

Administrivia

- **Grades have been updated; please report your problems to Molly.**
- **LCA ARB Schedule has been finalized, make sure you check the schedule and send a reminder to your client.**
- **You (at least 1 team member) must report 45 minutes in advance with all documents and don't staple your documents.**

ARB Schedule

	Tue 11/19	Wed 11/20	Thu 11/21	Fri 11/22	Mon 11/25	Tue 11/26
9:00 AM - 10:20 PM	<u>TEAM #05</u>		<u>TEAM #08</u>	<u>TEAM #02</u>	<u>TEAM #01</u>	
10:40 AM - 12:00 PM			<u>TEAM #14</u>	<u>TEAM #19</u>	<u>TEAM #20</u>	<u>TEAM #12</u>
12:20 PM - 1:40 PM	<u>TEAM #09</u>		<u>TEAM #11</u>	<u>TEAM #03</u>	<u>TEAM #22</u>	
2:00 PM - 3:20 PM		<u>TEAM #21</u>	<u>TEAM #18</u>	<u>TEAM #04</u>	<u>TEAM #16</u>	
3:40 PM - 5:00 PM		<u>TEAM #15</u>	<u>TEAM #17</u>	<u>TEAM #06</u>	<u>TEAM #13</u>	<u>TEAM #07</u>

ARB Suggestions

- **Don't present class stuff, we already know that!**
- **If your OCD, SSRD has changed, present a change summary and the modifications (say what has changed and show what has changed)**
- **Good to have a traceability matrix which basically shows the ripple of effect of changes in all documents**
- **SSAD: Focus on System Design**
- **LCP: Focus on CS577B**
- **FRD: Requirements Satisfaction; Risk Management; Stakeholder Concurrence**

Sample Change Traceability

From Team 13 – Fall

OCD

- Focus Shift: Generic COTS -> Spearmint
- Introduced Capability: Metamodel <- OCD 'wish-list'
- Evolutionary Requirements -> OCD 'wish-list'

SSRD

- Focus Shift: Generic Capabilities -> Spearmint Configuration
- Added OCD Capability: Metamodel

SSAD

- Focus Shift: Design -> Analysis
- Analysis: Mapping Spearmint Entities <-> MBASE Entities

LCP

- Focus Shift: Evaluation, Modeling -> Initial Working Set, VV & Beta Release
- Replanned: Efforts/Week 10-15 -> 95, 120, 160, 120, 120

FRD

- Special Emphasis on Savings, Breakeven & Risk Addressal
- Bumper Sticker: "Address Risks, Guarantee Breakeven & Prepare for Beta Release"

CMMI

-A Quick Primer-

Presentation for CS577A

Dr. Barry Boehm

Dr. Daniel Port

Dr. David Klappholz

CMMI – A Quick Primer

What's a process model?

- **A structured collection of elements that describe characteristics of effective processes.**
- **Processes in a model are typically proven by experience to be effective.**
- **Often called 'best practices'**
- **Some process models are for assessment**
 - **Capability Maturity Models, Process adequacy standards**
- **Some process models are for guiding practice**
 - **Waterfall, Spiral, MBASE, RUP**

CMMI – A Quick Primer

Why use a model?

- **Leverage on the community's prior experience**
- **Helps establish a shared vision in the community**
- **Provides a framework for decision analysis**
- **Often a good place to start...**

CMMI – A Quick Primer

Caveat!

- **Models are really simplified approximations of reality that provide insight**

“All models are wrong, but some are useful.”

- Dr. George Box, University of Wisconsin-Madison

- **Requires application of common sense**

“CMM is common sense.” - Mark C. Paulk, SEI

- **No one size fits all**

CMMI – A Quick Primer

What is a Capability Maturity Model (CMM)?

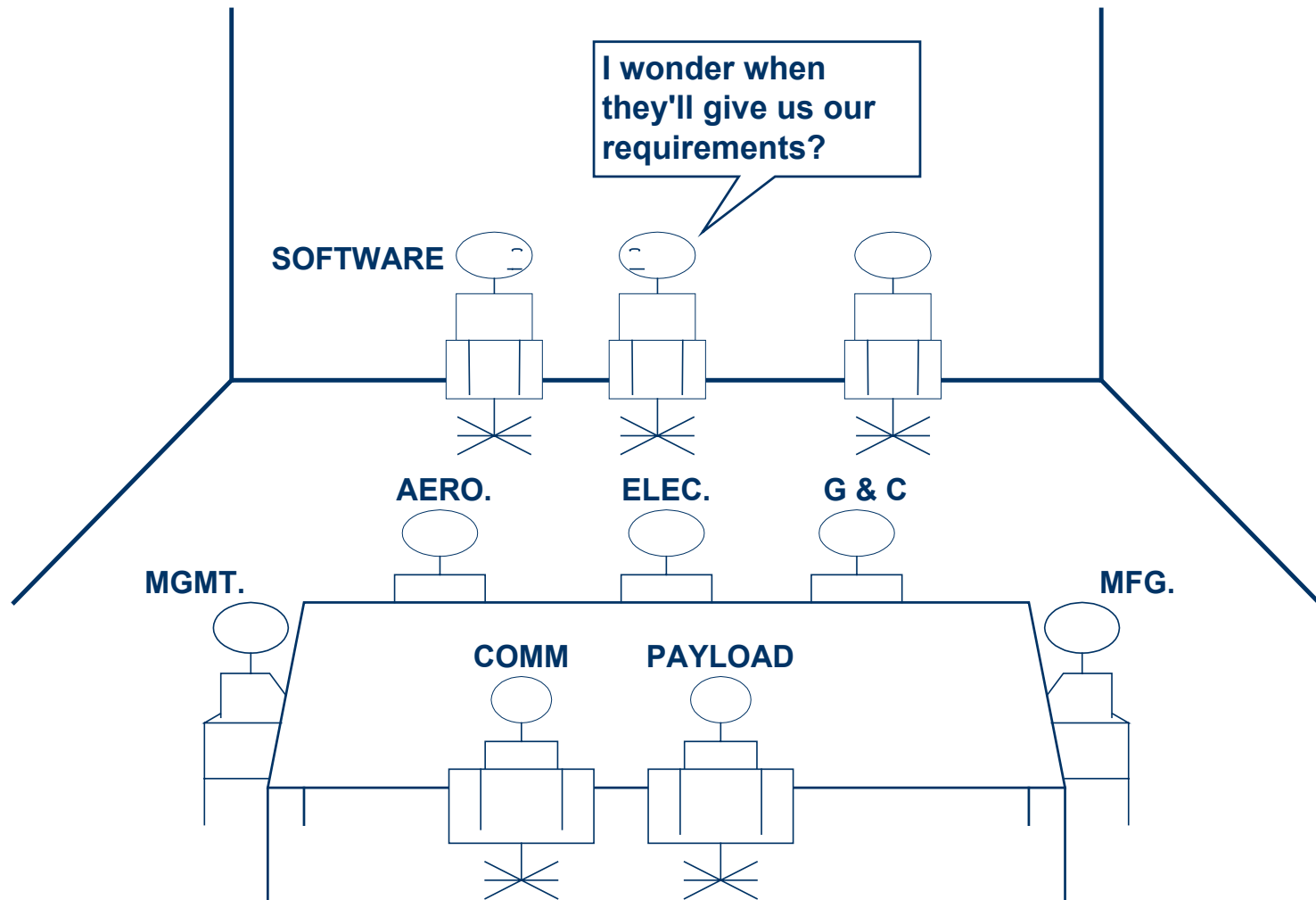
- **A reference model of mature practices in a specified discipline, used to assess a group's capability to perform that discipline**
- **CMMv1.1 was released in 1993 (v1.0 in 1987)**
- **Motivation to adopt CMM: Govt. companies said if you aren't level 2/3 you can't bid on contracts**

