

Performance Models – Enabling Organizations Prediction Capability

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By
Mamta Sinha
Process Specialist



CMC Limited

A TATA Enterprise

Coverage

- **Need for Performance Models**
- **Performance Model**
- **Enablers**
- **Evolution of Measurement Capability – Data Maturity**
- **Evolution of Performance Models**
- **Example – Performance Model**
- **Prediction and Decision Making**
- **Risks, Benefits and Challenges**

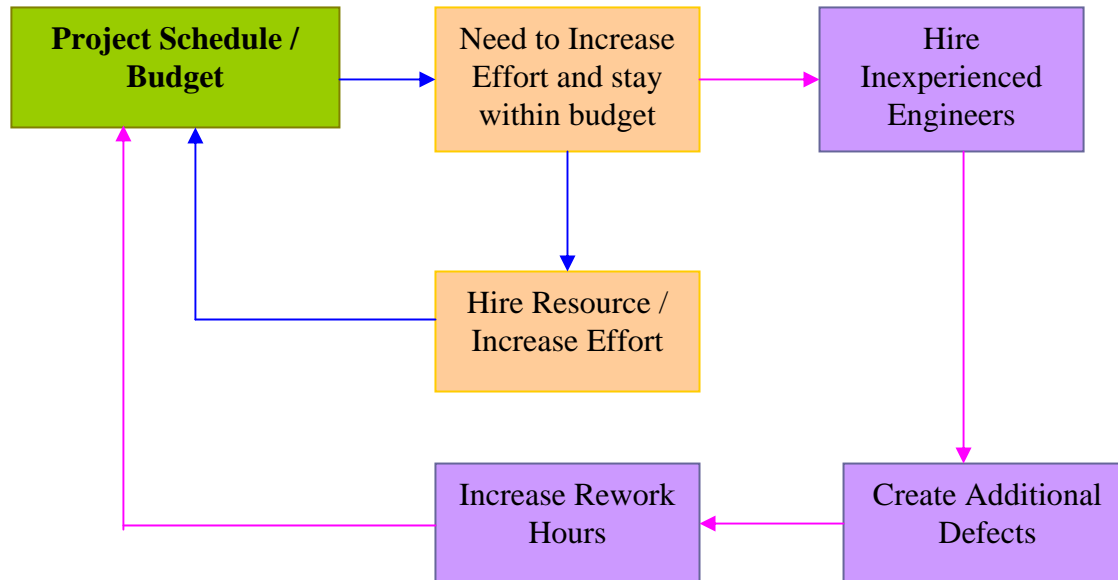


Concerns & Difficulties in Projects

- Budget Overrun
- Schedule Overrun
- Defects and Rework
- Reviews and Review Coverage
- Changing Requirements
- Staffing / Experience Level
- Attrition

