a path for developing metal furnishing and construction systems? The research aims to develop a methodology that is applicable to the assembly of metal furnishing and construction systems

structures through integrating reverse engineering and re-design techniques as well as establishing evaluation criteria to evaluate the structural connections of prefabricated components to be used in developing new structures and improving the efficiency of metal furnishing and construction systems. To achieve this objective, the research adopts the descriptive analytical approach which is based on information collection, categorization and organization to reach the findings and conclusions that would develop the structural system of prefabricated components. The research also applies the experimental approach through establishing criteria that are used to evaluate the structural connections and determine how suitable they are for metal furnishing and construction systems.

One of the most significant findings of the research was that the proposed methodology supports the designer on the theoretical, empirical, and applied levels. In addition, the evaluation criteria for structural connections of prefabricated components provide a thematic categorization that aims to find and develop structural, functional and aesthetic solutions that enhance the structural integrity of metal furnishing and construction systems. The most important recommendation of the research highlights the need to develop a plan for knowledge collection and organization to be followed by different institutions and industries, in order to systematically and organizationally promote technological advances for greater diversity in metal furnishing and construction systems designs.