Tackling Non-transparency - Identification of Hidden Problems in Component-Based Supply Chains
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Introduction

Non-transparency in component-based supply chains beyond tier 1 [1,2]
- Hidden Problems remain undetected, propagate and reinforce before popping up as crisis event at tier 1 [3,4]
- Traditional supply chain management: reactive measures at tier 1 or 2 [5]

Hidden Problem Detector identifies critical supply chain components, whose shortage interfere timely and cost-effective production → enables proactive measures for end users to manage shortages

Methods

Hidden Problem Detector uses graph-theoretic centrality measures (in-degree, out-degree, out-strength, and betweenness-centrality of nodes) to identify critical supply chain components, whose shortage interfere timely and cost-effective production
1. Bill of materials (BoM) are mapped onto a knowledge graph
2. Enrichment of graph with component data (e.g., seller, manufacturer, category etc.)
3. Graph-theoretical determination of component criticality
4. Integration of historical data regarding market availability, prices and lead times
5. Generating decision support for end users

Results

Service prototype Hidden Problem Detector detects and localizes hidden problems in component-based supply chains in sensor manufacturing

Client-server architecture:

![Octopart Flask](image)

Shortage alerts for critical components

<table>
<thead>
<tr>
<th>Component</th>
<th>Manufacturer</th>
<th>Supplier</th>
<th>Type</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>H131700</td>
<td>3M</td>
<td>[Elec...</td>
<td>No</td>
<td>For the current time horizon the component H131700 results shows shortage behavior by increase in lead-time (20.0 %) and increase in price (1710.01 %)</td>
</tr>
</tbody>
</table>

Actual and historic market data for critical components

![Factory lead time for the selected period](image)

![Median price trend](image)

References & Acknowledgements


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