



Software Engineering Improvement

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OUTLINE

- WHY INVEST IN IMPROVEMENT
- WHY USE SEI CMMIMPROVEMENT (CHANGE) FROM PEOPLE STANDPOINT
- DIFFICULT AREAS
- FUTURE ACTIVITIES



WHY INVEST TIME & MONEY IN IMPROVING SOFTWARE DEVELOPMENT



- GENERALLY, THIS QUESTION IS NOT DIFFERENT IN KIND FROM THE QUESTIONS: WHY ADOPT INNOVATIONS? WHY INVEST IN NEW TECHNOLOGY?
 - THESE QUESTIONS ARE ROOTED IN THE TYRANNY OF THE STATUS QUO.
 - TWO FACTIONS – THOSE WHO BELIEVE IN THE STATUS QUO AND THOSE WHO DO NOT
 - 85% OF THE PEOPLE BELIEVE THAT THE WAY THINGS ARE IS THE WAY THAT THEY OUGHT TO BE
 - WHEN MINDS ARE FIRMLY MADE UP, THEY ARE DIFFICULT TO CHANGE – LIKE TEACHING AN ELEPHANT TO FLY
- SPECIFICALLY, THE STATUS QUO OF SOFTWARE DEVELOPMENT IS SUCH THAT IT PROVIDES GREAT OPPORTUNITIES
 - PESSIMIST, OPTIMIST, SOFTWARE ENGINEER
 - SEE NEXT CHART



COMMERCIAL SOFTWARE PERFORMANCE



- **INFORMATION TECHNOLOGY PROJECTS IN 1995: \$250 BILLION**
 - \$59 BILLION WERE SPENT ON OVERRUNS
 - \$81 BILLION WERE SPENT ON CANCELED PROJECTS
- **PROJECT RESULTS**
 - 16% WERE SUCCESSFUL
 - 53% WERE TROUBLED
 - 31% WERE CANCELLED
- **ON AVERAGE**
 - COSTS WERE 189% OVERTARGETS
 - SCHEDULES AVERAGED 130% LONGER THAN PLANNED
 - ONLY 42 % OF THE INTENDED FUNCTION WAS DELIVERED



