Practical Application of the SPI for Software Maintenance Organization

October, 2005

TQMS

Services, Solutions and Systems Provider for Total Quality Management

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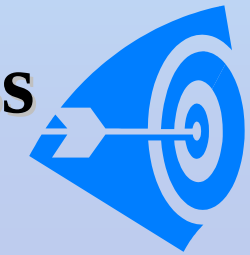
SEI Authorized CMMI/CMM Lead Appraiser

TQMS Prime Consultant

Agenda

1. PI Implementation Strategy
2. Transition to High Maturity Level
3. Inspection Data Management System
4. SM Data Collecting System
5. Understanding Quantitative Process Management



1. PI Implementation Strategy

1.1 PI Implementation Scope

Process Infrastructure

- **Define Standard Process**
  - Select key processes and define standard processes
- **Develop standard templates for tasks/services**
  - Define standard templates by task/service category

Select Process metric

- **Select metric by process**
  - Collect and analyze process Implementation data
- **Collect and analyze defect data**
  - Intensive management on defect data directly related on SW products

Organize PI Expert Group

- **Organize Process Improvement Group**
- **Train Process Improvement Group**
  - Specialize PI Group
  - Self Support

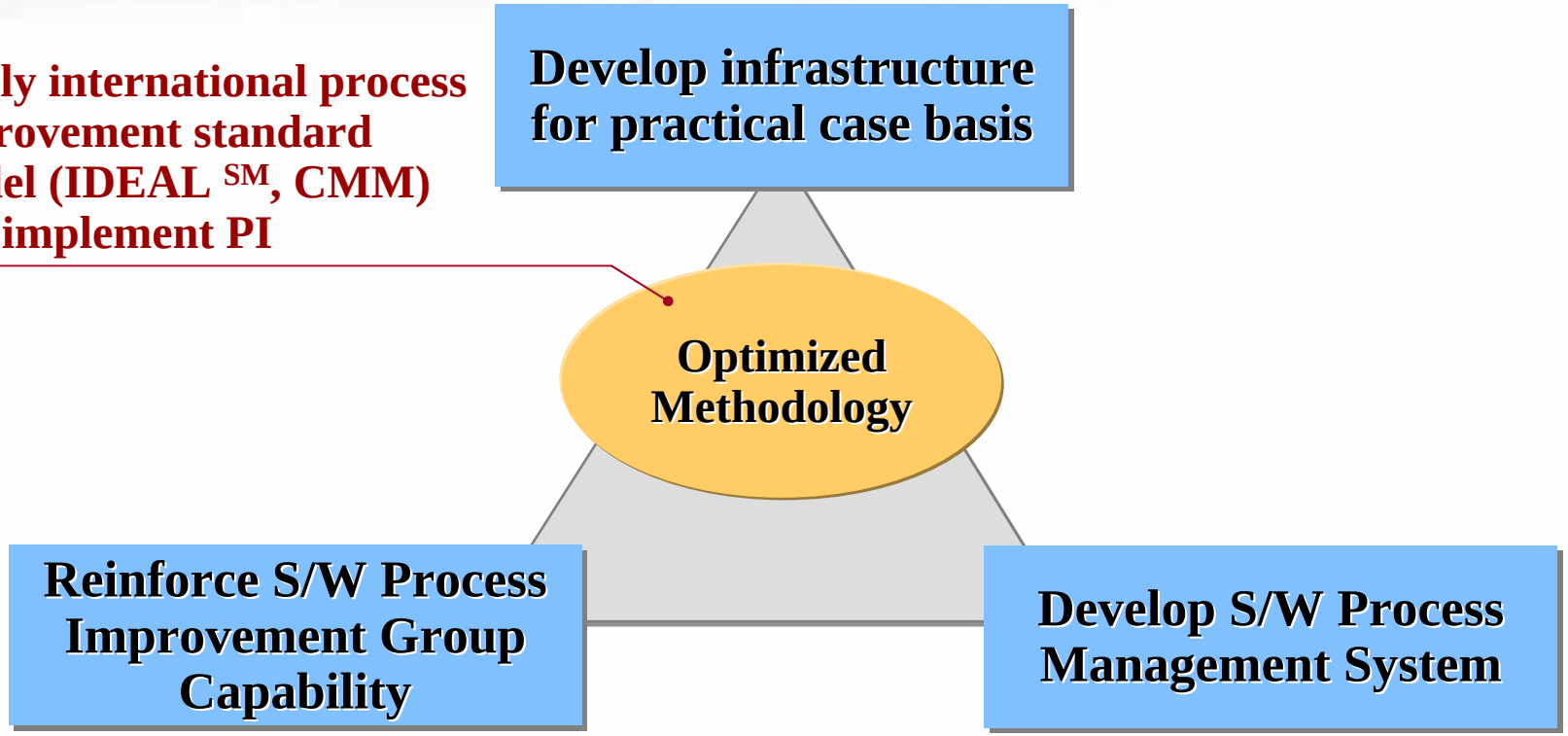
Process Management & Supporting Infrastructure

- **Process Asset Library Design & Development**
  - S/W Standard Process
  - S/W Process Asset Library
- **Process Measurement DB Design**
  - Design PMDB for monitoring and managing process implementation progress

*** PI: Process Improvement**

1.2 Optimized Methodology for PI

Apply international process improvement standard model (IDEAL SM, CMM) and implement PI



SM IDEAL is a service mark of Carnegie Mellon University

1. PI Implementation Strategy

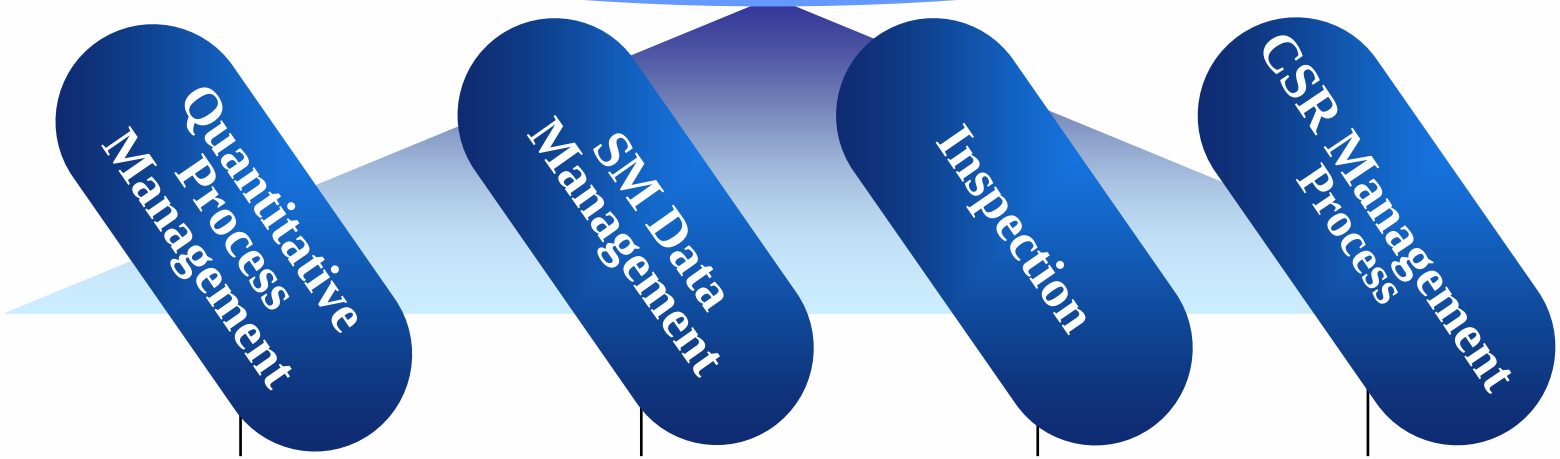
1.3 S/W PI Methodology

Step	Key Tasks
AS-IS Analysis	• Analyze process gaps based on CMM(I) • Identify organization's requirements and improvement opportunities
Organize Process Improvement Group	• Build PI plan and targets based on AS-IS analysis results • Develop PI plan and detailed schedule by PI task • Organize SEPG and provide training
Develop Standard Processes & Infrastructure	• Design process architecture based on job function model then analyze impact & risks • Define processes in detailed level and select process measurement data • Construct process repository and establish change management system
Review & Application	• Run pilot project for the new processes defined • Refine processes based on pilot results
Gap Analysis	• Gap Analysis (Product review, Interviews) → Identify gaps
PI Plan Implementation	• Build PI Plan → Continuous monitoring on implemented processes • Optimize processes by taking corrective actions
Formal Assessment	• Organize assessment team → Formal Assessment

1.4 Key Tasks for Quantitative Process Management

Purpose of CMM(I) Implementation

- Strengthen Organization's Capability
- Develop stabilized maintenance system
- Improve service quality



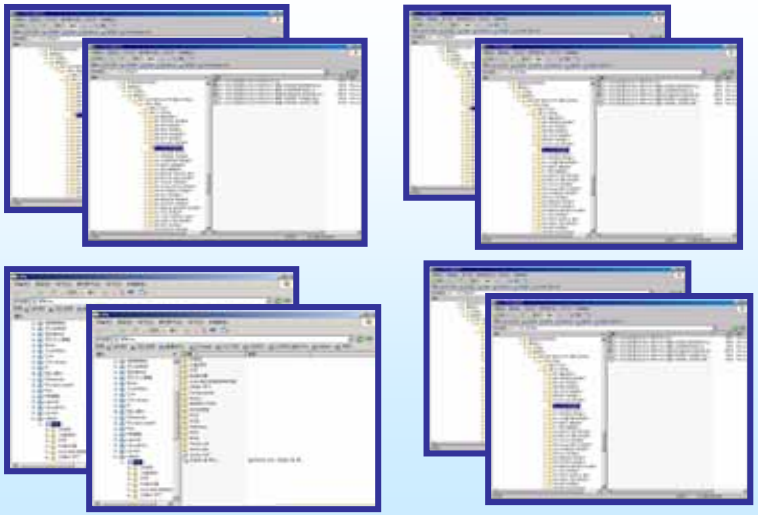
Develop Quantitative Quality Management System	Provide Stabilized Maintenance System	Defect Management and prevention	Quantitative CSR Management

2. Transition to High Maturity Level

2.1 Refine Process Asset Library (1/2)

Level 2 – Documentation

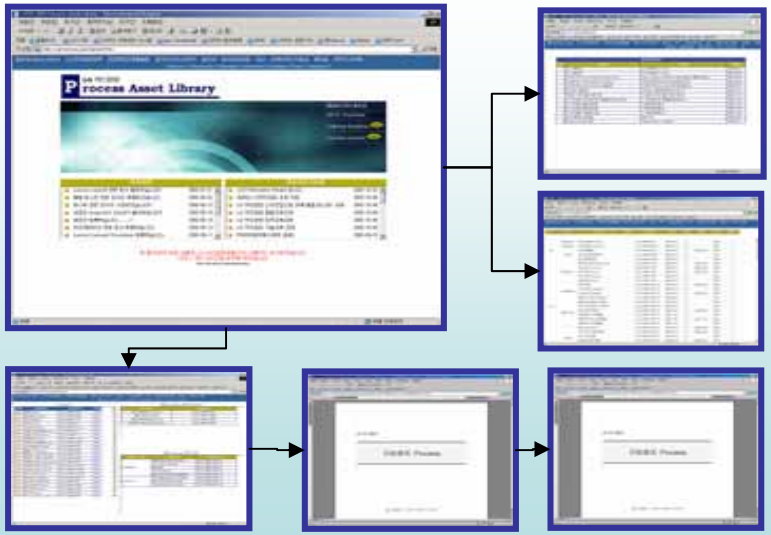
Manage existing quality documents



- Dispersed documents under numbers of servers and directory
- Isolate access of developers on basic documents related to processes
- Not easy to run Configuration Management on quality documents
- Hard for developers to use reference materials

Level 3 – PAL

Quality Documents Library



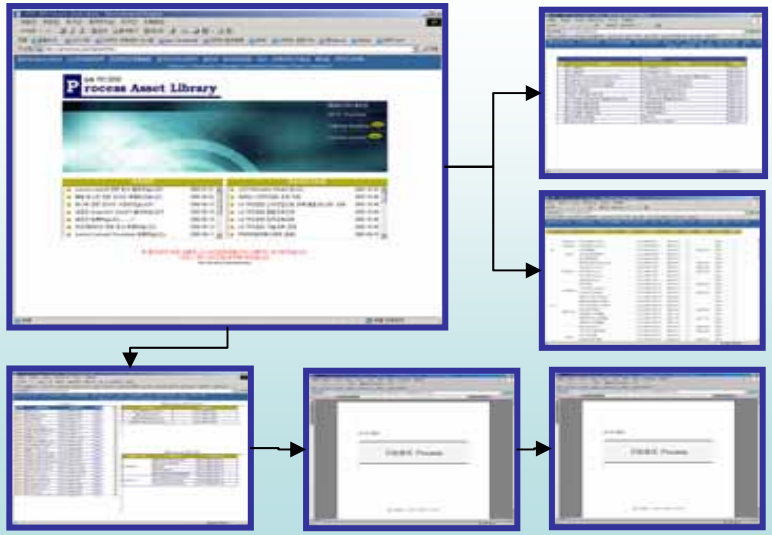
- Integrate quality documents related to development
- Easy to access with Web base
- Easy to manage configuration of processes and quality documents
- Easy for developers to use reference materials