CMMI – A Quick Primer

CMM Shortfalls

- **CMM had traces of waterfall**
 - *Requirements Mgmt, Ability 1 -- “Analysis and allocation of the system requirements is not the responsibility of the software engineering group but is a prerequisite for their work.”*
- **Systems and software disciplines were not well integrated**
- **So many CMMs; Stovepipe development didn’t work**
- **Percent of requirements allocated to software**
 - **B-2: 65%, F-22: 80% (Standish Group)**
- **Required more compliance with ISO 15504**

CMMI – A Quick Primer



CMMI – A Quick Primer

CMMI

- Emerged in 2000
- Culminated from SW-CMM v2, draft C, EIA Interim Standard 731, SECM, IPD-CMM v0.98, draft
- 2 Representations: Staged & Continuous

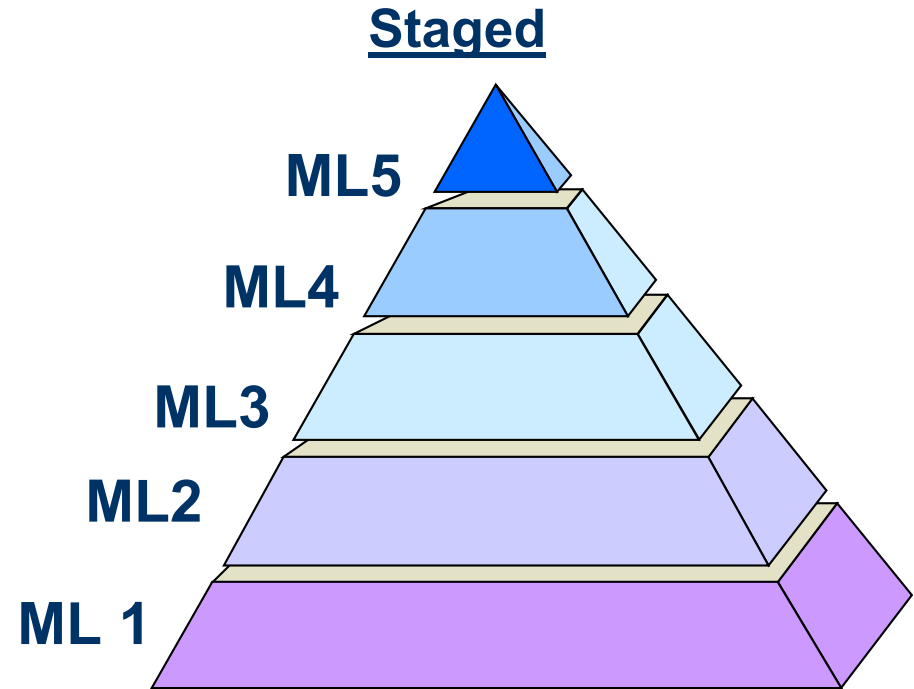
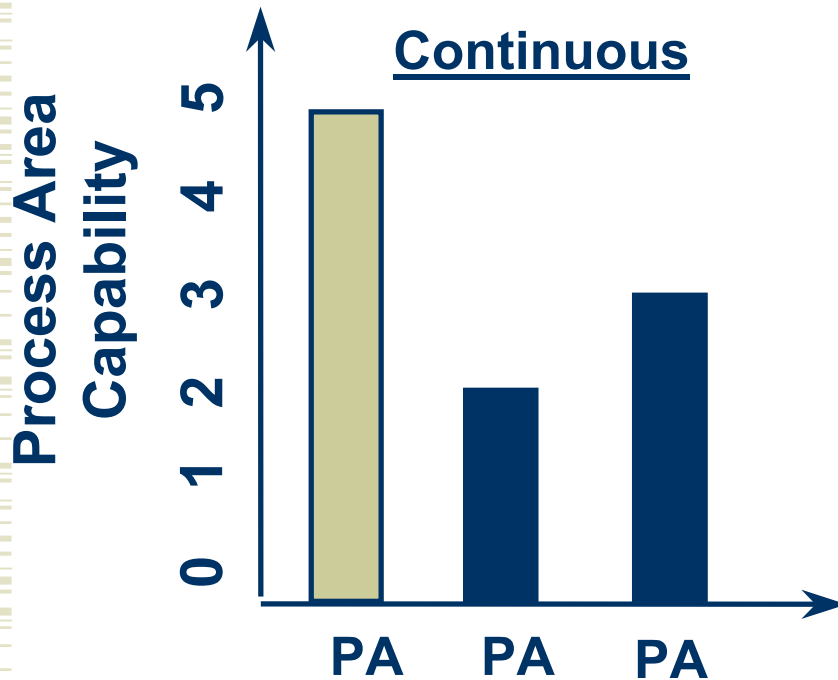
CMMI – A Quick Primer

CMMI

- **System and software engineering are integrated**
 - **Software has a seat at the center table**
- **Requirements, architecture, and process are developed concurrently**
 - **Along with prototypes and key capabilities**
- **Developments done by integrated teams**
 - **Collaborative vs. adversarial process**
 - **Based on shared vision, negotiated stakeholder concurrence**

CMMI – A Quick Primer

CMMI Representations



...for an established set of process areas across an organization

CMMI – A Quick Primer

CMMI Continuous Representation

- **Flexibility in aligning improvement focus that meets the organization's business objectives and mitigates the organization's areas of risk.**
- **Increased visibility within each individual process area.**
- **Because capability levels are measured by process area, comparisons across and among organizations can be made on a process area by process area basis.**

How to choose a representation?

