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Identifying and constructing leading indicators for monitoring and controlling performance of engineering projects

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PMSs (Performance measurement systems)

- Scholar theories and models
- Capabilities of Support softwares

PMSs classical models:
- Performance Measurement Matrix (1989);
- Performance Pyramid System (1991);
- Balanced Scorecard (1992, 1996);
- Integrated Performance Measurement System (1997);

Gap analysis:
1) Balanced scorecard has been used across the world, whereas many other frameworks have tended only to have regional appeal;
2) The practices in industries are not following the rapid academic rhythm.

SEM (Systems engineering measurement)

- Characteristics:
  - Providing visibility into expected project performance and potential future states;
  - Providing predictive analysis based on trend information or significant correlation.

18 SE Leading indicators

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Fitting rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-perspectives; Connected to Multiple data sources; VPMM; KPIs-based.</td>
<td>High fitting rates (≥ 60%)</td>
</tr>
<tr>
<td>Balanced; integrated; strategy-relevant; stakeholders focus; Dynamic; PPMS; SCPMM; QM-PMSs; PMSs for SMeS.</td>
<td>Low fitting rates (&lt;60%)</td>
</tr>
</tbody>
</table>

10 Knowledge areas (PMBoK)

Requirements Trends | Risk treatment trends
System definition change backlog trend | Systems engineering staffing and skills trends
Interface trends | Process compliance trends
Requirements Validation Trends | Technical Measurement Trends
Requirements Verification Trends | Facility and equipment availability trends
Work Product Approval Trends | Defect/ error trends
Review Action Closure Trends | System affordability trends
Technology Maturity Trends | Architecture trends
Risk Exposure Trends | Schedule and cost pressure

Relationship between lagging and leading indicators

Lagging indicators are dominant in the PPM, but leading indicators are not yet well developed.

Preliminary mapping result after reading through

It can be concluded that it's feasible to apply some measurement methods in Systems Engineering like SE leading indicators in the general project management.