2. Transition to High Maturity Level

2.1 Refine Process Asset Library (2/2)

Level 3

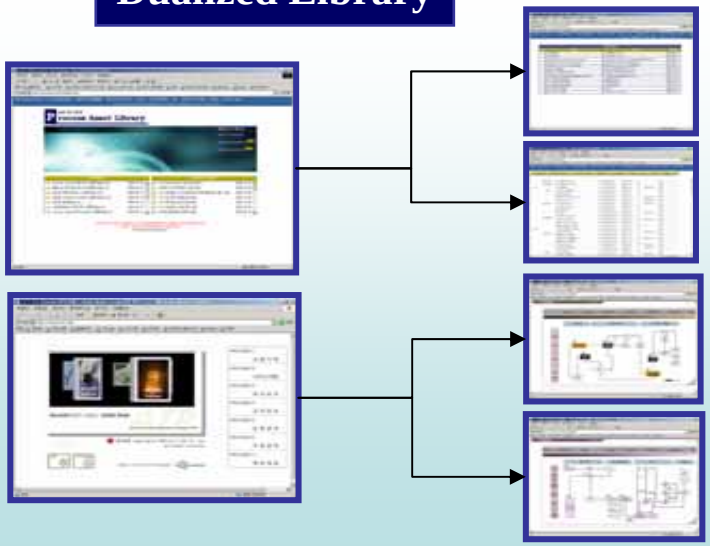
Quality Documents Library



- Rise the needs of Quality Documents Library on maintenance aspects
- Gaps existing between system maintenance and development

Level 4

Dualized Library



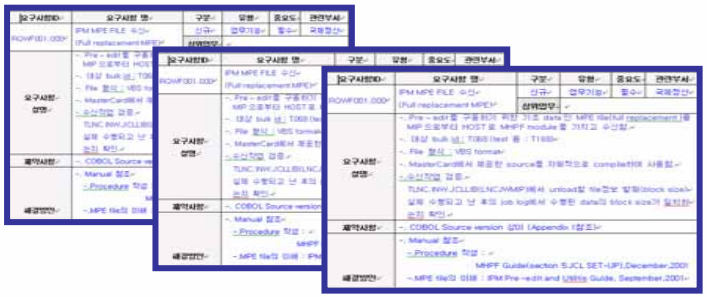
- Separate management on process library for maintenance and development
- Maintenance library includes areas of account management

2.2 Requirement Management Process (1/3)

L2: Requirement Specification

- Identify customer needs
- Specify functional/non-function requirements

Requirement Specification



Design Specification

L3: Requirement Tracking Matrix

- Identify relationship between requirements and work products
- Analyze impact of requirement changes
- Able to trace back to requirement in case of defects found

Requirement Traceability Matrix

요구사항 ID	SYSTEM	PROC_ID	No	PGM_ID	단위테스트 케이스 ID	통합테스트 ID
RQWF001.000	IPM MPE FILE 수신 (full replacement MPE)	LNCAWP50	1	MHPF		
RQWF002.000	IPM MPE FILE 수신 (update MPE)	LNCAWP5A	2	MHPF		
RQWF003.000	MPE optimized	LNCAWMC1	3	Pre-edit		
	MPE optimized	LNCAWMC3	4	Pre-edit		
	MPE optimized	LNCAWMC5	5	Pre-edit		
	MPE optimized	LNCAWMCC	6	Pre-edit		
RQWF004.000	IPM 이용수신	LNCAWP5C	7	MHPF		IT-AF-001
RQWF005.000	IPM 해외이용 FILE 검증	LNCAWP5D	8	LNCBWP50	UT-LNCBWP50-001	IT-AF-003
						IT-AF-004
						IT-AF-005
RQWF006.000	IPM INCOMING FILE 분류					IT-AF-006
			12	LNCBWP54	UT-LNCBWP54-001	IT-AF-008
RQWF007.000	IPM INCOMING FILE 반영 (일반 매출 DATA)	LNCAWP60	13	LNCBWP60	UT-LNCBWP60-001	IT-AF-010
			14	LNCBWP11	UT-LNCBWP11-001	IT-AF-011
RQWF008.000	IPM INCOMING FILE 반영 (C/B, R/R)	LNCAWR71	15	LNCBWR70	UT-LNCBWR70-001 UT-LNCBWR70-002 UT-LNCBWR70-003	IT-AF-013
			16	LNCBWR71	UT-LNCBWR71-001 UT-LNCBWR71-002 UT-LNCBWR71-003 UT-LNCBWR71-004	IT-AF-014

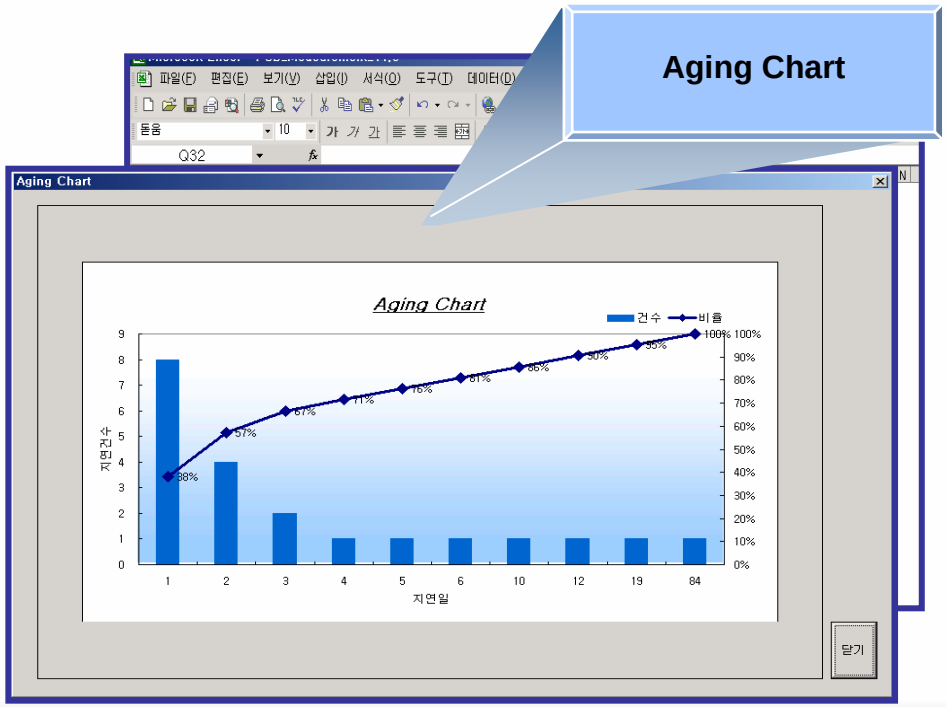
요구사항 추적 metrix

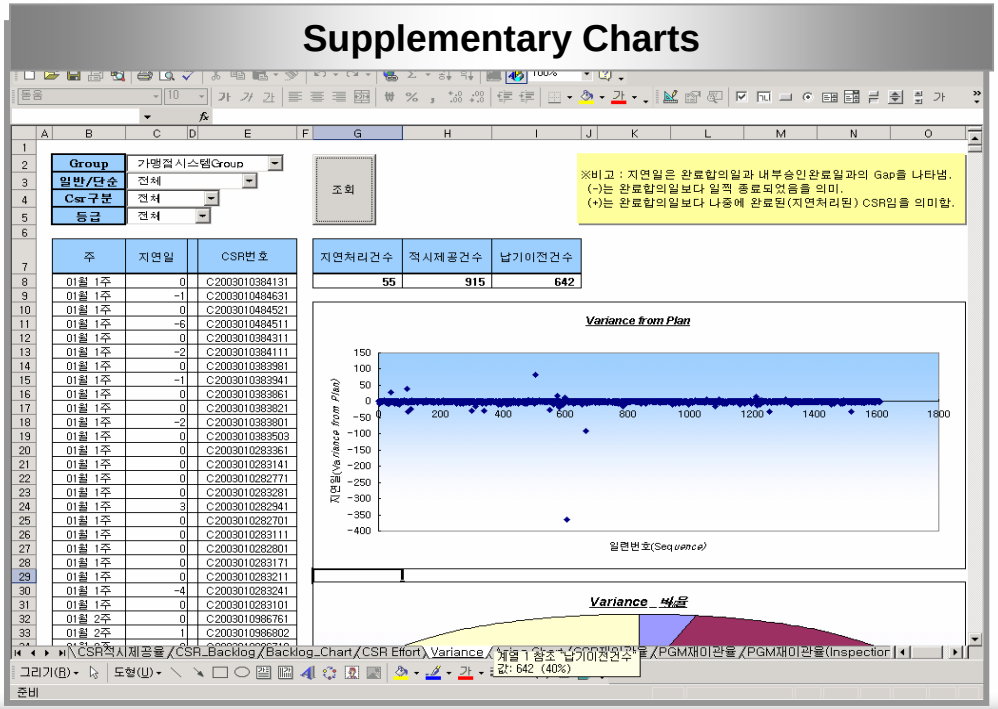
2. Transition to High Maturity Level

2.2 Requirement Management Process (2/3)

Level 4 – Aging Chart

- Define customer requirements in quantitative terms
- Monitor requirement delay (aging) and status of requirement by using Excel
- Requirement management by using aging chart and other supplementary charts





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2.2 Requirement Management Process (3/3)

CSR Aging Chart

Group	발급시스템Group
Csr구분	전체
일반/단순	전체
등급	전체

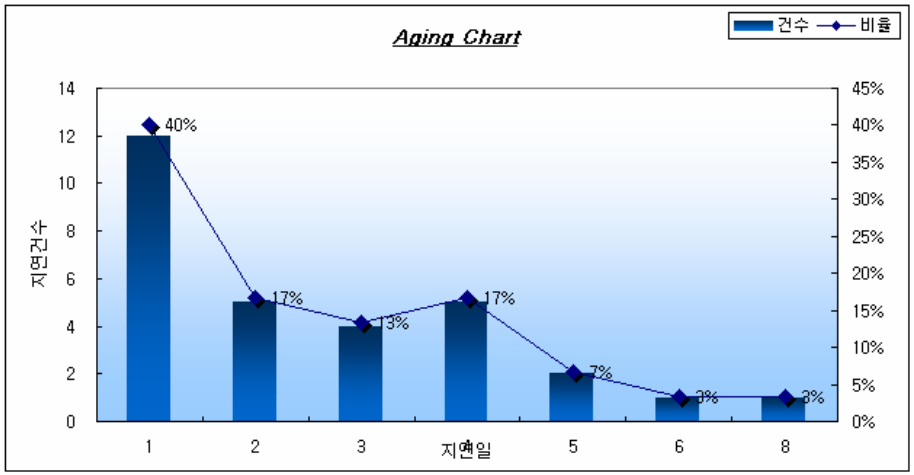
조회

지연일	건수	비율	누적비율
Total	30	100%	100%
1	12	40%	40%
2	5	17%	57%
3	4	13%	70%
4	5	17%	87%
5	2	7%	93%
6	1	3%	97%
8	1	3%	100%

