# Article information:

A Method to Assess Assembly Complexity of Industrial Products in Early Design Phase | IEEE Journals & Magazine | IEEE Xplore
<https://ieeexplore.ieee.org/document/8169677>

# Article summary:

1. Assembly complexity is a major factor in high production costs and increased lead time for product realization, and assessing complexity can help designers rationalize various designs that meet functional requirements.

2. A systemic approach based on Hückel's molecular orbital theory has been proposed to assess assembly complexity of manufacturing products in a quantitative and repeatable manner, defining complexity as a combination of the complexity of product entities and their topological connections.

3. The proposed approach allows designers to better track the possible root causes of assembly complexity arising due to the product’s inherent structure than the approaches proposed in the literature, and supports assembly operations which can be done either manually or by an automatic assembly system.

# Article rating:

May be slightly imbalanced: The article presents the information in a generally reliable way, but there are minor points of consideration that could be explored further or claims that are not fully backed by appropriate evidence. Some perspectives may also be omitted, and you are encouraged to use the research topics section to explore the topic further.

# Article analysis:

The article proposes a systemic approach to assess the assembly complexity of industrial products in the early design phase. The authors argue that complexity is a major factor that induces high cost, operational issues, and increased lead time for product realization, and continues to pose challenges to manufacturing systems. The proposed approach defines complexity as a combination of both the complexity of product entities and their topological connections based on Hückel’s molecular orbital theory. The article provides a comprehensive review of the literature on assembly complexity and highlights the limitations of existing approaches.

The article presents a well-structured argument for the need to assess assembly complexity in early design stages. The authors provide evidence from previous studies that show how assembly processes significantly affect products’ final quality and cost. They also highlight how products are becoming more complex, which poses challenges for manufacturing systems. The proposed approach is based on Hückel’s molecular orbital theory, which has been adapted to industrial product assembly. This provides a unique perspective on assessing assembly complexity that goes beyond existing approaches.

However, there are some potential biases in the article that need to be considered. Firstly, the authors only test their proposed approach on two case studies from electronics industry for its validity. This limits the generalizability of their findings to other industries or contexts. Secondly, while the article provides a comprehensive review of existing literature on assembly complexity, it does not explore counterarguments or alternative perspectives on this issue.

Furthermore, while the proposed approach is innovative and promising, there are some missing points of consideration that need to be addressed. For example, the authors do not discuss how their approach can be integrated into existing design processes or how it can be used by designers with limited knowledge of molecular orbital theory. Additionally, they do not address potential risks associated with reducing product complexity too much or how this may impact product functionality.

In conclusion, while the article presents an innovative approach to assessing assembly complexity in early design stages based on Hückel’s molecular orbital theory, there are some potential biases and missing points of consideration that need to be addressed. Further research is needed to test the generalizability of the proposed approach and to explore its integration into existing design processes.

# Topics for further research:

* Integration of assembly complexity assessment into design processes
* Risks associated with reducing product complexity
* Alternative perspectives on assembly complexity
* Application of Hückel's molecular orbital theory in industrial product assembly
* Generalizability of assembly complexity assessment approach to other industries
* Use of assembly complexity assessment by designers with limited knowledge of molecular orbital theory

# Report location:

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