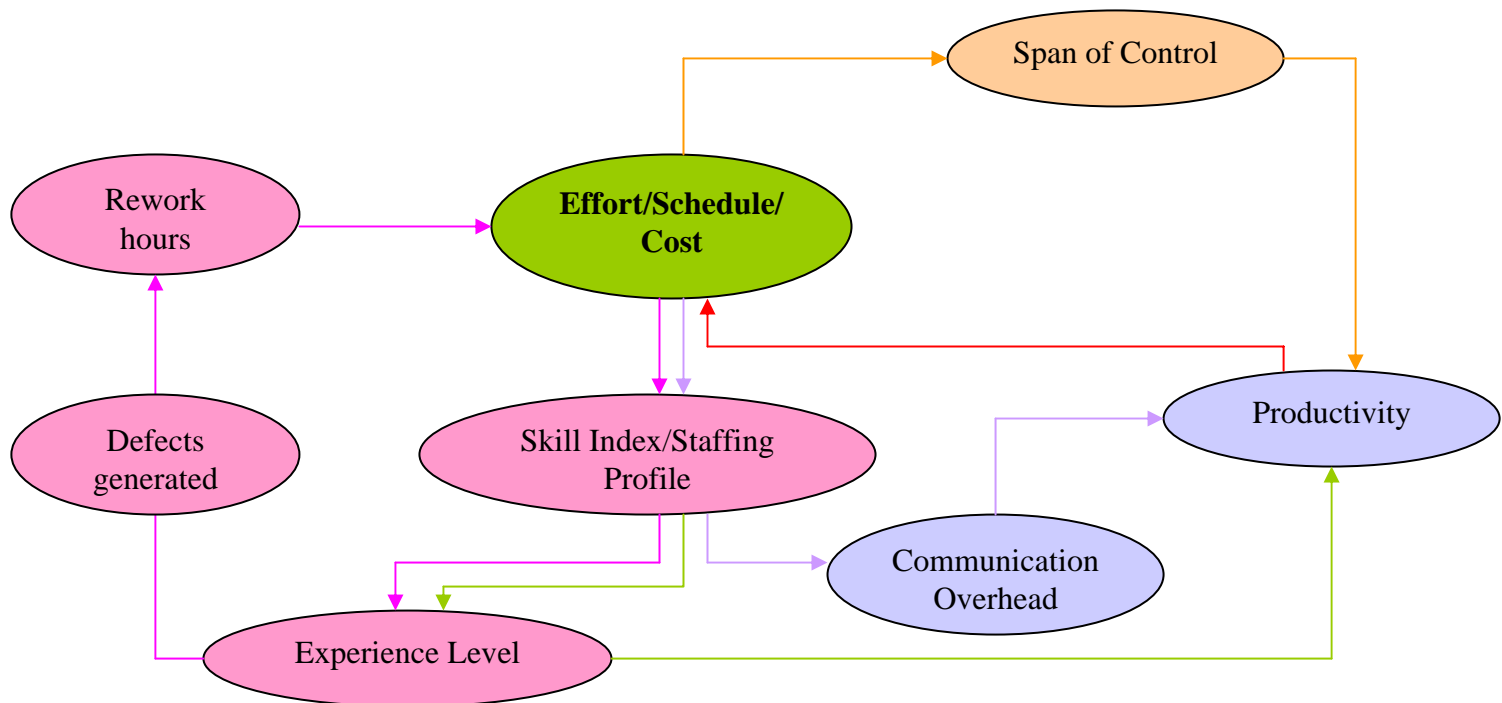


Scenario Analysis



Multiple dynamic variables that require consideration

System Dynamics and Feedback Loops



Need for Performance Models

- Understanding the system dynamic feedback loops
- Understand co-relations between variables
- Understand and predict trade-offs



What is a Performance Model?

Models used to estimate or predict the value of a process performance measure from the values of **other** process and product measurements

- Use measures that are collected throughout the life cycle of the project
- Predict values that can be collected later in the project life cycle



Performance Model – A Tool

A tool that takes into consideration the various system dynamics associated with a project execution and calculates the outcome



Readiness for Modeling - Enablers

- Process Group
- Data Repository
- Statistical Tools
- Knowledge of measures/metrics
- Knowledge of Statistics
- Organization Level / Project Level

Are we ready yet? When do we begin ?



Data Maturity Path – as per CMMI

- **Data Collection – Level 2**
- **Standardization of processes, data definition and data collection at the organization level – Level 3**
- **Stable processes – statistical management of sub-processes - Level 4**
- **Processes optimized and capable – Level 5**

Processes are stable and predictable.

Minimum two years of historical data from such processes required.