※ 현재 지연처리중인 CSR 현황

CSR번호	처리상태	지연일
C2003042449241	사용자승인대기	18

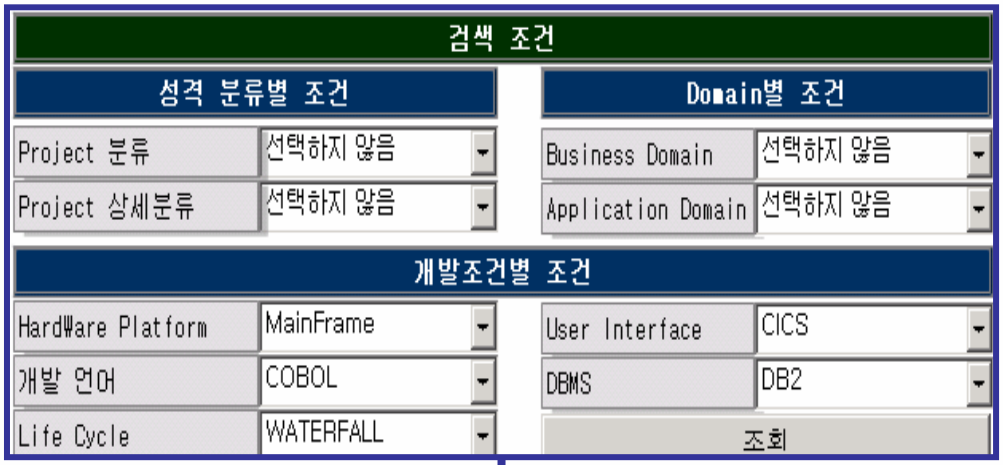
Analysis & Corrective Action

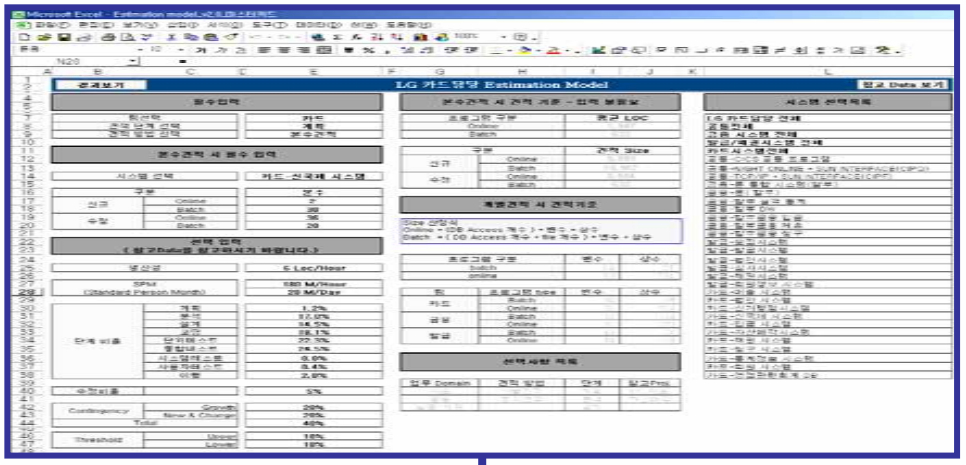


2. Transition to High Maturity Level

2.3 Estimation Process

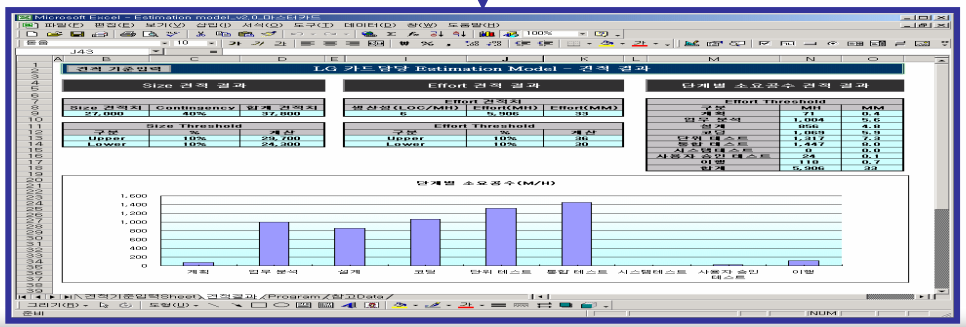
- **Estimation by using PMDB**
  - Search for historical Project Data
  - Estimate by using similar project data
- **Apply estimation model for estimation**
  - Model for estimating Program's LOC
  - Use program LOC and trends of other parameters





검색 결과

Production Rate	단계별 비율								프로젝트 분류		Domain		개발정보				
	분석	설계	개발	UT	IT	ST	UAT	이행	대분류	소분류	Business	Application	H/W Platform	개발 언어	User_Interface	DB	Life Cycle
0.98									시스템 변경	시스템 Upgrade	할부금융	소비 리스	MainFrame	COBOL	CICS	DB2	WATERFALL
6.57	17%	15%	18%	23%	25%	0%	0%	2%	시스템 변경	외부 Interface Upgrade	카드시스템	국제 시스템	MainFrame	COBOL	CICS	DB2	WATERFALL
7.30	12%	14%	30%	10%	32%	0%	1%	1%	시스템 변경	시스템 Upgrade	카드시스템	회계시스템	MainFrame	COBOL	CICS	DB2	WATERFALL
10.87	18%	21%	29%	15%	11%	0%	4%	2%	시스템 개발	자체 시스템 개발	할부금융	소비 리스	MainFrame	COBOL	CICS	DB2	WATERFALL
12.76	16%	16%	21%	19%	25%	0%	0%	2%	시스템 변경	외부 Interface Upgrade	카드시스템	국제 시스템	MainFrame	COBOL	CICS	DB2	WATERFALL



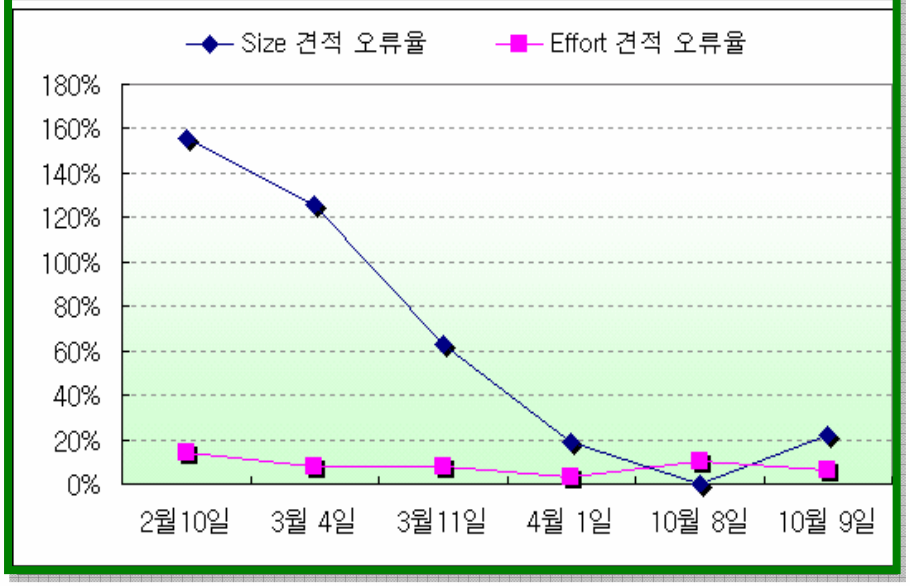
2. Transition to High Maturity Level

2.4 Increase Accuracy of Estimation

Automate SM project estimation by using estimation model & PMDB

Increase accuracy of estimation by using estimation model & PMDB

Project	견적일	Size 견적 오류율	Effort 견적 오류율
A	2월10일	156%	14%
B	3월 4일	126%	8%
C	3월11일	63%	8%
D	4월 1일	19%	3%
E	10월 8일	0.14%	10%
F	10월 9일	22%	6%



2. Transition to High Maturity Level

2.5 Increase CSR* Level Estimation Capability

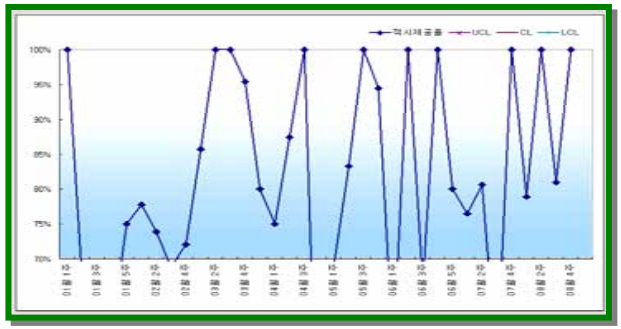
* CSR: Customer Service Request

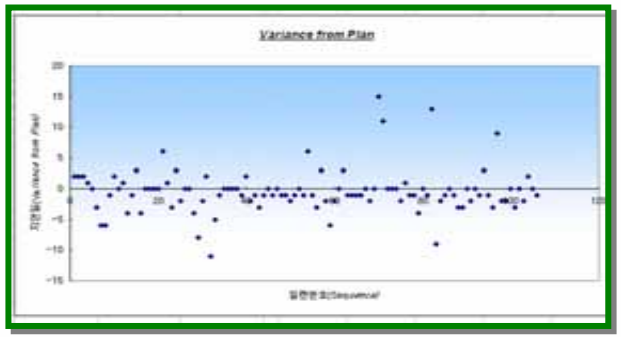
Year 2002

	예측1등급	예측2등	6등급	예측7등급	예측8등급	total
등급별예측건수	15		913	161	93	4,607
예측적중건수	6		210	63	52	682
등급예측적중률(%)	40%		23%	39%	56%	15%

Year 2003

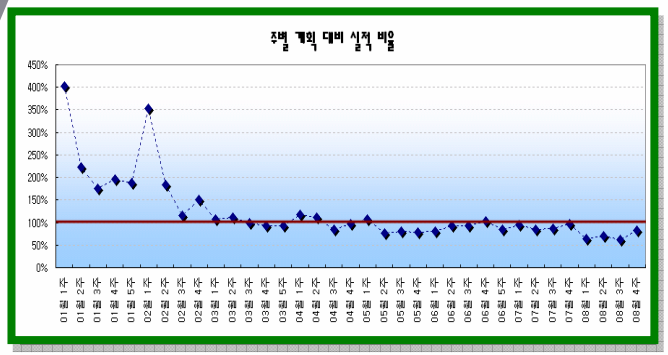
	예측1등급	예측2등급	예측3등	측7등급	예측8등급	total
등급별예측건수	3	7		1,173	77	4,527
예측적중건수	2	3		529	48	2,313
등급예측적중률(%)	67%	43%	3	45%	63%	51%

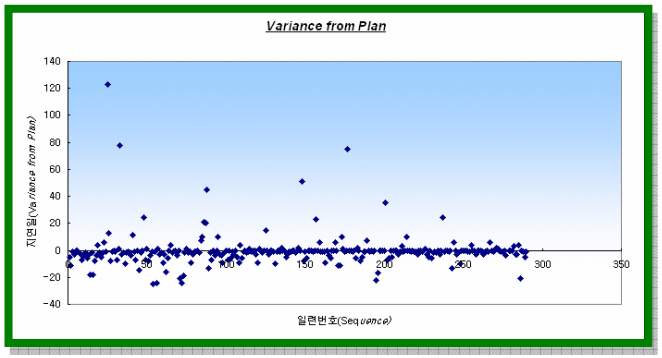




Increase accuracy on CSR size Estimation : 15% in year 2002 -> 51% in year 2003

- Decrease variance on CSR plan vs. actual
- Increase CSR cycle time (Delivery on time rate)

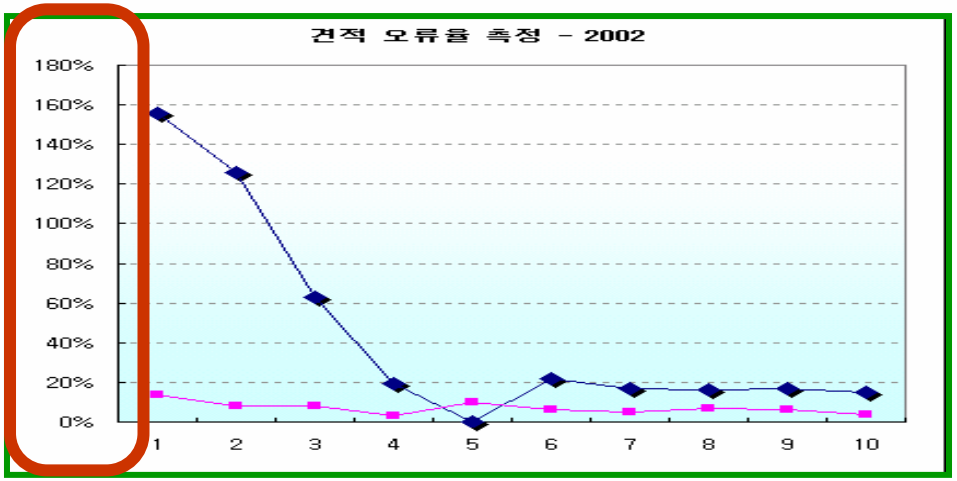




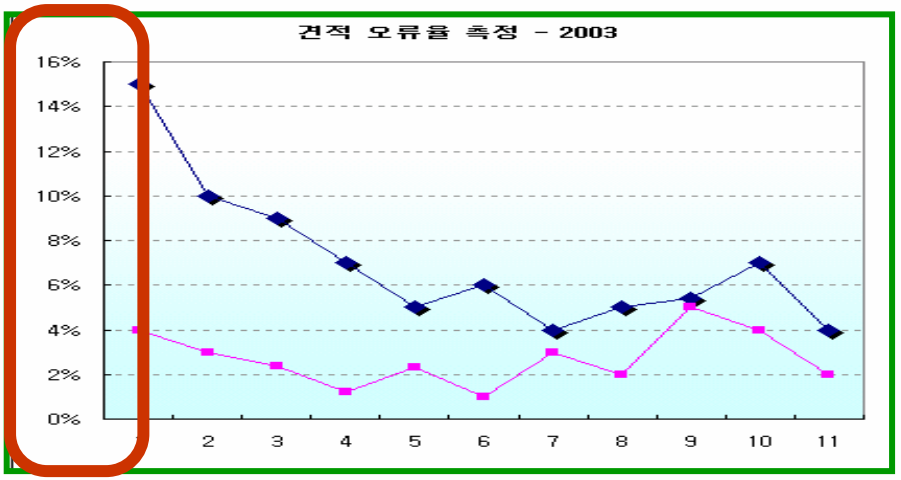
2. Transition to High Maturity Level

2.6 Decrease Estimation Error Rate

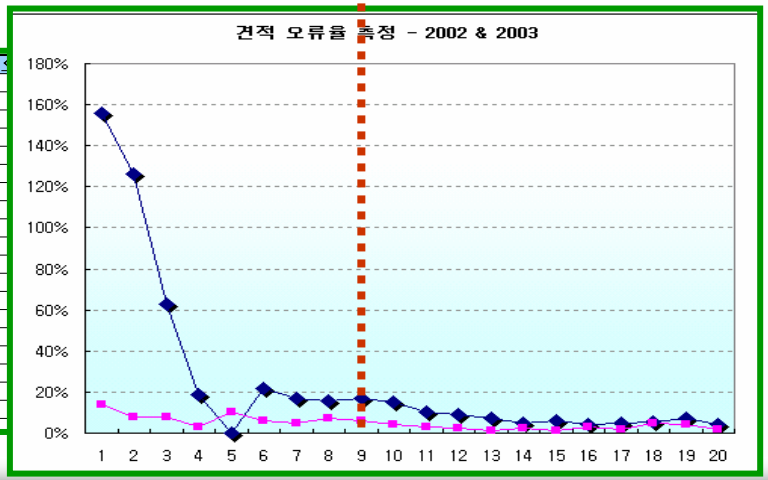
Level 3 Implementation



Level 4 Implementation



프로젝트	size 견적오류율	Effort 견적
1	156%	
2	126%	
3	63%	
4	19%	
5	0%	
6	22%	
7	17%	
8	16%	
9	17%	
10	15%	
11	10%	
12	9%	
13	7%	
14	5%	
15	6%	
16	4%	
17	5%	
18	5%	
19	7%	