CMMI – A Quick Primer

Organization of Process Areas

Category	Process Area
Project Management	Project Planning Project Monitoring and Control Supplier Agreement Management Integrated Project Management(IPPD) Integrated Supplier Management (SS) Integrated Teaming (IPPD) Risk Management Quantitative Project Management
Support	Configuration Management Process and Product Quality Assurance Measurement and Analysis Causal Analysis and Resolution Decision Analysis and Resolution Organizational Environment for Integration (IPPD)

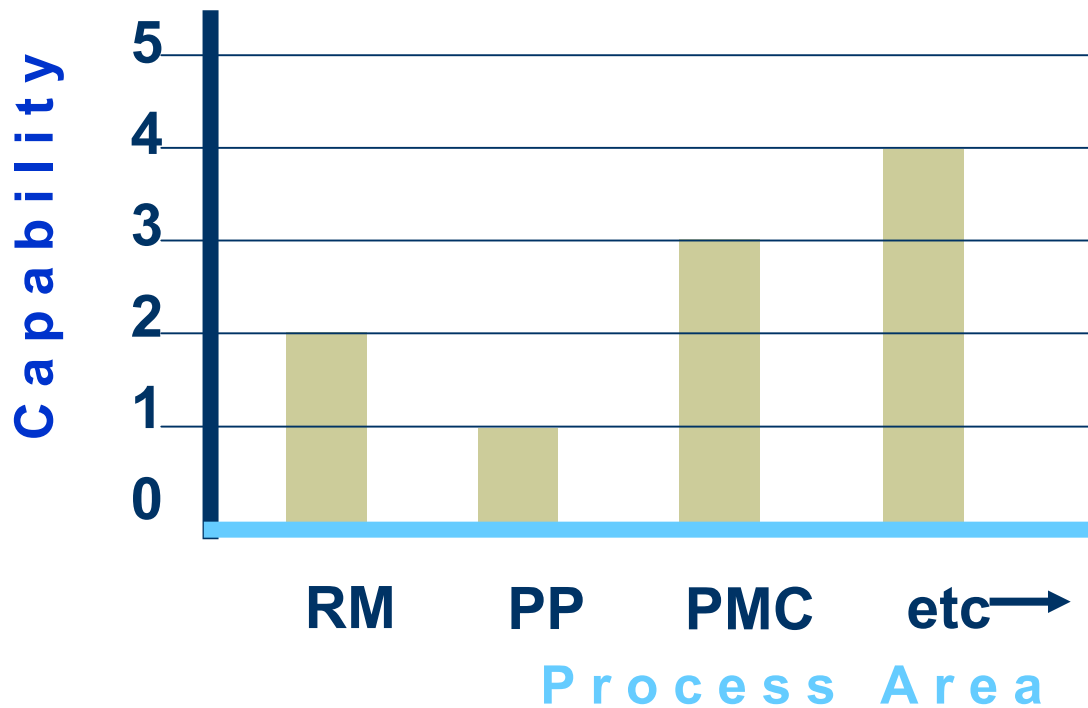
CMMI – A Quick Primer

Organization of Process Areas

Category	Process Area
Engineering	Requirements Management Requirements Development Technical Solution Product Integration Verification Validation
Process Management	Organizational Process Focus Organizational Process Definition Organizational Training Organizational Process Performance Organizational Innovation and Deployment

CMMI – A Quick Primer

Sample Profile (Continuous) – Sierra Mountainbikes Inc.



CMMI – A Quick Primer

Sample Profile (Staged)		Commitment to Perform	Ability to Perform	Activities Performed	Directing Implementation	Verification
Level 5	Causal Analysis and Resolution (Support) Org Innovation and Deployment (Process)					
Level 4	Quantitative Project Management (PM) Organizational Process Performance (Process)					
Level 3	Organizational Process Focus (Process) Organizational Process Definition (Process) Organizational Training (Process) Integrated Project Management (PM) Risk Management (PM) Decision Analysis and Resolution (Support) Requirements Development (Eng) Technical Solution (Eng) Product Integration (Eng) Product Verification (Eng) Validation (Eng)	Organizational policies	Organizational training		Standard metrics	Senior management review Quality Assurance organization
Level 2	Project Planning (PM) Project Monitoring and Control (PM) Configuration Management (Support) Product and Process Quality Assurance (Support) Supplier Agreement Management (PM) Data Management (Support) Measurement and Analysis (Support) Requirements Management (Eng)					

CMMI – A Quick Primer

CMMI Implementation Challenges

Need a model that is:

- **Well-grounded in software experience**
- **Supportive of all CMMI process area**
- **Tailorable to individual situation**
- **Specific about what to do**
- **Supportive of future software/system trends**
 - **RAD, CAIV/SAIV etc.**
- **Spiral Model? Almost. Needs some refinements**
- **MBASE? Provides key refinements, but project-level only**
- **CeBASE? Integrates MBASE and organization-level Experience Factory**



