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Li Zheng, Claude Baron, Philippe Esteban

#### ► To cite this version:

Li Zheng, Claude Baron, Philippe Esteban. Identifying and constructing leading indicators for monitoring and controlling performance of engineering projects . 7ème FORUM ACADEMIE - INDUS-TRIE de l'AFIS , Dec 2016, Toulouse, France. 2016. hal-01496495

#### HAL Id: hal-01496495 https://laas.hal.science/hal-01496495

Submitted on 22 May 2017  $\,$ 

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

Li ZHENG (lzheng@laas.fr) Claude BARON, Philippe ESTEBAN LAAS-CNRS, Université de Toulouse, INSA, UPS, Toulouse, France

## **PMSs** (Performance measurement systems)



Performance Measurement Matrix (1989);
Performance Pyramid System (1991);

## **SEM** (Systems engineering measurement)



- Balanced Scorecard (1992, 1996);
- Integrated Performance Measurement System (1997);
- The Performance Prism (2002).

## Gap analysis:

1) Balanced scorecard has been used across the world, whereas many other frameworks have tended only to have regional appeal;

 The practices in industries are not following the rapid academic rhythm.

Characteristics	Fitting rates
Multi-perspectives; Connected to Multiple data sources;	High fitting rates
VPMM; KPIs-based.	(≥ 60%)
Balanced; integrated; strategy-relevant; stakeholders focus;	Low fitting rates
Dynamic ; PPMS; SCPMM; QM-PMSs; PMSs for SMEs.	(<60%)

Model input

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

18 SE Leading indicators					
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				

# Indicators input

# Improving Project Performance Measurement

10 Knowledge areas (PMBoK)

Relationship between lagging and leading indicators



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

	Project Integration	Management	Project Scope	Ivianagement Project Time	Management	Project Cost Management	Project Quality	Management	(···)	Project	Stakeholder	Management	
Requirements trends			Х				>						
System definition change backlog trend	Х		Х	Х			>						
Interface trends			Х										
<b>Requirements validation trends</b>			Х				>						
Requirements verification trends			Х				)						
Work product approval trends				Х			>						
Review action closure trends				Х	,						Х		







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Séminaire Doctoral, Forum académie-Industrie AFIS