2. Transition to High Maturity Level

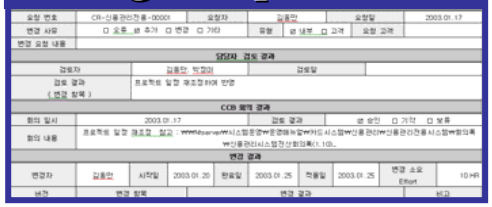
2.7 Configuration Management

- Identify configuration items and manage on deciding and changing baseline
- Configuration Management by using tool or server

- Identify parts of system with high volatility rate
- Possible to identify parts with high defect density

CM Management Log

Change Request Form



- Application Management Example

그룹선택	U.폰 통합 시스템(금융)	LNCPU%	LNCSU%	LNCUU%	LNCWU%	535	데이터 불러오기	DB업데이트완료 확인	Y
프로그램입력	LNCPJ00C	데이터 불러오기							

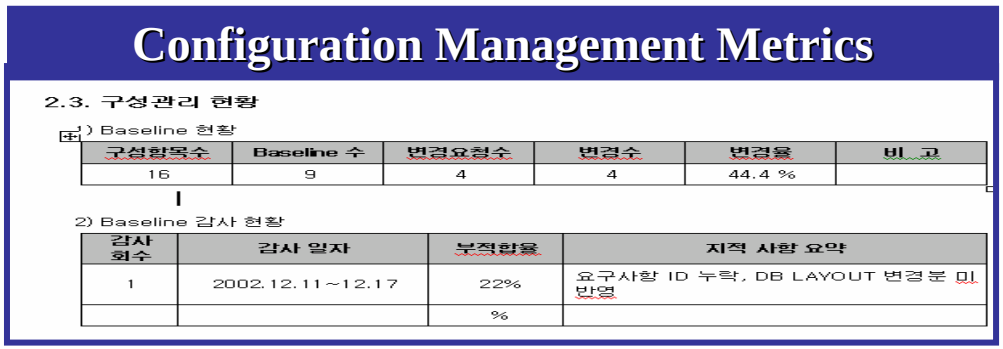
PROGRAM	REGION	TRAN	최근이관횟수	최근 NON_CSR이관횟수	총이관횟수	총NON_CSR이관횟수	등록일	최종수정일	최종수정자	CSR #	Access # / THIS WEEK	Access # / LAST WEEK
LNCPUBGC	CIPP	QUBG	1	1	3	3	2000-04-02	2003-08-12	김정선	N20030812220111	4406	1973404
LNCPUBTC	CIPP	QUBT	2	2	3	3	2000-04-02	2003-08-12	김정선	N20030812220111	1027	1957202
LNCPU40C	CIPQ/CIPP	QU40	5	1	7	2	2000-03-27	2003-06-19	강구철	C20030609689332	112965	250907
LNCPUB6C	CIPP	QUB6	26	8	43	19	2000-09-14	2003-08-08	강구철	N20030805211946	55975	207613
LNCPUA6C	CIPP	QUA6	1	0	4	2	2000-02-14	2003-03-03	강구철	C20030123932211	42506	136339
LNCPUF1C	CIPP/CIPQ	QUF1	33	5	60	15	2000-04-02	2003-08-08	강구철	N20030805211945	29135	101046

- Database Management

TABLE입력	T	2293	데이터 불러오기	DB업데이트완료 확인	Y

TABLE	총변경횟수	등록일	최종수정일	최종수정자	CSR #
TF360	13		2003-07-11	서미경	C2003051759021
TF190	12		2003-03-20	서경애	C2003022117871
TW540	10		2003-07-28	구선미	C2003052160521
TW550	10		2003-07-28	구선미	C2003052160521
T4HC0	8	2002-05-28	2003-07-02	조성철	C2003061773581
TJCC0	8		2003-07-24	김재곤	C2003070985831
TJCF0	8		2003-07-24	김재곤	C2003070985831
TW5G0	8	2002-12-17	2003-07-28	구선미	C2003052160521
T1N20	7	2003-07-30	2003-07-30	윤상보	C2003071186811
T1N30	7	2003-07-30	2003-07-30	윤상보	C2003071186811
TA830	7		2003-07-31	서경애	D200307
TF160	7		2003-06-19	한재훈	C2003060968791

Configuration Management Metrics



2.3. 구성관리 현황

1) Baseline 현황

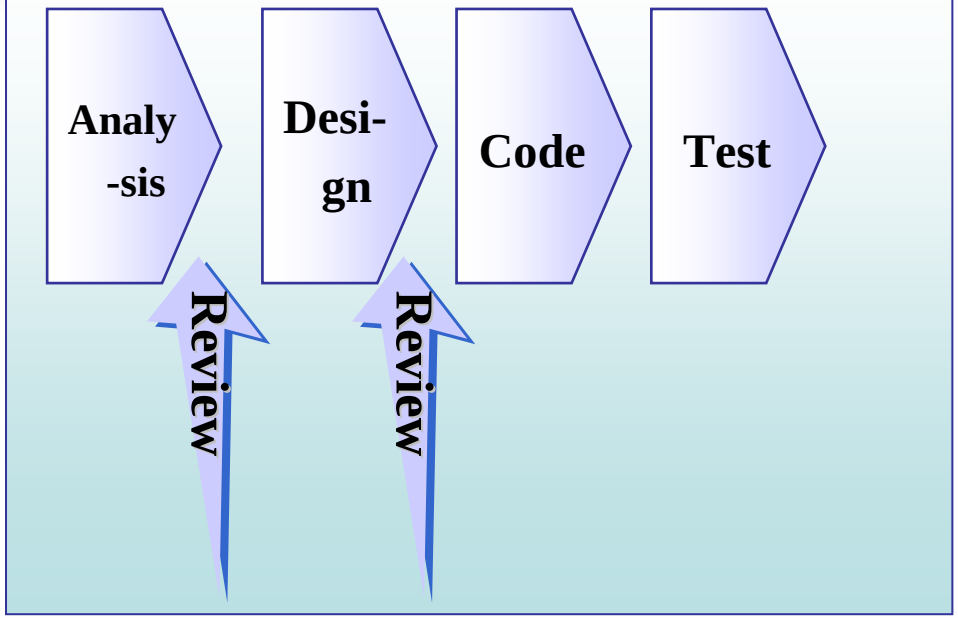
구성항목수	Baseline 수	변경요청수	변경수	변경율	비 고
16	9	4	4	44.4 %	

2) Baseline 감사 현황

감사 회수	감사 일자	부적합율	지적 사항 요약
1	2002.12.11~12.17	22%	요구사항 ID 누락, DB LAYOUT 변경분 미 반영
		%	

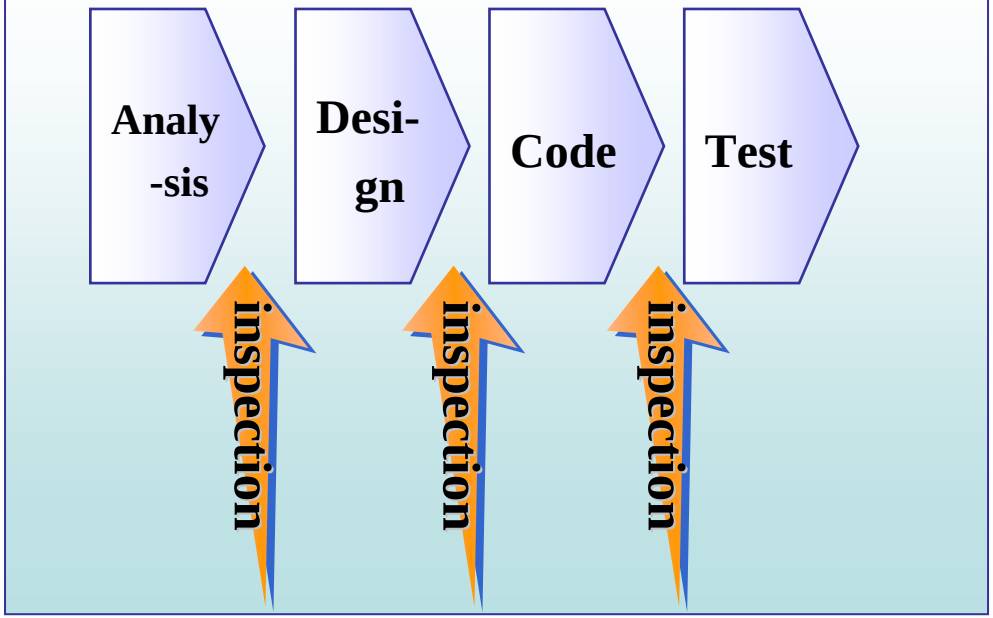
2.8 Inspection Management (1/9)

Reinforce Validation Activities



- Dissatisfaction of developers on inefficient review
- Validation required steps between development and test

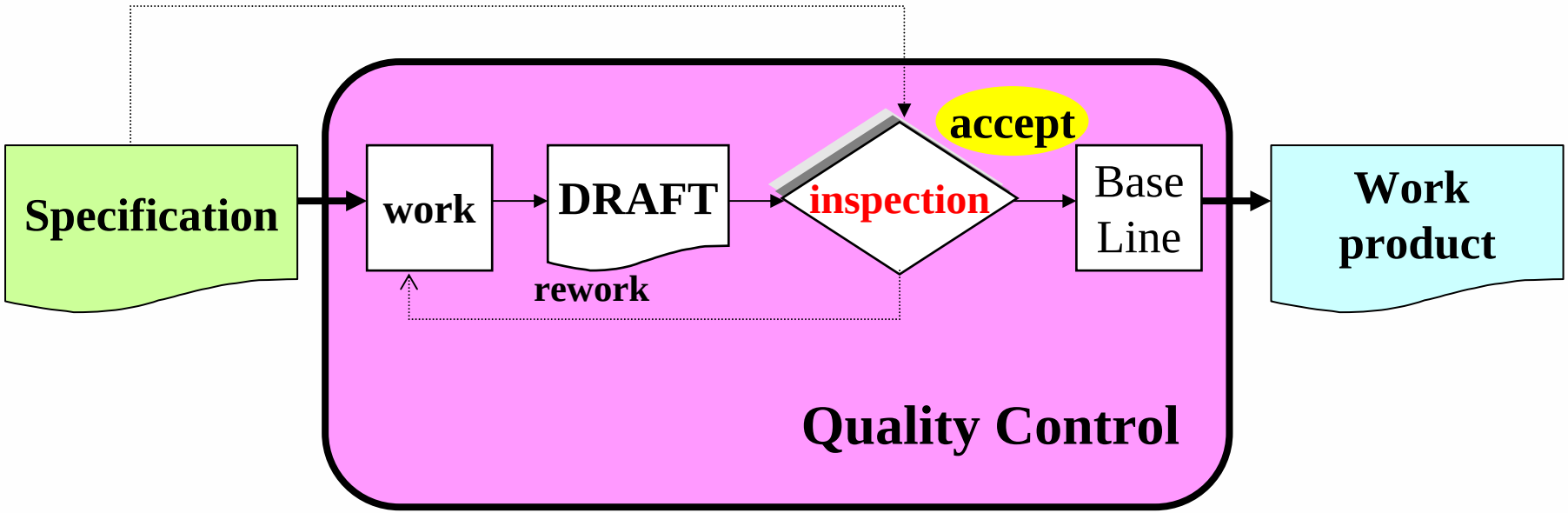
Inspection Introduction



- Introduction of review technique on formal review by peers
- Reinforce on validation activities by running before test

2.8 Inspection Management (2/9)

Context for Inspection



2.8 Inspection Management (3/9)

Can you inspect everything ?

[Step 1] To judge which work products to be inspected, consider the following risk criteria:

*** Precondition: Actually, it's impossible to inspect all work products**

Type	Function	Defect Density
Batch	Insert/Delete/Update	7.76
	Selection	8.98
On-line	Insert/Delete/Update	8.25
	Selection	9.83

2.8 Inspection Management (4/9)

Can you inspect all parts of work products ?