Data and Process Maturity – an Illustration

Estimation Methodology differ across projects; data collection



Standardization of Methodology for project types; data collection



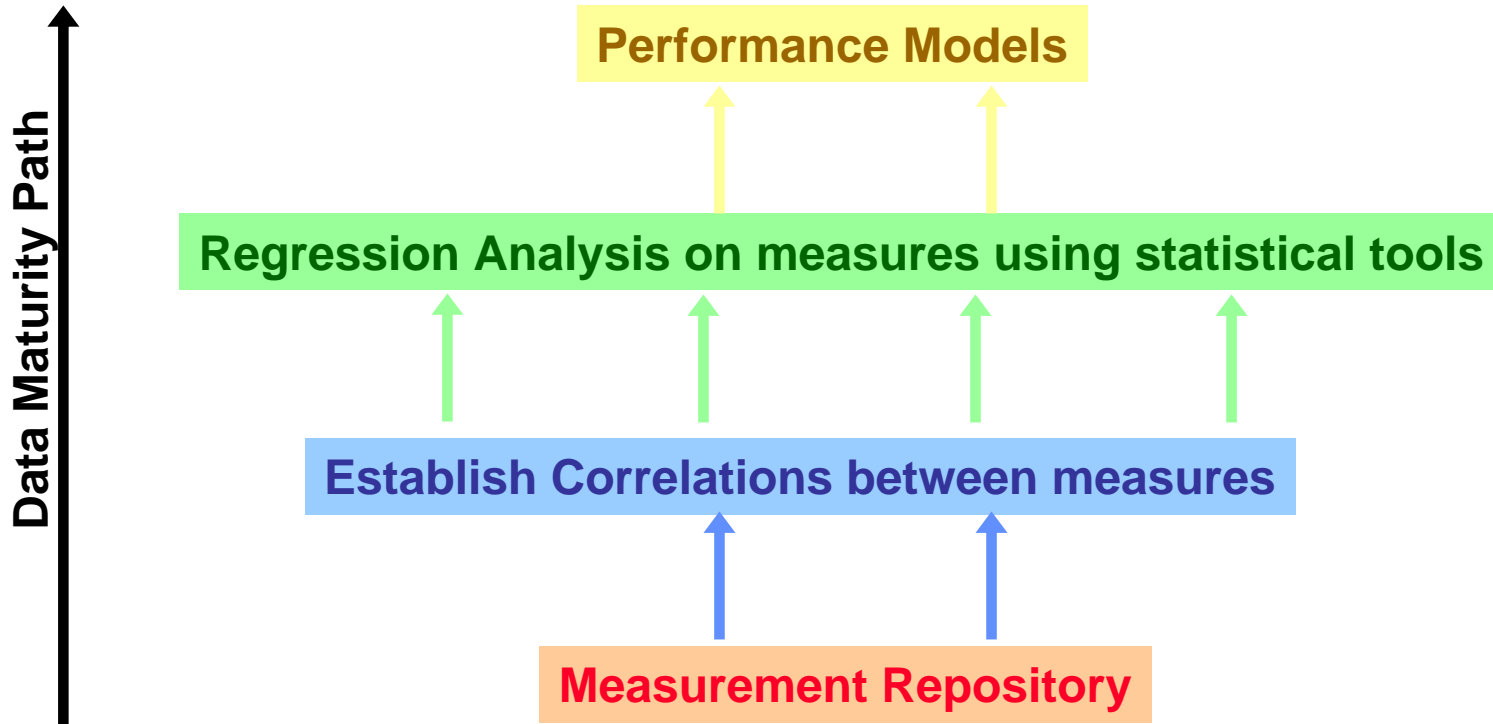
Validation of Methodology + Add – ons; monitoring of Schedule Variance and Effort Variance statistically



Optimized Estimation Methodology; Performance Models can further help refine the methodology



Evolution of Performance Models



Correlation and Regression

- **Statistical Methods**
- **Correlation – How one variable behaves with respect to another - measures association between two variables**
- **Regression – Develop quantitative relationships between variables.**