The CeBASE Strategic Method An Integrated Vision

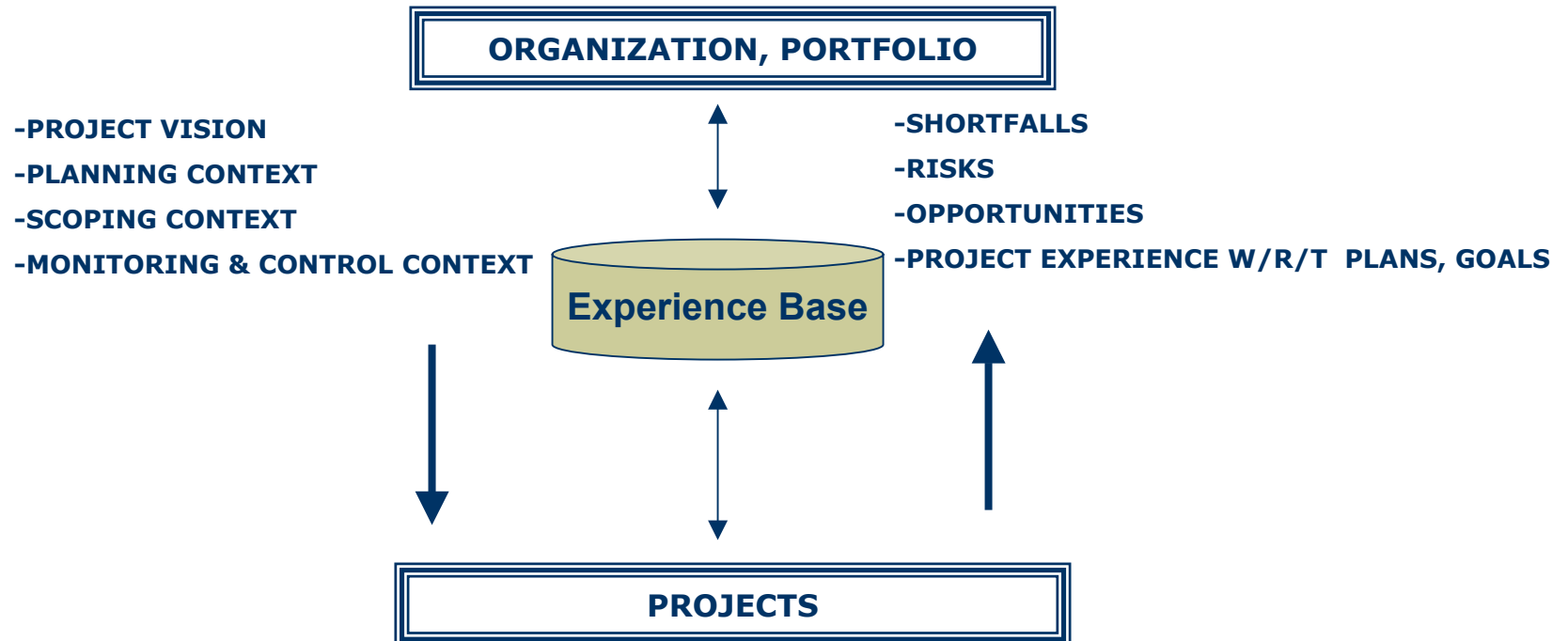
-A Very Rough Cut-

The CeBASE Strategic Method

- Software projects utilize models to manage, develop, rationalize, etc. products
- Software projects are initiated within organizations
- Organizations utilize models (often empirical) to help direct, manage, and evolve
- Prior experiences, existing practices, and new experiences are factors (corporate knowledge)
- Projects are elements of a portfolio of ongoing initiatives, not all of which are software related but have an impact

Is there a coherent view of all this?

The CeBASE Strategic Method



The CeBASE Strategic Method

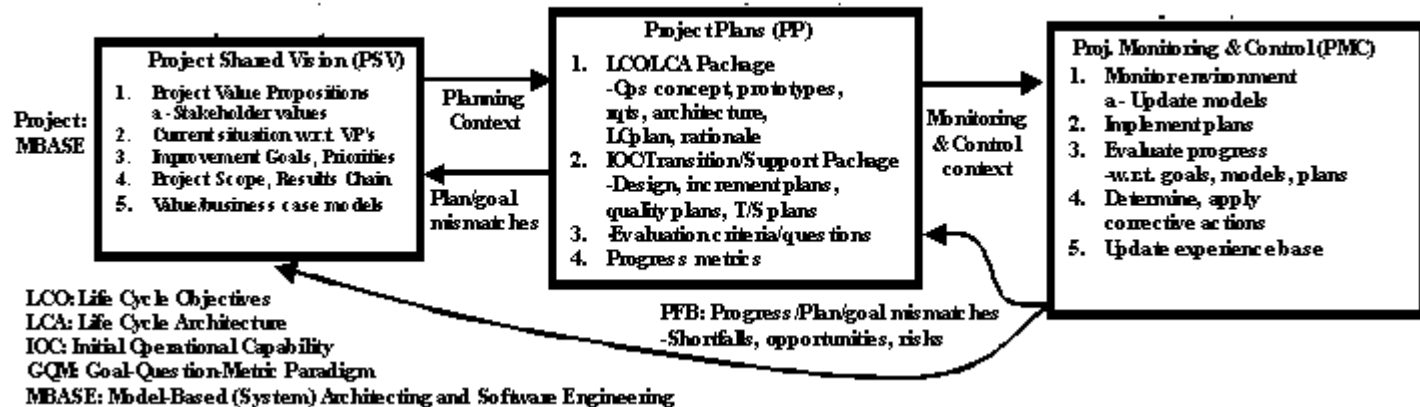
- CeBASE = OPM + MBASE + EF + GQM
- OPM: An organization's portfolio models representing mission, goals, value propositions, initiatives, business cases, results chains, profit/loss, profit sharing, resource competition, sales forecasting, etc.
- MBASE: A model based approach to software engineering which promotes nurturing projects from 'lust to dust'.
- EF: Packages experience by building informal and formal models and measures of various processes, products, and other forms of knowledge via people, documents, and automated support.
- GQM: A mechanism for defining and evaluating a set of operational goals [and strategies] using measurement.

The CeBASE Strategic Method

PROJECT MODELS

<p style="text-align: center;">SUCCESS MODELS</p> <ul style="list-style-type: none">-WinWin-Business Case Analysis-10X-Software Warranties-Award Fees-IKIWISI...	<p style="text-align: center;">PROCESS MODELS</p> <ul style="list-style-type: none">-Spiral-Waterfall-CMMs-BPR-Peopleware-Agile...
<p style="text-align: center;">PROPERTY MODELS</p> <ul style="list-style-type: none">-COCOMO-COCOTS-Function Point-System Dynamics, Metrics-Simulation and Modeling, Environment...	<p style="text-align: center;">PRODUCT MODELS</p> <ul style="list-style-type: none">-UML-COBRA-OOAD-Product Lines-COTS, GOTS...

The CeBASE Strategic Method



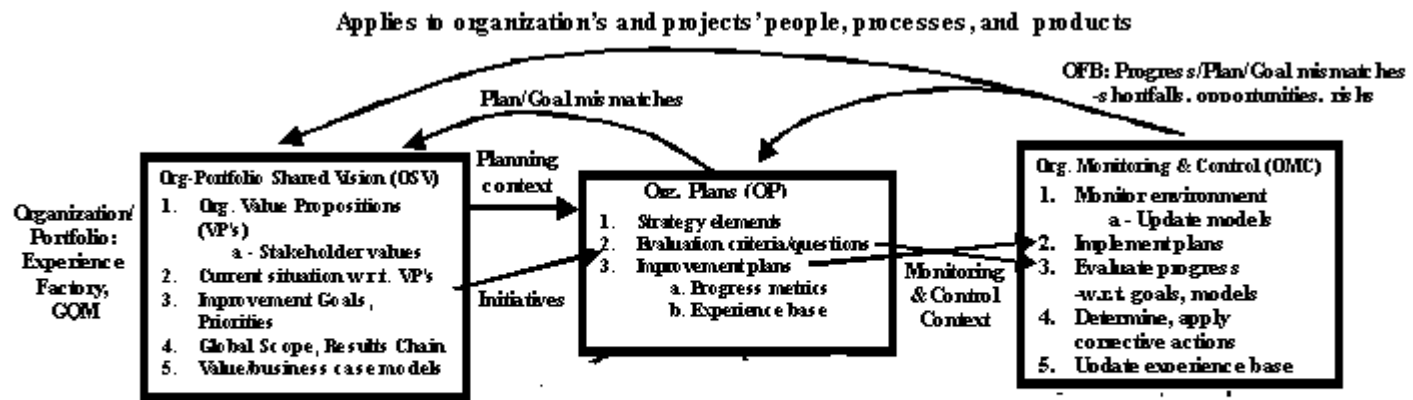
The CeBASE Strategic Method

ORGANIZATION MODELS

- Results Chain**
- Organization Business Case**
- Product Lines**
- Balanced Scorecards**
- Mission Statements**
- Value Proposition**
- Strategic Planning**
- Earned Value**
- Portfolio Management**

...