[Step 2] To judge which parts of work products to be inspected, consider the following data results:

(1) components that new technology, techniques, or tools

(2) components having many exception conditions

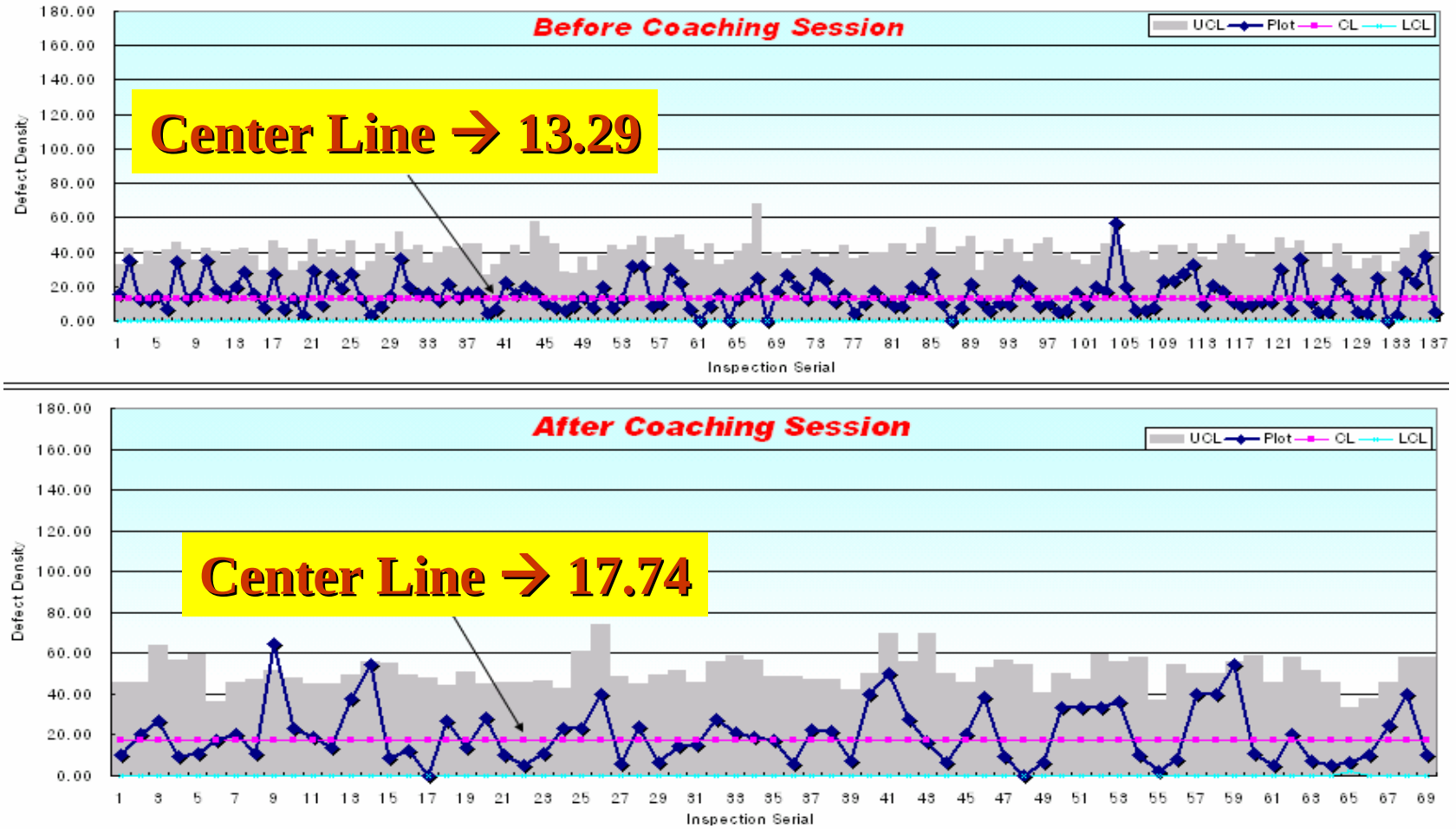
(3) components that are intended to be reused

(4) Complex User Interface

(5) modules having a history of many defects or changes

2.8 Inspection Management (5/9)

Coaching Session



2.8 Inspection Management (6/9)

Cost Comparison of Defect Removal in Test and Inspection

Inspection no	Defect found Inspection	Inspection defect	Test Defect	user defect	Inspection Effectiveness	Test Effectiveness	Inspection + Test	inspection hit rate	Inspection Defect Fnd Rate	재 이관율
238	35	107	51	8	64%	86%	158	15%	45%	3%

With Inspection

Phase	Inspection	Test	Post Release	Total
Effectiveness	64 %	86%		
# of defect removed	107	51	8	166
Defect removal cost (hr) per defect	0.7 hr	0.6 hr	3.5 hr	
Cost of defect removal	**74.9 hr**	**30.6 hr**	**28 hr**	**133.5 hr**
Accumulated cost	74.9 hr	105.5 hr	133.5 hr	

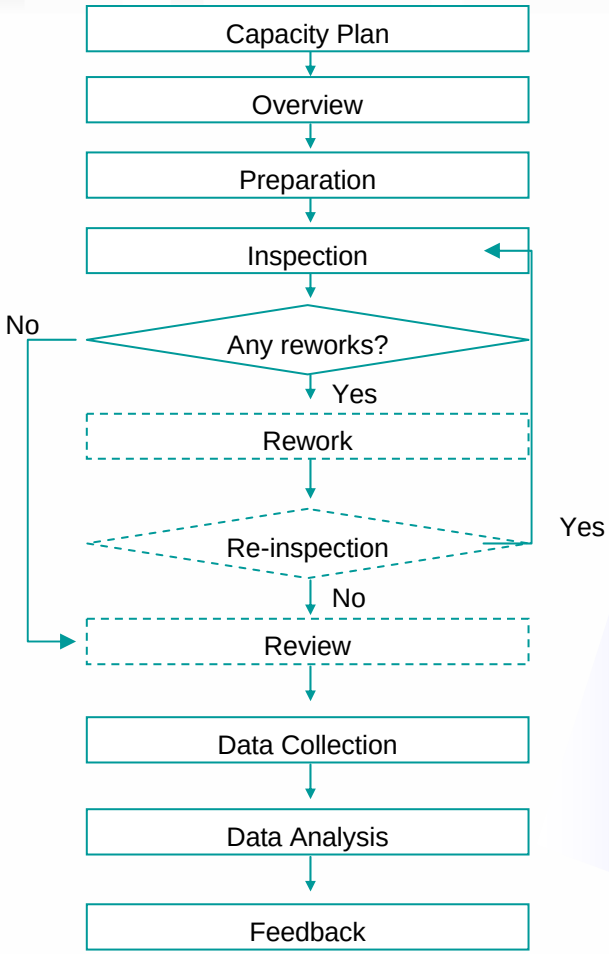
Without Inspection

Phase	Inspection	Test	Post Release	Total
Effectiveness	0 %	86%		
# of defect removed		143	23	166
Defect removal cost (hr) per defect		0.6 hr	3.5 hr	
Cost of defect removal		**85.8 hr**	**80.5 hr**	**166.3 hr**
Accumulated cost		85.8 hr	166.3 hr	

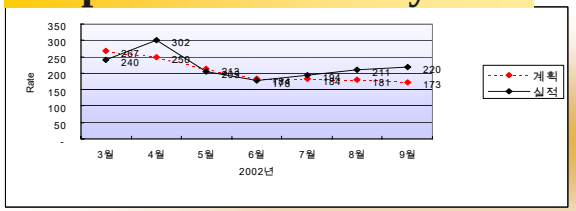
* Test Effectiveness: Defects detected in test/ (Defects from Test + Post-release defects)

2.8 Inspection Management (7/9)

Inspection Process & Data

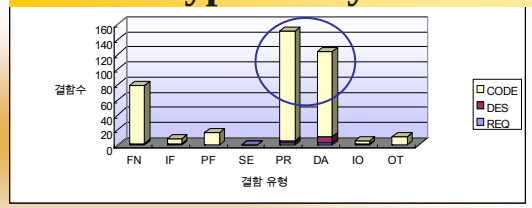


Inspection Rate Analysis



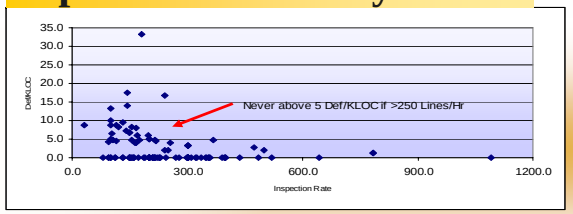
* preparation/Inspection rate

Defect Type Analysis



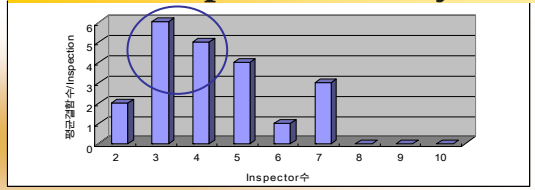
* Including injection phase analysis

Optimal Rate Analysis



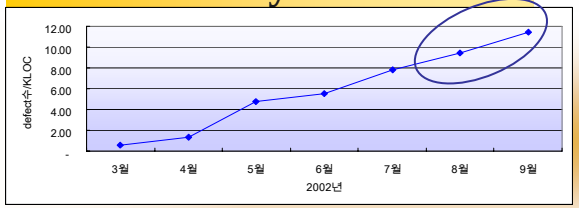
* Optimal preparation/Inspection rate

No. of Inspectors Analysis



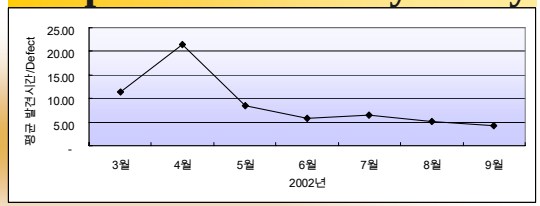
* 3~4 inspectors are most appropriate

Defect Density Trends



* # of Defects/KLOC

Inspection Efficiency Analysis



* Avg. detection time for each defect

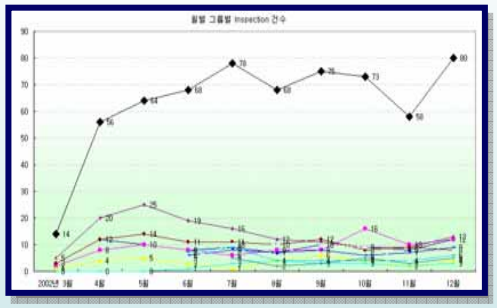
2. Transition to High Maturity Level

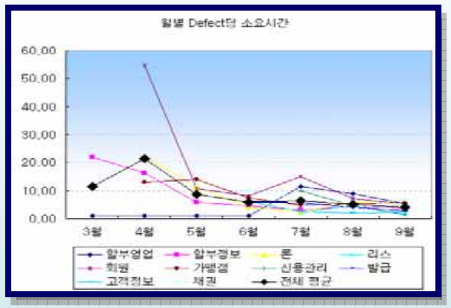
2.8 Inspection Management (8/9)

Level 3

Introduction of Inspection

- No. of Inspection meetings per month
- Time spent for each defect detection





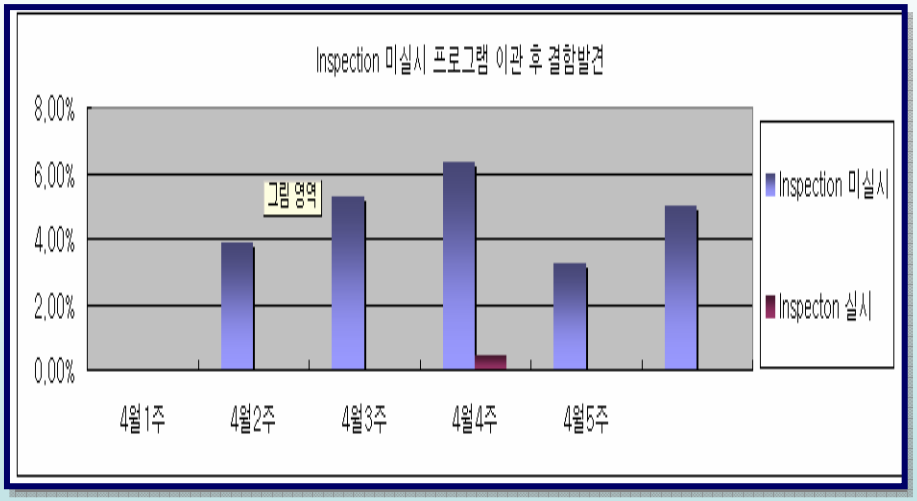
Raw Data 입력 Sheet

• 하늘색은 입력 필드, 보라색은 자동계산 필드입니다.