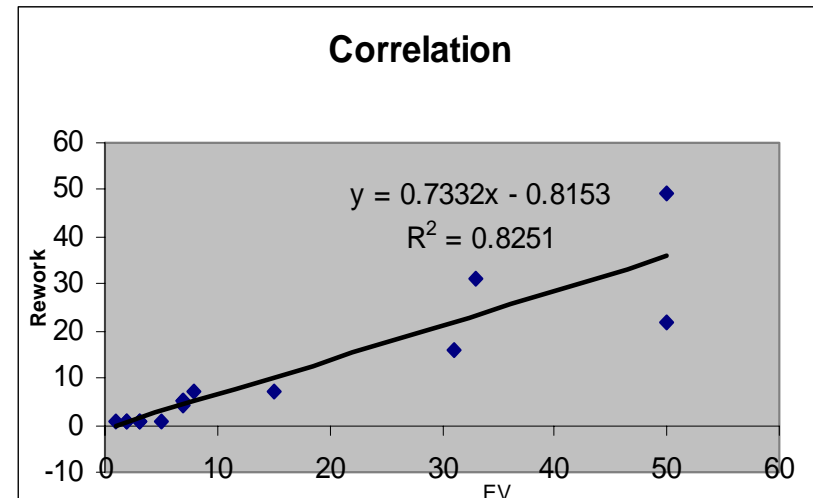
Analyze how a single dependent variable (y) is affected by the values of one or more independent variables (x), you can predict what y will be given x . You can use this information to fit a line or a curve to your existing data and to fore-cast future values.

Equations: $y = mx + c$ or $y = m_1x_1 + m_2x_2 + m_nx_n + c_1$

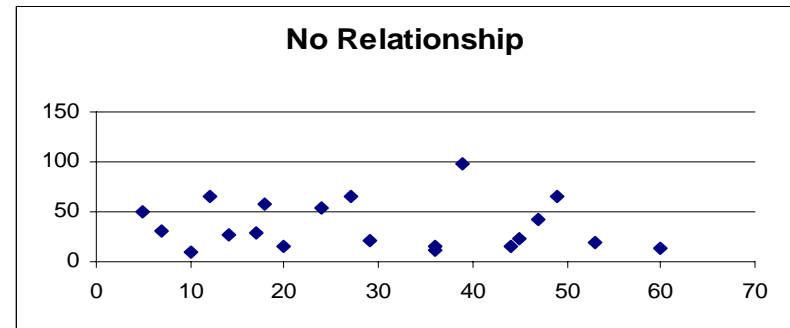
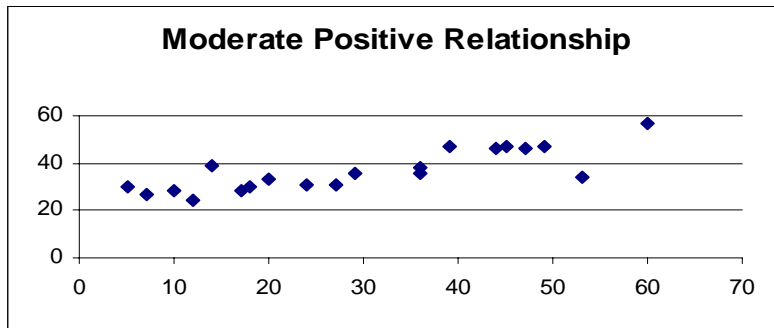
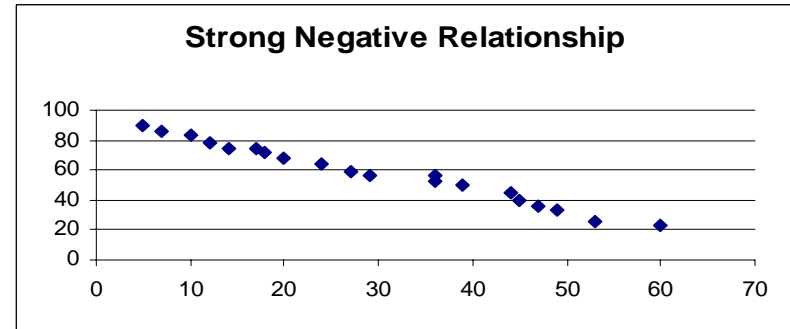
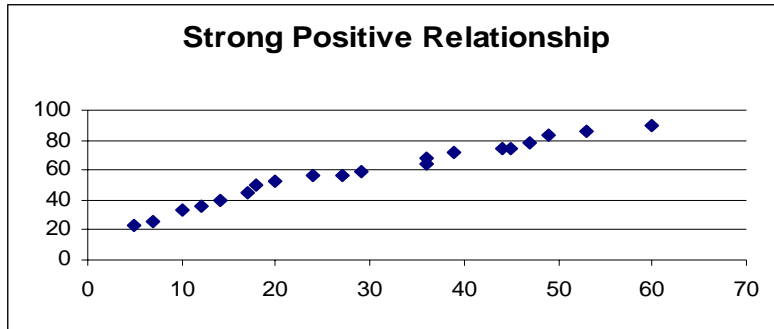