WHY USE SEI CMM FOR SOFTWARE ENGINEERING IMPROVEMENT

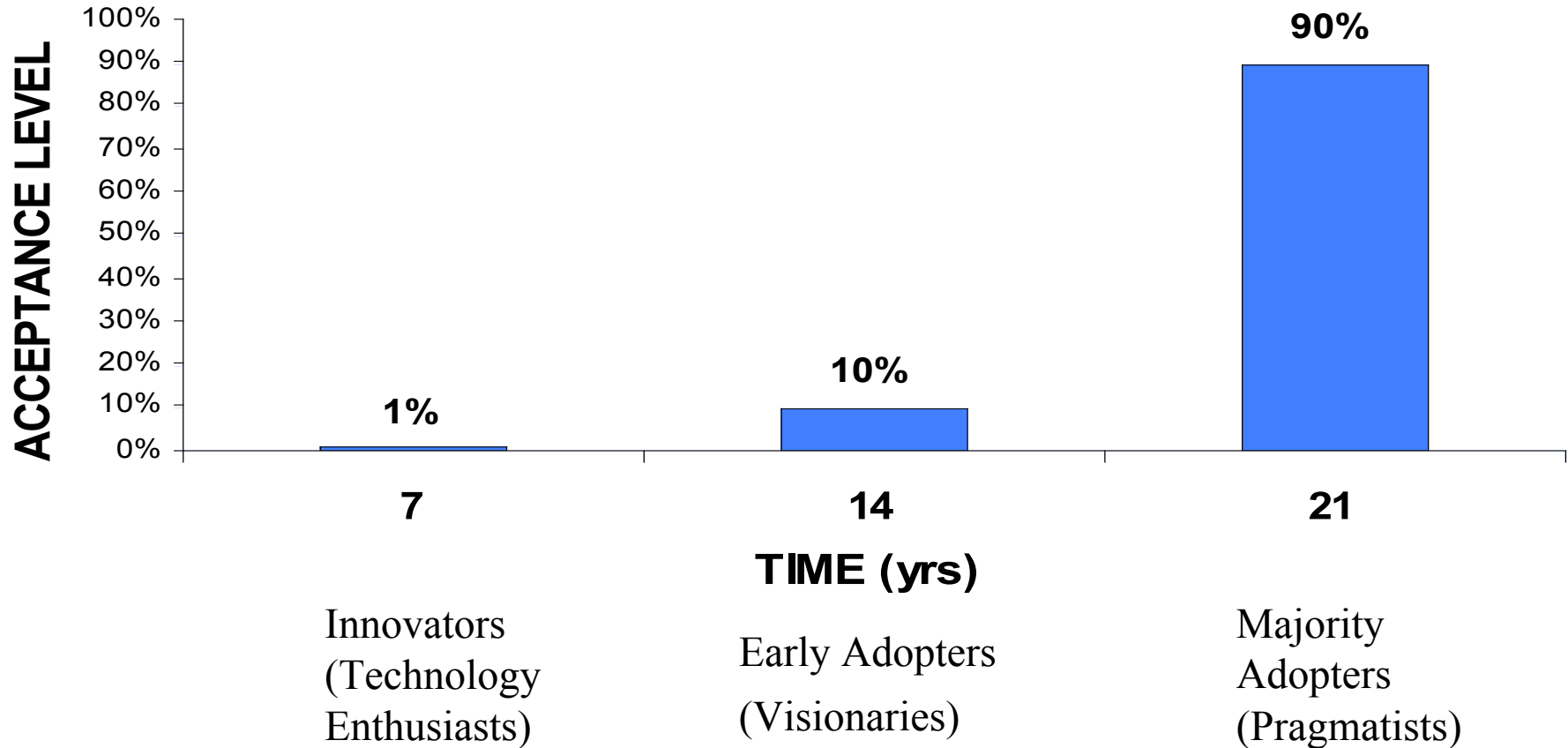
- SEI ESTABLISHED IN 1984 TO HELP IMPROVE SOFTWARE ENGINEERING IN DoD AND ITS CONTRACTORS IN 1996 THE SECRETARY OF THE ARMY SET A GOAL FOR ITS LIFE CYCLE SOFTWARE ENGINEERING CENTERS TO REACH AN SEI LEVEL III CAPABILITY IN DEC 00, GAO COMPLETED FOR THE SENATE ARMED SERVICES COMMITTEE A COMPARISON OF SELECTED DoD COMPONENTS' SOFTWARE/SYSTEMS PROCESS IMPROVEMENT PROGRAMS AGAINST SEI'S IDEAL MODEL SEI CMM IS GENERALLY ACCEPTED AS BEING MORE DEMANDING THAN ISO 9001
- ANOTHER SPECIFIC GIVEN IN NEXT SUBJECT



IMPROVEMENT FROM PEOPLE STANDPOINT



DIFFUSION OF INNOVATIONS



* New Paradigm (Complete Shift in Thinking) – Chasm between early adopters and majority adopters.



NUMBER OF ORGANIZATIONS USING SEI CMM

	<u>YEAR</u>	<u>NO. OF ORGANIZATIONS</u>
(7YRS AFTER SEI ESTABLISHED)	1991	130
	1998	965
	1999	1177
	2000	1380



IMPROVEMENT (CHANGE – INNOVATION ADOPTION) FROM PEOPLE STANDPOINT



- IT APPEARS THAT THE SEI CMM QUALIFIES AS A GENUINE SUCCESSFUL INNOVATION
- THE FOREGOING BEING TRUE, WE CAN EXPECT RAPID EXPANDED USE OF THE SEI CMM PRODUCTS
- SINCE THE SEI CMM CAPABILITY LEVEL RATING INHERES IN THE LOWEST COMMON DENOMINATOR, EVERY MEMBER OF THE WORKFORCE IS IMPORTANT IN THE IMPROVEMENT PROCESS. ANY WEAK LINK IN THE CHAIN RENDERS THE CHAIN NO STRONGER THAN THAT LINK
 - Government- Contractor Team
 - Division Chiefs
 - QMB Members
 - Project Team Leaders
 - Project Members
 - CM Personnel
 - QA Personnel
 - Business Office Personnel
 - Secretaries
 - Support Personnel