월	주	Work group	산출물	SM/SI	운영/신규	Insp-Date	Insp 유형	Prep Lines	Prep Time	Overview Time	Insp Lines	insp Time	팀원	Rework Time	총 defect	Prep Rate	ins Ra
3월	5주	회원	LNCBP009	SM	수정	2002.3.28	O	298	0.80		298	1.0	5	0	2	373	29
3월	5주	회원	LNCPH0BC	SM	신규	2002.3.28	O	300	1.00		300	1.0	5	0	1	300	30
3월	5주	회원	LNCBP9A1	SM	수정	2002.3.28	O	503	0.80		503	1.5	4	0	1	629	33
3월	5주	회원	LNCBHB07	SM	수정	2002.3.28	O	210	1.00		210	1.0	4	0	1	210	21
3월	5주	회원	LNCPHT5C	SM	수정	2002.3.29	O	357	0.90		357	1.0	5	0	2	397	35
4월	1주	회원	LNCSPSDC	SM	수정	2002.4.4	O	286	0.75	0.0	295	0.9	3	0	0	381	32
4월	1주	회원	LNCBHV53	SM	신규	2002.4.4	O	200	0.75	0.1	200	1.0	4	0	1	267	20
4월	1주	회원	LNCBP9B0	SM	수정	2002.4.4	O	291	0.93	0.3	644	1.0	5	0	1	312	64
4월	1주	회원	LNCBDJ20	SM	신규	2002.4.4	O	142.5	0.90	0.2	170	1.0	4	0	1	159	17
4월	1주	회원	LNCBBP5D	SM	수정	2002.4.4	O	245	1.38	0.3	245	1.0	5	0	4	177	24
4월	2주	회원	LNCDP03C	SM	신규	2002.4.13	O	100	1.67	0.3	100	1.0	3	0.17	1	60	10
4월	2주	회원	LNCPIX6C	SM	수정	2002.4.12	O	137.5	0.75	0.2	200	1.0	4		1	183	20

Impact of Inspection Introduction

- Decrease on number of defects



2. Transition to High Maturity Level

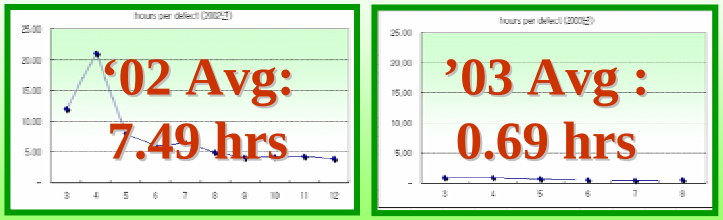
2.8 Inspection Management (9/9)

Level 4

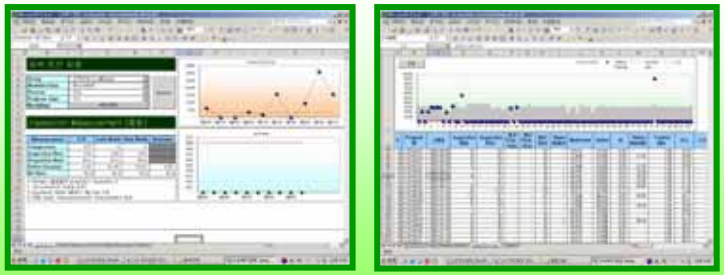
- Lack of consistency on selection work products to be inspected
- Inefficiency exist on inspection on fix Program
- Insufficient quantitative analysis on inspection data

- Shorter time spent on defect detection through inspection
- Introduction of fix Inspection Process
- Develop Inspection Data Analysis tool

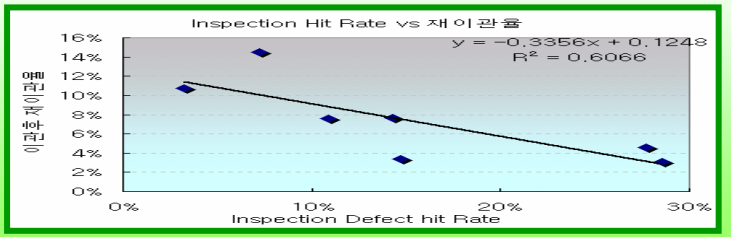
Time spent on defect detection per month (Defects/Time)



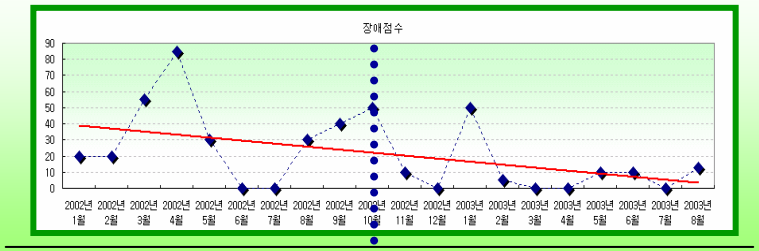
Inspection Data Analysis Tool



Comparison on Inspection Effectiveness and Re-delivery Rate by Group



Status of Abend Point



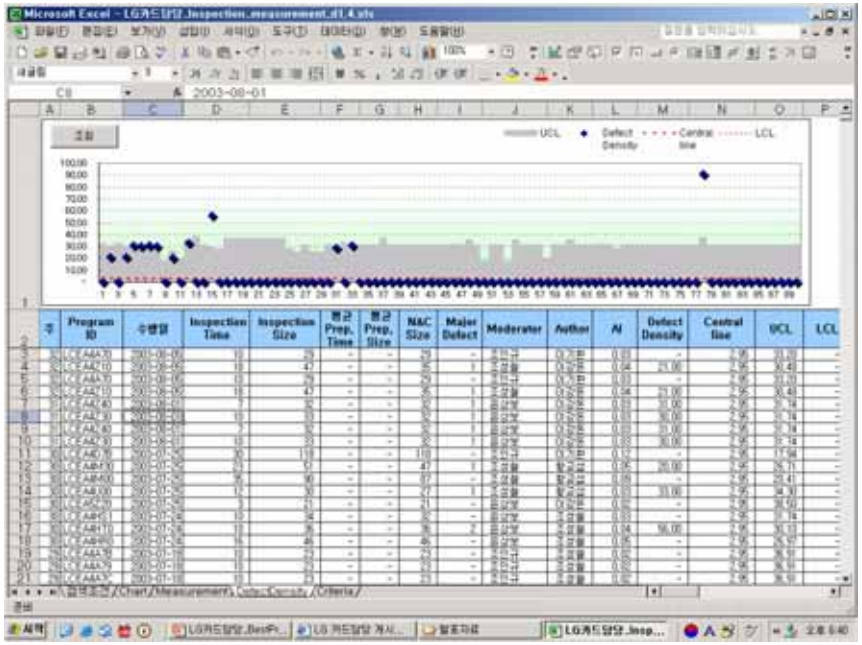
Level 2 → Level 3 → Level 4

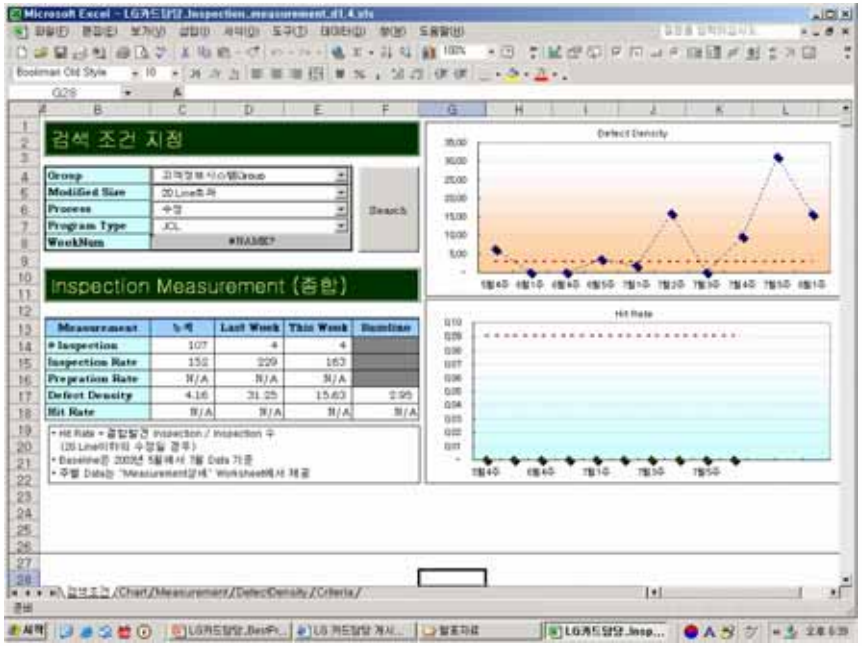
3. Inspection Data Management System

3.1 Automation of Inspection Data Analysis and Management

Inspection Data Collection and Analysis

Inspection Status Search & Management by group/team/organization

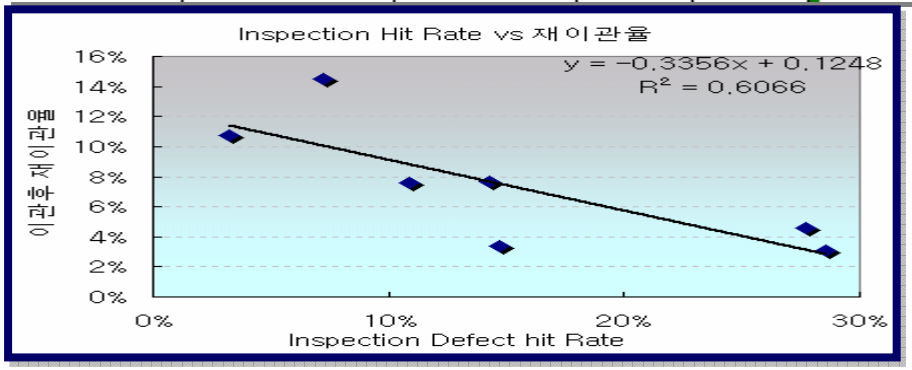


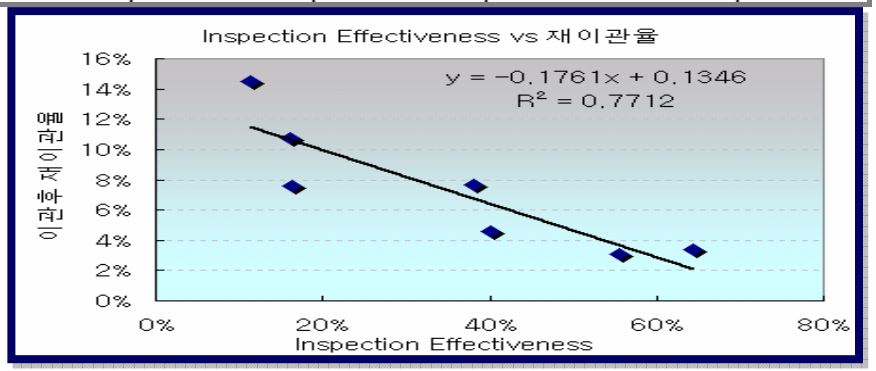


3. Inspection Data Management System

3.2 Manage Inspection effectiveness & efficiency

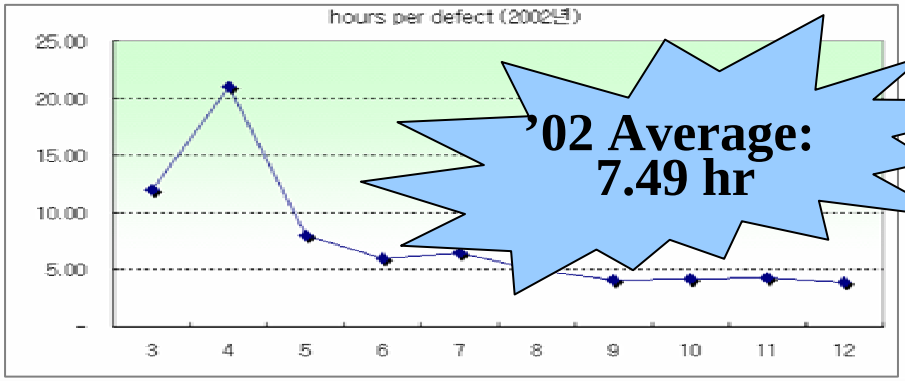
Inspection no	Defect found Inspection	Inspection defect	Test Defect	user defect	Inspection Effectiveness	Test Effectiveness	Inspection + Test	inspection hit rate	Inspection Defect Fnd Rate	재 이관율
1220	**166**	**292**	**523**	**104**	**32%**	**83%**	**815**	**14%**	**24%**	**9%**
238	35	107	51	8	64%	86%	158	15%	45%	3%
93	3	4	11	10	16%	52%	15	3%	4%	11%
130	36	45	61	6	40%	91%	106	28%	35%	5%
98	28	35	25	3	56%	89%	60	29%	36%	3%