The CeBASE Strategic Method

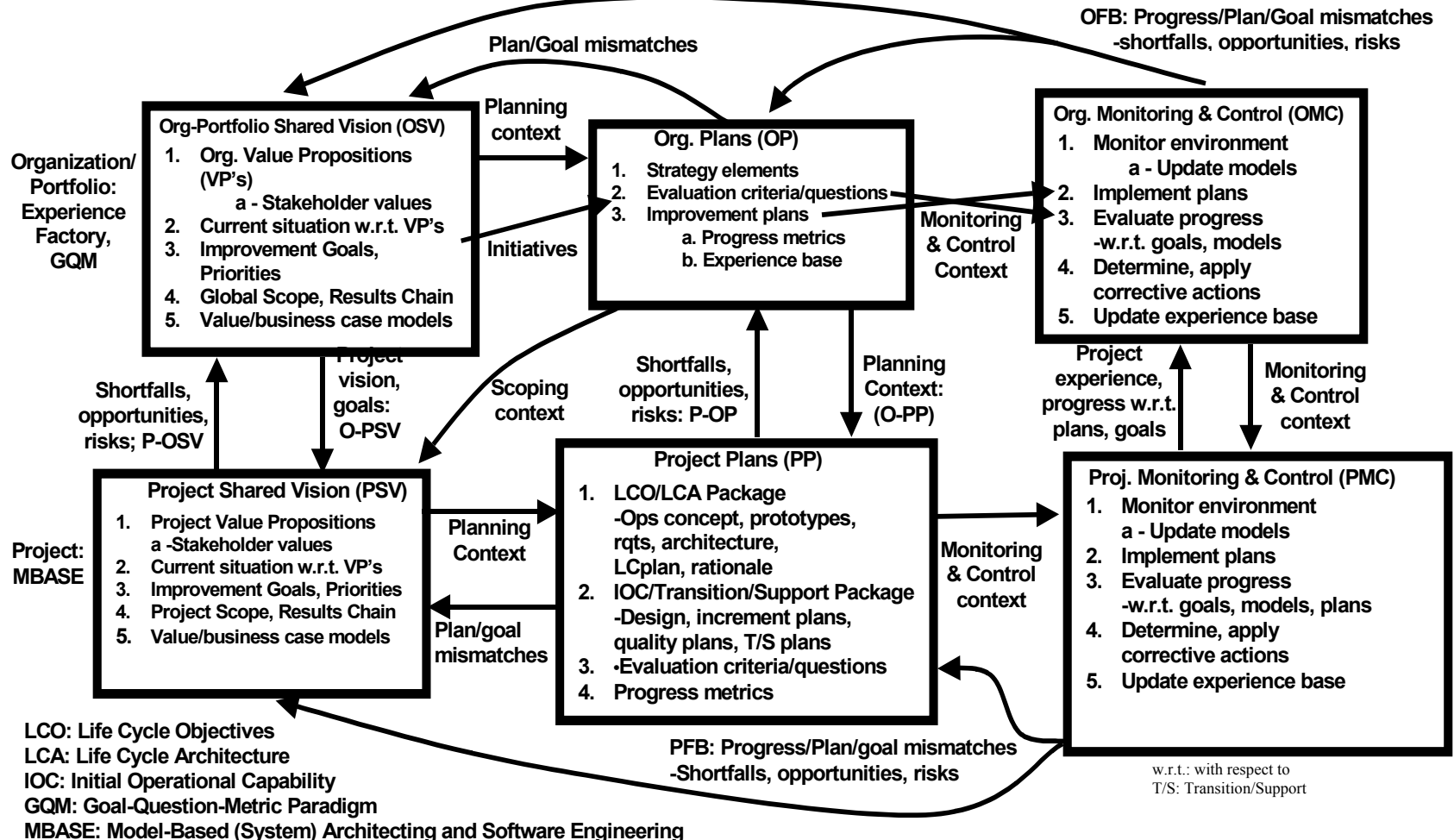


The CeBASE Strategic Method

- CeBASE Method “Integration” is key
- Spans across projects and programs and builds the notion of continuous improvement by managing portfolios.
- Risk Amortization
- Empirical Foundations
- Realistic (Refined) Goals
- Baselines, continuous monitoring and control, iteration

The CeBASE Strategic Method

Applies to organization's and projects' people, processes, and products



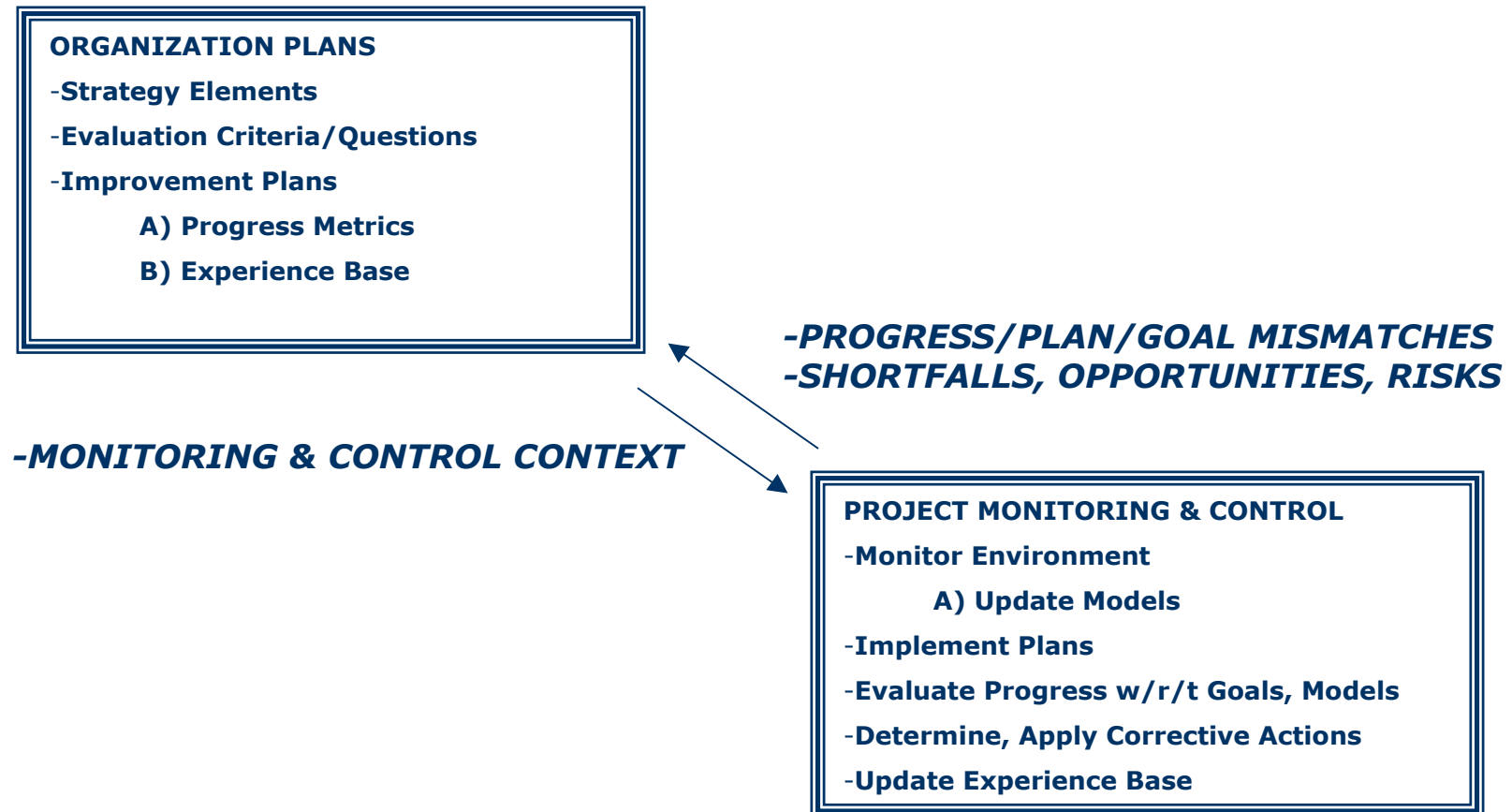
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ORGANIZATION MODELS