IMPROVEMENT (CHANGE-INNOVATION ADOPTION) FROM PEOPLE STANDPOINT

- BUT NOW WHAT IS OUR OBJECTIVE?
 - THE PROCESS IS A TOOL, A MEANS
 - A RATING LEVEL, ANY LEVEL, IS NOT THE OBJECTIVE

THE OBJECTIVE IS A HIGH TECHNOLOGY, HIGHLY PRODUCTIVE (SUSTAINABLE) SATISFIED WORKFORCE THAT CAN SATISFY CUSTOMERS NEEDS

- SO PEOPLE IS THE CENTRAL THEME

NATURE OF MAN

RISING TIDE – JOHN M. BARRY – NATURE IS THE PERFECT SYSTEM

“PART OF THE ESSENCE OF BEING HUMAN IS MAKING CHOICES” (THE INVISIBLE HEART – RUSSELL ROBERTS)



IMPROVEMENT (CHANGE-INNOVATION ADOPTION) FROM PEOPLE STANDPOINT (CONT'D)



- **SINCE MAN'S NATURE IS TO MAKE CHOICES (EXECUTING RESPONSIBILITY), ANY DELIBERATE OR INADVERTANT UNNECESSARY SUPPRESSION OR RESTRICTION OF THIS NATURE OF MAN WILL DIMINISH HIS REACHING FULL POTENTIAL**
- **SO THE WORKFORCE HAS TO DEFINE THEIR PROCESSES AND PROCEDURES. THIS IS THE REASON THAT ORGANIZATIONS CANNOT SIMPLY TAKE AND USE THOSE PRODUCED BY OTHERS (THEY ARE USEFUL AS GUIDES)**



IMPROVEMENT (CHANGE-INNOVATION ADOPTION) FROM PEOPLE STANDPOINT (CONT'D)



SOFTWARE ENGINEERING IMPROVEMENT (AS IN ANY ENDEAVOR) IS ENHANCED TO THE EXTENT THAT REAL RESPONSIBILITY FOR IT IS INHERED IN THE WORKFORCE (EVERYONE) THAT HAS A VESTED INTEREST IN THE ORGANIZATION'S SOFTWARE ENGINEERING MISSION



DIFFICULT AREAS



- MAKING ESTIMATES FOR LARGE PROJECTS
- TRAINING
- METRICS



MATURITY SUMMARY – 3 ORGANIZATIONAL TRENDS



- SOFTWARE QUALITY ASSURANCE IS THE LEAST FREQUENTLY SATISFIED LEVEL II KPAs AMONG ORGANIZATIONS* ASSESSED AT LEVEL I INTEGRATED SOFTWARE MANAGEMENT AND TRAINING PROGRAM ARE THE LEAST FREQUENTLY SATISFIED LEVEL 3 KPAs AMONG ORGANIZATIONS* ASSESSED AT LEVEL II HIGHER MATURITY HAS BEEN REACHED AMONG THOSE ORGANIZATIONS REPORTING REASSESSMENTS



FUTURE ACTIVITIES



- WE ARE CORRECTING WEAKNESSES IDENTIFIED IN OUR LAST ASSESSMENT
- PURSUE CMMI
- BEGIN USE OF PSP/TSP



RESULTS OF USING PSP/TSP *



Category	Without TSP	With TSP
Effort Deviation (% average, range)	17% -60% to +100%	-4% -25% to +25%
Schedule Deviation (% average, range)	41% -50% to +150%	5% -8% to +20%
System test defect density (defect/KLOC)	1 to 8	0 to 0.9
Acceptance test & release defect density (defects/KLOC)	0.55 to 0.75	0 to 0.35
Duration of system test (days/KLOC)	1 to 7	0.1 to 1.1

* Four projects/organizations.

Defect Density reduced by 70% to 95% across the four projects.