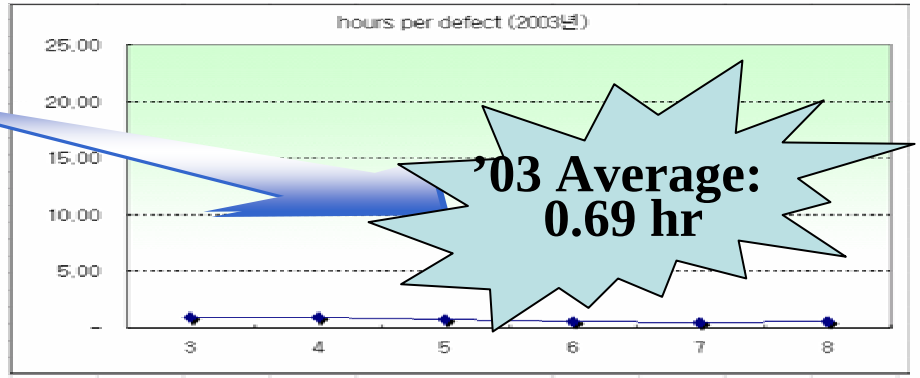




Inspection Hit Rate =
# of Inspection with defect / # of Inspection

Inspection Effectiveness =
Inspection Found Defect # / Total Found Defect





Time expended for detecting defect by month (defect/Hr)

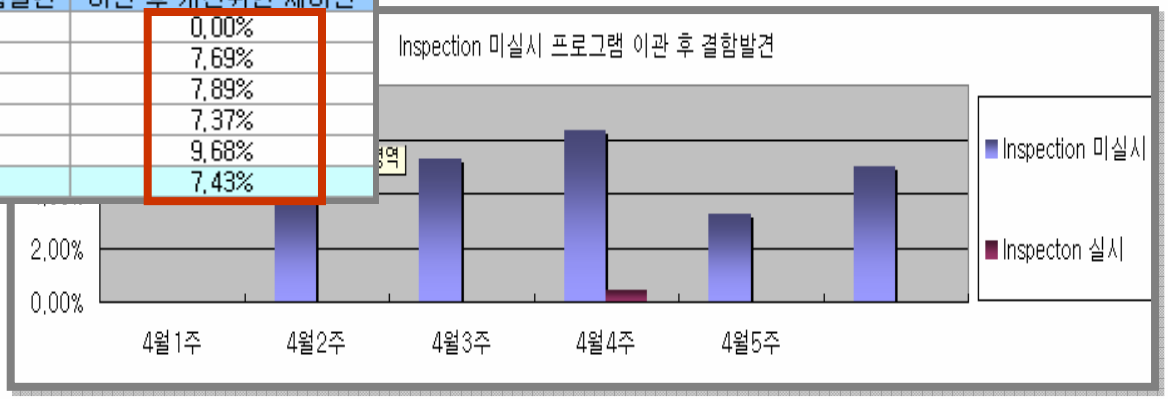
3.3 Effect of Inspection and improvement of failure prevention

Rate of defect detected after delivery

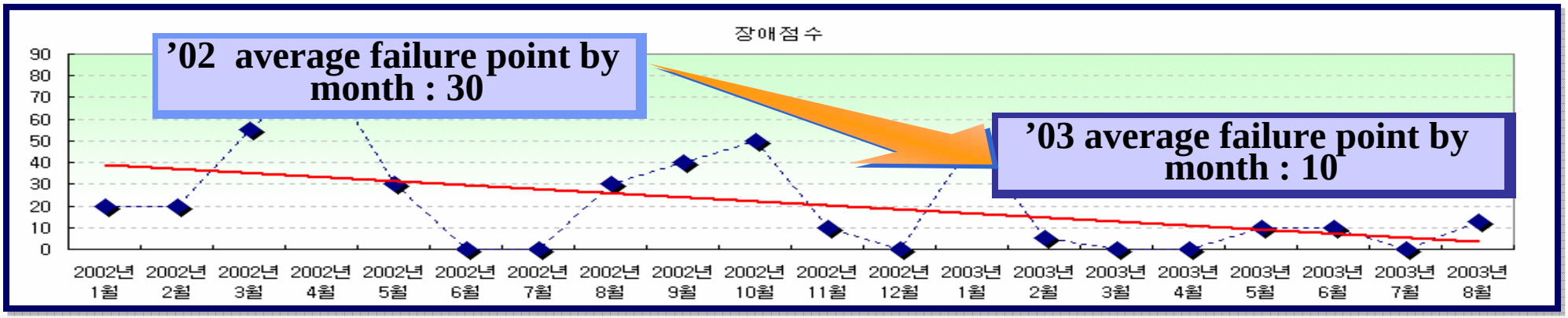
Rate of program with defects detected with inspection: 0.48 %

Rate of program defects defected without inspection: 7.43 %

월주	Inspection 대상 프로그		Inspection 미실시 프로그램	
	이관 후 결함발견	이관 후 개선위한 재이관	이관 후 결함발견	이관 후 개선위한 재이관
4월1주	0.00%	0.00%	0.00%	0.00%
4월2주	0.00%	1.01%	3.85%	7.69%
4월3주	0.00%	0.00%	5.26%	7.89%
4월4주	0.42%	0.42%	6.32%	7.37%
4월5주	0.00%	0.00%	3.23%	9.68%
total	0.24%	0.48%	4.95%	7.43%



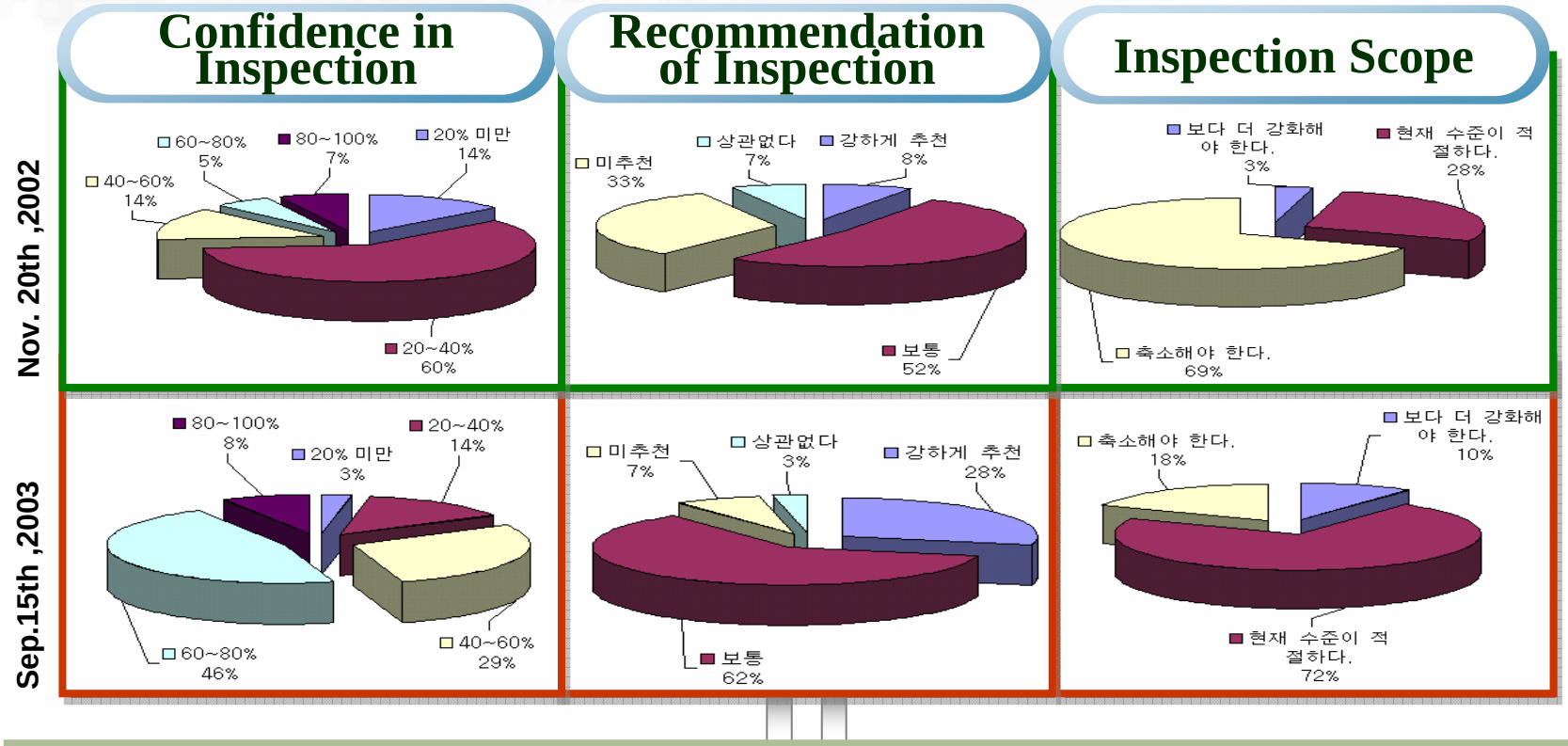
Failure Prevention



'02 average failure point by month : 30

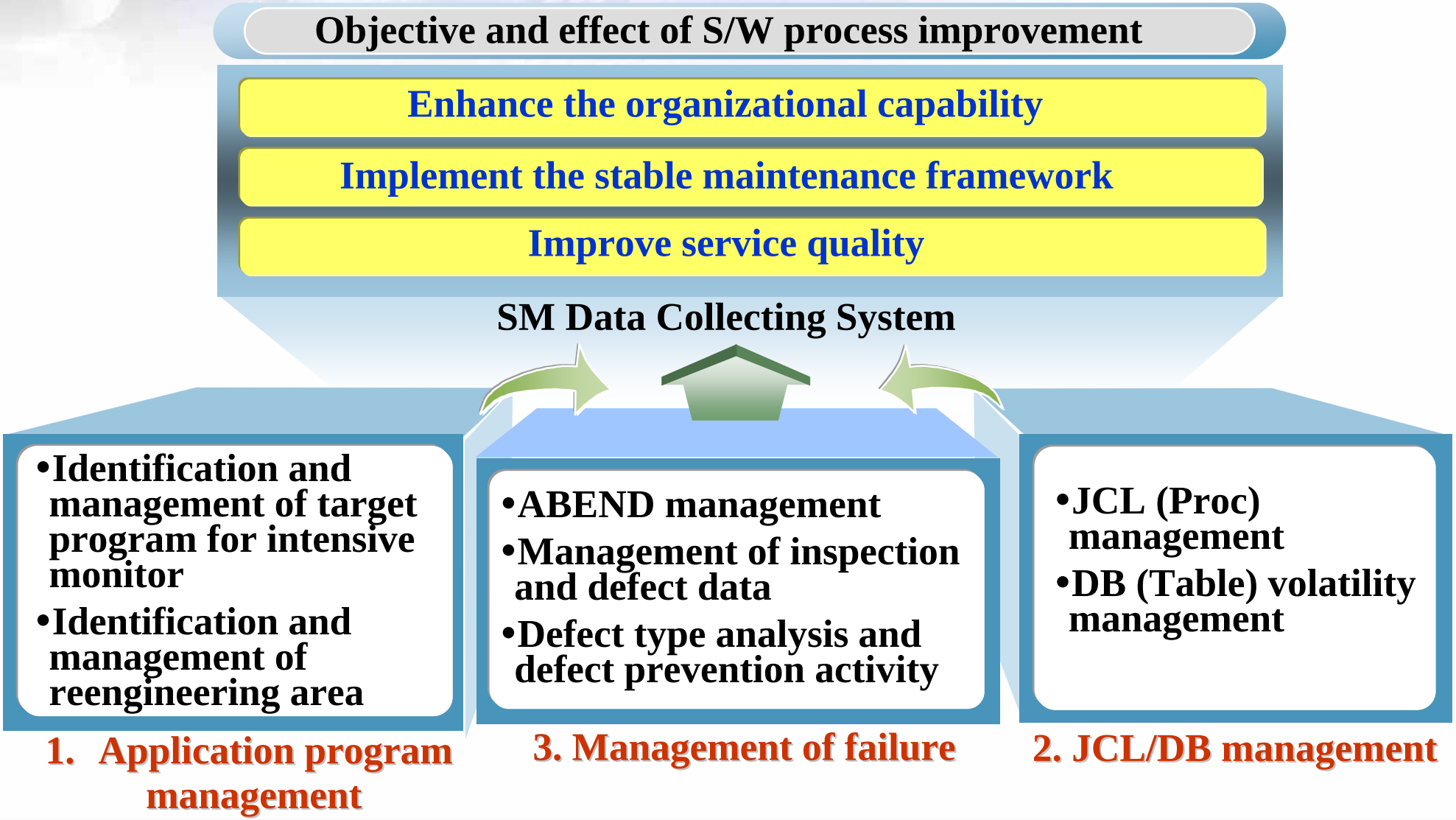
'03 average failure point by month : 10

3.4 Analysis the result of survey on inspection process



- **Inspection process institutionalization**
- **Recognition of importance and positive impact of inspection process**

4.1 Context for SM Data Collecting System



4. SM Data Collecting System

4.2 Application program management (1/2)

Identify and manage key program for intensive management

Online Program

그룹선택	U.론 통합 시스템(금융)	LNCPU%	LNCSU%	LNCUU%	데이트완료 확인
프로그램입력	LNCPJ00C	데이타 불러오기			

PROGRAM	REGION	TRAN	최근이관횟수	최근 NON_CSR이 관횟수	Access # / THIS WEEK	Access # / LAST WEEK
LNCPUBGC	CIPP	QUBG	1	1	4406	1973404
LNCPUBTC	CIPP	QUBT	2	2	1027	1967202
LNCPU40C	CIPQ/CIPP	QU40	5	1	112965	250987
LNCPUB6C	CIPP	QUB6	26	8	55975	207613
LNCPUA6C	CIPP	QUA6	1	0	42506	136338
LNCPUF1C	CIPP/CIPQ	QUF1	33	5	29135	101046