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ORGANIZATION MODELS



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ORGANIZATION MODELS

ORGANIZATION SHARED VISION

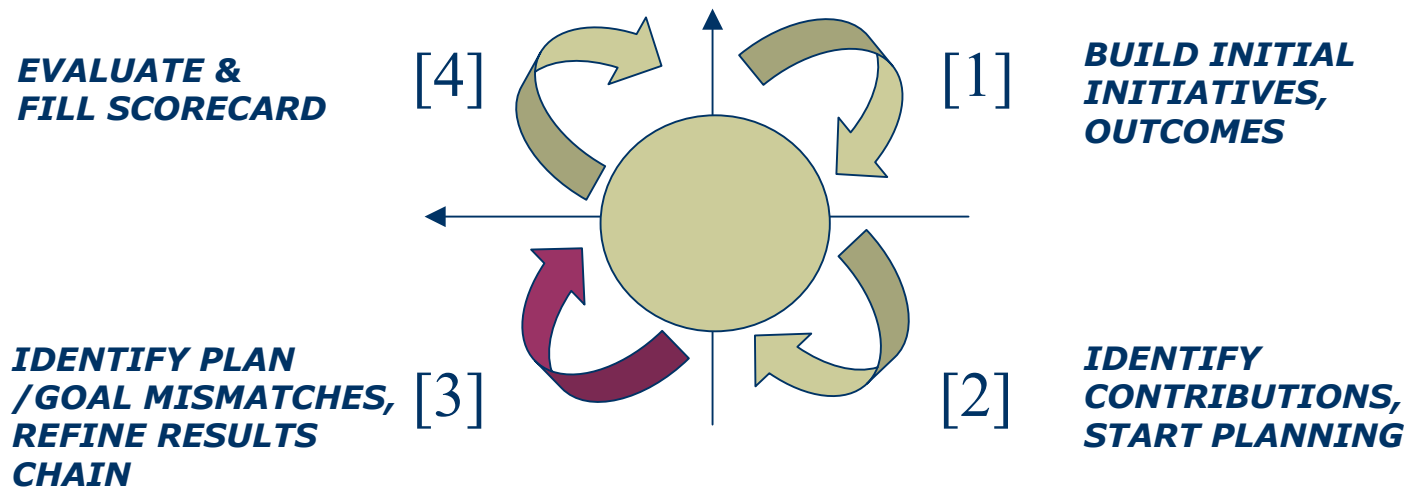
- Organization Value Propositions
 - A) Stakeholder Values
- Current Situation w/r/t OVPs
- Improvement Goals, Priorities
- Global Scope, Results Chain
- Value/Business Case Models

***-PROGRESS/PLAN/GOAL MISMATCHES
-SHORTFALLS, OPPORTUNITIES, RISKS***

PROJECT MONITORING & CONTROL

- Monitor Environment
 - A) Update Models
- Implement Plans
- Evaluate Progress w/r/t Goals, Models
- Determine, Apply Corrective Actions
- Update Experience Base

The CeBASE Strategic Method



The CeBASE Strategic Method

- Example CSE (Organization) & 577 (Portfolio)
- Organization Goals
 - Create software engineering technology addressing key future needs
 - Understand current needs; Infer future needs
 - Transition technology into practice
 - Affiliates program, research contracts
 - \$2-3 M/year: NSF, DARPA, DoD, NASA, FAA, industry
 - Grow future software engineering leaders
 - MSCS-SE, SE Certificate, Ph.D., internships

The CeBASE Strategic Method

— Stakeholders Contribution

- Principals: Provide research direction and establish a vision by understanding the key future needs of the industry. Support and guide PhD students in their area of research.
- Faculties: Provide state-of-art software engineering education to CS577 Students
- Students: Assist researchers in their ongoing research contracts. Assist faculties in CS577
- Administrative Staff: Provide administrative and executive support to the center.
- Affiliates: Provide empirical data for tools and technologies.
- Contractors: Provide funding for researching and experimenting new technology.

The CeBASE Strategic Method

— Stakeholders Contribution

Stakeholder Needs	Value Proposition	Stakeholder Contribution
Financial Support, Care, Advisor, Guidance	Provide financial support and guidance to students.	Students: Assist researchers in their ongoing research contracts. Assist faculties in CS577

The CeBASE Strategic Method

- Organization Goals with GQM and visibility to VP
 - Goal:
 - Grow future software engineering leaders
 - Questions:
 - What are the characteristics of SE Leaders?
 - What leaders need to know about SW-Product/Process Engineering?
 - What are industry expectations from SE leaders?
 - Metrics:
 - New PhD. and Masters admits vs. last year's admits
 - Employed vs. Unemployed CSE Alumni
 - Number of 577 students this year vs. last year
 - Number of supported vs. unsupported PhD. students
 - List of Publications
 - Number of references to published work by graduates

The CeBASE Strategic Method

— Current Situation

– Expected Outcomes:

- Recognition as a pre-eminent organization in SE Education
- Significant contribution to SE empirical base of knowledge
- Increase in new admits

– Current Initiatives:

- Teach 577

The CeBASE Strategic Method

— Current Situation

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– Current Initiatives:

- Teach 577

The CeBASE Strategic Method

Current Situation

- Map Initiatives with Outcomes
 - Gap Analysis & Prioritization
 - Refine Organization Goals
 - List new Improvement Goals
- Build new tools for 577?
- Integrate existing tools?