Correlation between Measures

<i>Milestone</i>	<i>EV</i>	<i>Rework.</i>
AC 448	50	49
AC 483	8	7
AC 450	50	22
AC 486	7	5
AC 493	1	1
AC 492	2	1
AC 484	15	7
AC 478	31	16
AC 494	7	4
AC 495	7	5
AC 482	33	31
AC 498	5	1
AC 499	3	1
AC 500	3	1
AC 502	2	1



Types of Relationship



Regression Analysis

- Re-organize data and establish inter-relationship between data
- Analysis of data and identification of dependent and independent (causal) variables
- Curve or line fitting and establish the relationship through resultant equation



Correlated Measures

Measure	Size	Skill Mix	Communication Overhead	Span of Control	PCI	Review Coverage	RSI	Rework
Effort	✓	✓	✓	✓	✓	✓	✓	✓
Correlation	positive	negative	positive	negative	negative	positive	positive	positive



Deployment

- Establish models from organizational data
- Calibrate and test
- Review and support its usage
- Revise and maintain



Prediction and Decision Making

Illustrated through Case Study and sample
Performance Models

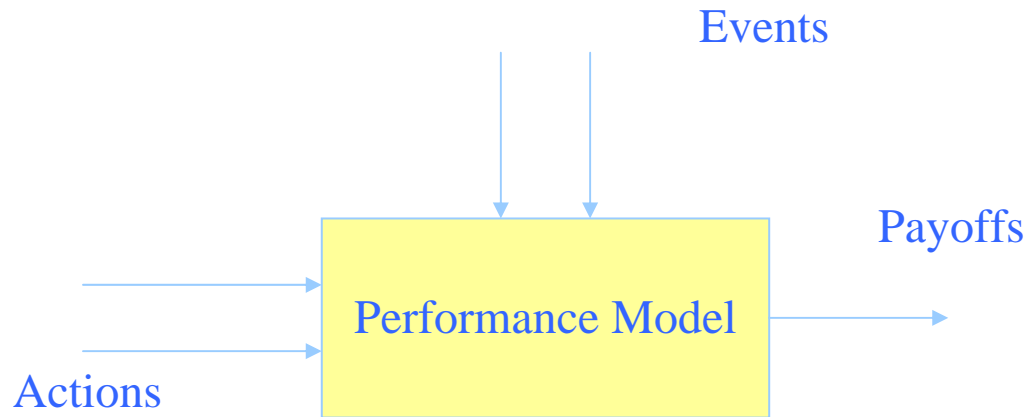


Benefits

- **Helps predict Process Performance**
- **Enables quantitative management of project.**
- **Enables comprehensive planning in the project – through adequate risk mitigation**
- **Early warnings signals for timely corrective actions - Effective Project tracking**
- **It is more easily understood than the empirical situation and, hence, permits the problem to be more readily solved with minimum time and effort.**



Risks and Challenges



All models are wrong, but some models are useful



Risks

- It is a simplified representation of the actual situation
- It need not be complete or exact in all respects
- It concentrates on the most essential relationships and ignores the less essential ones.
- False assumptions, not having an accurate estimation of the probabilities.
- Relying on expectations, difficulties in measuring the utility function, and forecast errors.
- Dynamics of organization changes, hence model should be current.



Key Success Factors

- Analysis of data – correlation and regression
- Careful planning of the measures/data
- Validation of the model (feedback from projects)
- Optimization of the model

Q & A ?

Mamta Sinha
Process Specialist

mamta.sinha@cmcltd.com