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Global Scope, Results Chain

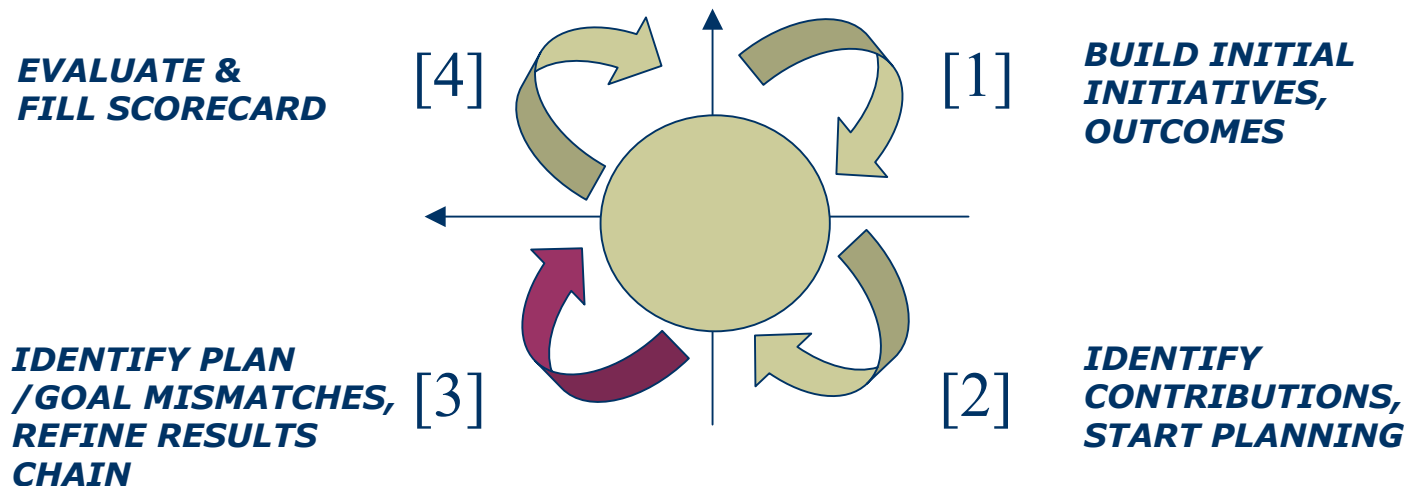
- Gain visibility into the organization's improvement program, current situation and required improvements.
- Projected Initiatives/Outcomes:
 - Redo results chain (expected outcomes) with respect to refined goals and gap analysis done in section 3.1.2 and 3.1.3. Support modifications such as additions, refinements with a rationale in a tabular format.

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Value Business Case Models

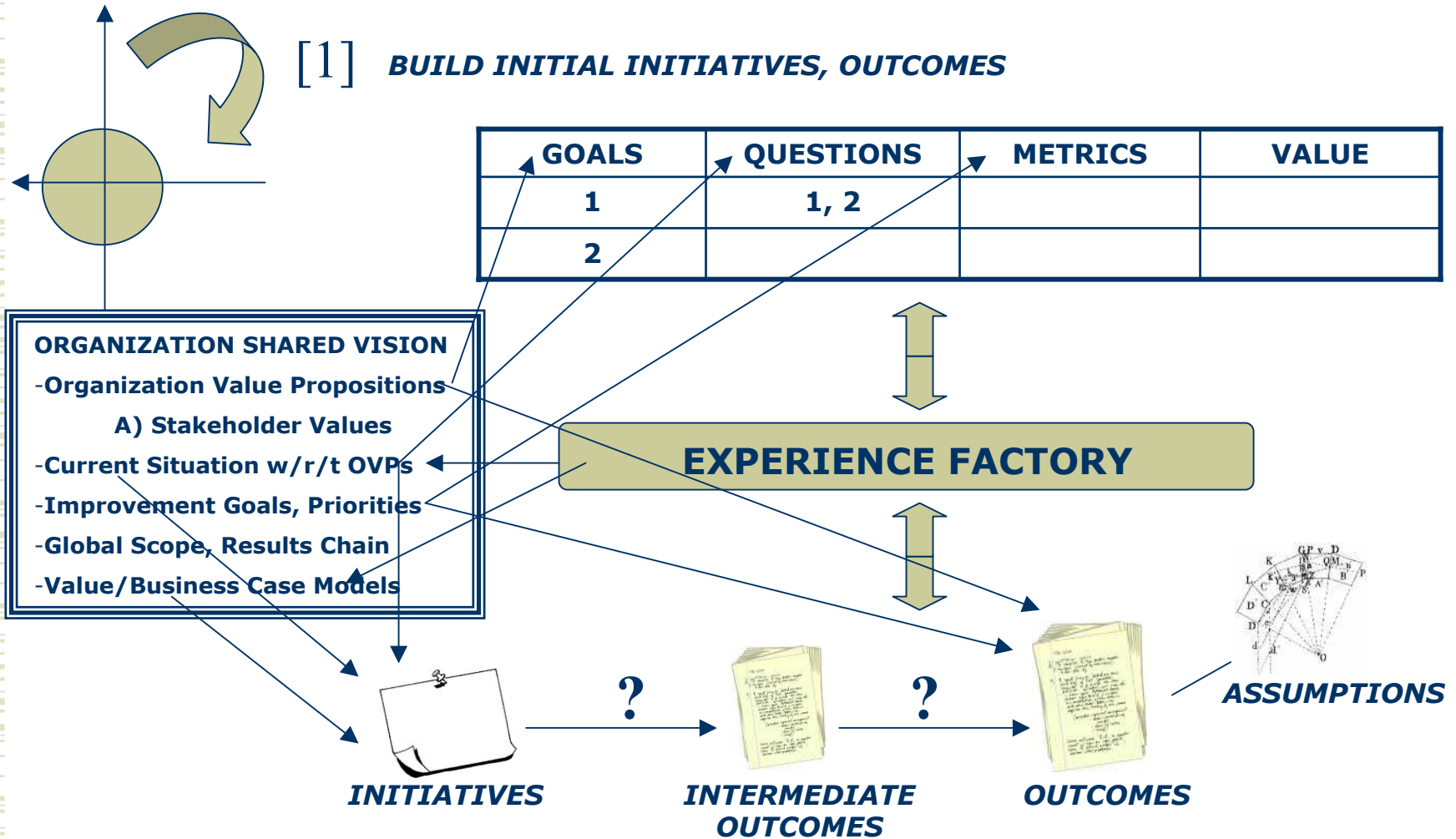
- Cost of Initiatives
 - What's involved in sponsoring projects for 577?
 - Cost of time of CSE Personnel
 - Just goes on..
- Value of Outcomes
 - 577 data portable to experience base
 - Understanding of SE needs
- Risk of Initiatives
 - Example – 577 Stovepipes, 2002
 - The list goes on..
- Feasibility Analysis

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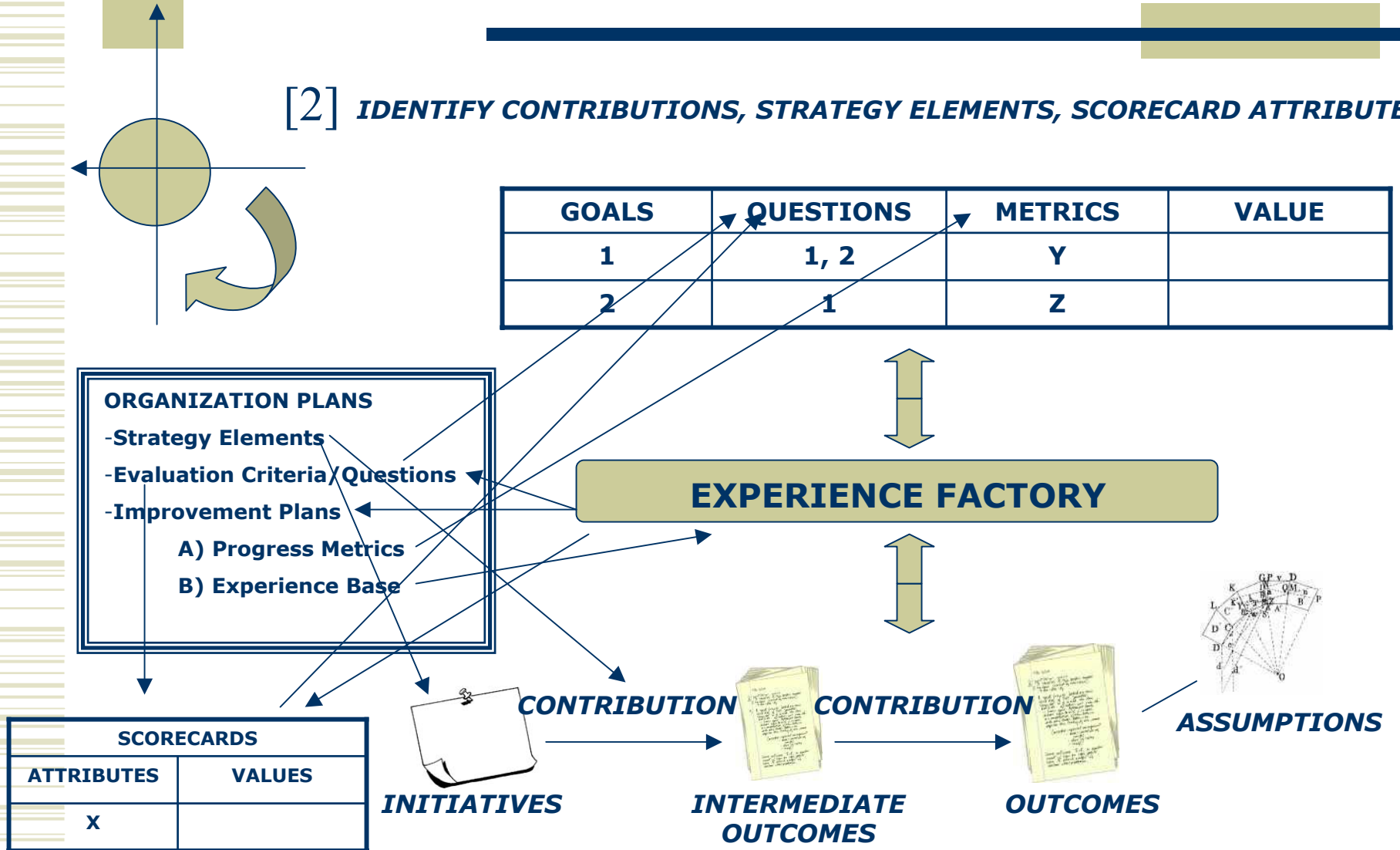
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[1] **BUILD INITIAL INITIATIVES, OUTCOMES**



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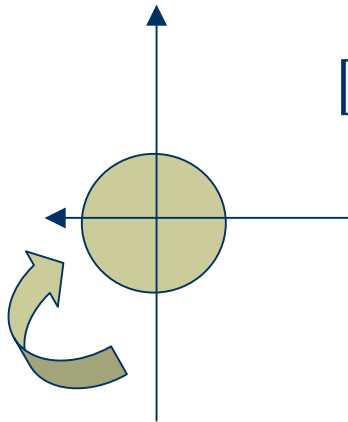
[2] IDENTIFY CONTRIBUTIONS, STRATEGY ELEMENTS, SCORECARD ATTRIBUTES



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[3] IDENTIFY PLAN/GOAL MISMATCHES, REFINE RESULTS CHAIN

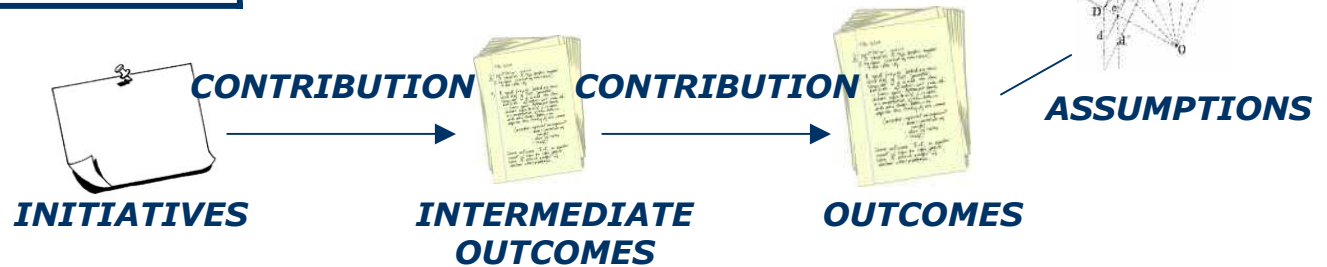
GOALS	QUESTIONS	METRICS	VALUE
1	1, 2	X	
2	1	X	



RECONCILE

- MISSING INITIATIVES FOR OUTCOMES
- MISSING OUTCOMES FOR INITIATIVES
- MISSING CONTRIBUTIONS
- CONTRADICTORY ELEMENTS/ASSUMPTIONS
- INCOMPATIBLE GQM WITH RESULTS CHAIN
- CONTRIBUTION W/ NO INITIATIVE OR OUTCOMES

EXPERIENCE FACTORY



The CeBASE Strategic Method

[4] MONITOR, EVALUATE – FILL SCORECARDS

GOALS	QUESTIONS	METRICS	VALUE
1	1, 2	X	XZ
2	1	X	XZ

ORGANIZATION MONITORING & CONTROL

- Monitor Environment
 - A) Update Models
- Implement Plans
- Evaluate Progress w/r/t Goals, Models
- Determine, Apply Corrective Actions
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SCORECARDS	
ATTRIBUTES	VALUES
X	

EXPERIENCE FACTORY

BASELINES

INITIATIVES

CONTRIBUTION

INTERMEDIATE OUTCOMES

CONTRIBUTION

OUTCOMES

ASSUMPTIONS

% ATTRIBUTES