Top 20 Online target programs for intensive monitor

- # of TRAN ACCESS = Impact of problem when failure occurred
- TOP 20 target program for intensive monitor (80-90%)
- Perform formal inspection when the program is changed

Batch Program

그룹선택	H.회원 시스템 (카드)	LNCBH%	LNCSH%	1978
프로그램입력	LNCSUB6C	데이타 불러오기		

PROGRAM	PROC수	최
LNCBHK3K	49	
LNCBHK3G	48	
LNCBHY01	20	
LNCBHD2B	20	
LNCBHD2C	16	
LNCBHG31	15	
LNCBHOB1	13	
LNCBHOB0		
LNCBHO2F	10	1

Batch Prog. 입력	LNCBHO2F	10	데이타 불러오기

PROGRAM	PROC	SYSINDB2 NAME
LNCBHO2F	LNCAHOD0	LNCIHO2F
LNCBHO2F	LNCAHOD1	LNCIHO2F
LNCBHO2F	LNCAHOD2	LNCIHO2F
LNCBHO2F	LNCAHOD3	LNCIHO2F
LNCBHO2F	LNCAHOD4	LNCIHO2F
LNCBHO2F	LNCAHOD5	LNCIHO2F
LNCBHO2F	LNCAHOD6	LNCIHO2F
LNCBHO2F	LNCAHOD7	LNCIHO2F
LNCBHO2F	LNCAHOD8	LNCIHO2F
LNCBHO2F	LNCAHOD9	LNCIHO2F

Manage # of JCL (Proc) using Batch programs

- # of JCL(Proc) related to Batch program = Basis for volatility management
- Address basis for performing formal inspection
- Address the range for SCCB

4. SM Data Collecting System

4.2 Application program management (2/2)

Identify and manage reengineering area

Manage the # of recent delivery and re-delivery

그룹선택	U.론 통합 시스템(금융)	LNCPU%	LNCSU%	LNCUU%	LNCWU%	535	데이터
프로그램입력	LNCSPF	데이터 불러오기					

PROGRAM	REGION	TRAN	최근이관횟수	최근 NON_CSR이관횟수	총이관횟수	총NON_CSR이관횟수	등록일	최종수정일
LNCSUB3C	CIP0		51	11	151	42	2000-03-14	2003-08-04
LNCPUB6C	CIPP	QUB6	25	8	42	13	2000-03-14	2003-08-08
LNCSUA3C	CIPQ/CIPF/CIP0/CIPW		39	6	128	35	2000-03-14	2003-08-04
LNCPUAEC	CIPP	QUAE	28	5	43	10	2002-10-03	2003-07-11
LNCPUB1C	CIPP	QUB1	16	5	38	14	2000-03-14	2003-07-31
LNCPUF1C	CIPP/CIPQ	QUF1	33	5	60	15	2000-04-02	2003-08-08
LNCSUD1C	CI F/CIPQ/CIPW/CIP0		15	4	57	31	2000-04-01	2003-08-08
LNCSUD3C	CIP /CIPW/CIP0/CIPP		7	4	11	6	2000-04-01	2003-07-22
LNCPU87C	CIPP	QU87	3	3	3	3	2003-08-06	2003-08-09
LNCPUDHC	CIPP	QUDH	13	3	24	8	2000-04-02	2003-08-05

- **# of recent delivery and re-delivery = basis for identifying defect detected area**
- **When program has significant # of recent delivery, analyze the status and cause of delivery**
  - **-When # of recent changes increase**
  - **-When average # of changes in month is high**

프로그램입력	LNCSUB3C	1	데이터 불러오기														
PROG	등록일	총이관횟수	1년총이관횟수	12개월이전 총이관횟수	2002년9월이전총이관횟수	2002년9월 이관횟수	2002년10월 이관횟수	2002년11월 이관횟수	2002년12월 이관횟수	2003년1월 이관횟수	2003년2월 이관횟수	2003년3월 이관횟수	2003년4월 이관횟수	2003년5월 이관횟수	2003년6월 이관횟수	2003년7월 이관횟수	2003년08월 이관횟수
LNCSUB3C	2000-03-14	310	110	200	5	9	12	12	7	9	7	11	8	12	8	9	1

프로그램입력	LNCPUB6C	1	데이터 불러오기														
PROGRAM	등록일	총이관횟수	1년총이관횟수	12개월이전 총이관횟수	2002년9월이전총이관횟수	2002년9월 이관횟수	2002년10월 이관횟수	2002년11월 이관횟수	2002년12월 이관횟수	2003년1월 이관횟수	2003년2월 이관횟수	2003년3월 이관횟수	2003년4월 이관횟수	2003년5월 이관횟수	2003년6월 이관횟수	2003년7월 이관횟수	2003년08월 이관횟수
LNCPUB6C	2000-03-14	71	32	39	-	1	-	2	3	1	1	-	-	6	9	8	1

4.3 JCL/DB Management (1/2)

PROC선택	LNCAXP00
8	데이타 불러오기

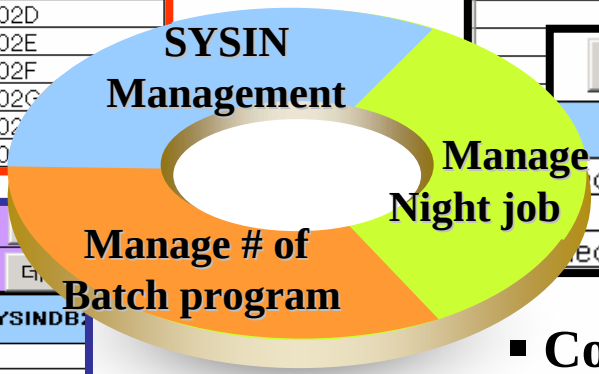
PROC	SYSIN
LNCAXP00	LNCIPBL2
LNCAXP00	LNCIPMH0
LNCAXP00	LNCIPML1
LNCAXP00	LNCIPMTD
LNCAXP00	LNCIPMY2
LNCAXP00	LNCIPMY7
LNCAXP00	LNCIPTE2
LNCAXP00	LNCIXPRD

PROC선택	LNCAS070
13	데이타 불러오기

PROC	SYSIN
LNCAS070	LNCIS01W
LNCAS070	LNCIS01X
LNCAS070	LNCIS01Y
LNCAS070	LNCIS01Z
LNCAS070	LNCIS02A
LNCAS070	LNCIS02B
LNCAS070	LNCIS02C
LNCAS070	LNCIS02D
LNCAS070	LNCIS02E
LNCAS070	LNCIS02F
LNCAS070	LNCIS02G
LNCAS070	LNCIS02
LNCAS070	LNCIS0

PROC 입력	LNCAS070	9
Batch Prog. 입력	LNCBSRZA	

PROC	PROGRAM	SYSINDB2
LNCAS070	LNCBS0B2	
LNCAS070	LNCBS0B1	
LNCAS070	LNCBS0A9	
LNCAS070	LNCBS0A8	
LNCAS070	LNCBS0A7	
LNCAS070	LNCBS0A6	
LNCAS070	LNCBS0A5	
LNCAS070	LNCBS0A4	
LNCAS070	LNCBS0A3	



그룹선택	A5.발급시스템 - 법인	LCEA5%
JOB NAME입력	LCEA6Z35	5 데이타 불러

선작업 불러오기 | 후작업 불러오기

JOB NAME	작업주기	선작업
LCEA6Z35	Daily	#CIVC-DOWN
	Weekly(05)	#CIVC-DOWN
	Request	#CIVC-DOWN
		LCEA6Z00
		LCEA6ZT5

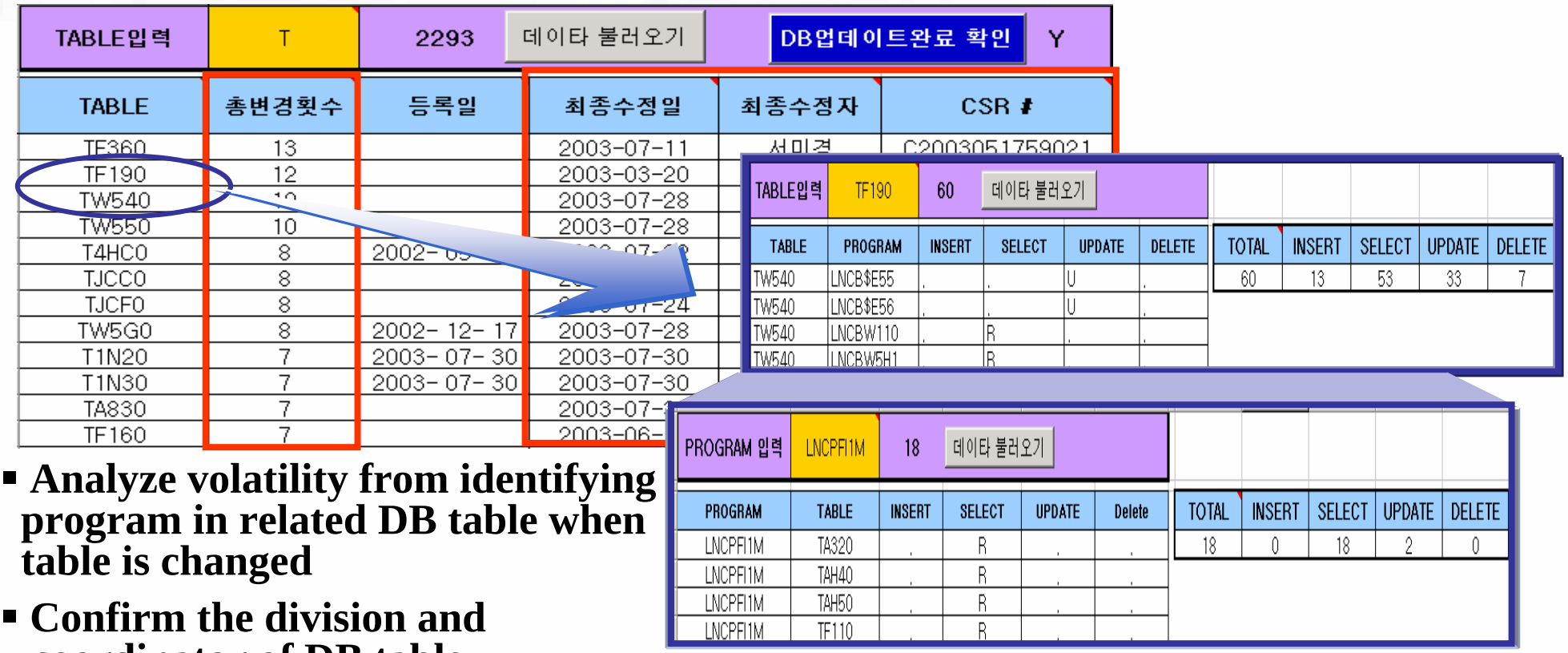
선작업 불러오기 | 후작업 불러오기

작업주기	후작업
quest	LCEA6Z90
	LCEA6ZA5
equest	LCEA60A5

- Confirm the period of night job
- Represent the dependency of night job
- Assign work efficiently by confirming the load and dependency of job

4.3 JCL/DB Management (2/2)

Volatility management



TABLE입력 | T | 2293 | 데이타 불러오기 | DB업데이트완료 확인 | Y

TABLE	총변경횟수	등록일	최종수정일	최종수정자	CSR #
TF360	13		2003-07-11	서미경	C2003051759021
TF190	12		2003-03-20		
TW540	10		2003-07-28		
TW550	10		2003-07-28		
T4HC0	8	2002- 05			
TJCC0	8				
TJCF0	8		07-24		
TW5G0	8	2002- 12- 17	2003-07-28		
T1N20	7	2003- 07- 30	2003-07-30		
T1N30	7	2003- 07- 30	2003-07-30		
TA830	7		2003-07-		
TF160	7		2003-06-		

TABLE입력 | TF190 | 60 | 데이타 불러오기

TABLE	PROGRAM	INSERT	SELECT	UPDATE	DELETE
TW540	LNCB$E55	.	.	U	.
TW540	LNCB$E56	.	.	U	.
TW540	LNCBW110	.	R	.	.
TW540	LNCBW5H1	.	R	.	.

TOTAL	INSERT	SELECT	UPDATE	DELETE
60	13	53	33	7

PROGRAM 입력 | LNCPFI1M | 18 | 데이타 불러오기

PROGRAM	TABLE	INSERT	SELECT	UPDATE	Delete
LNCPFI1M	TA320	.	R	.	.
LNCPFI1M	TAH40	.	R	.	.
LNCPFI1M	TAH50	.	R	.	.
LNCPFI1M	TF110	.	R	.	.

TOTAL	INSERT	SELECT	UPDATE	DELETE
18	0	18	2	0

- **Analyze volatility from identifying program in related DB table when table is changed**
- **Confirm the division and coordinator of DB table**
- **Identify relative DB tables when program is changed**

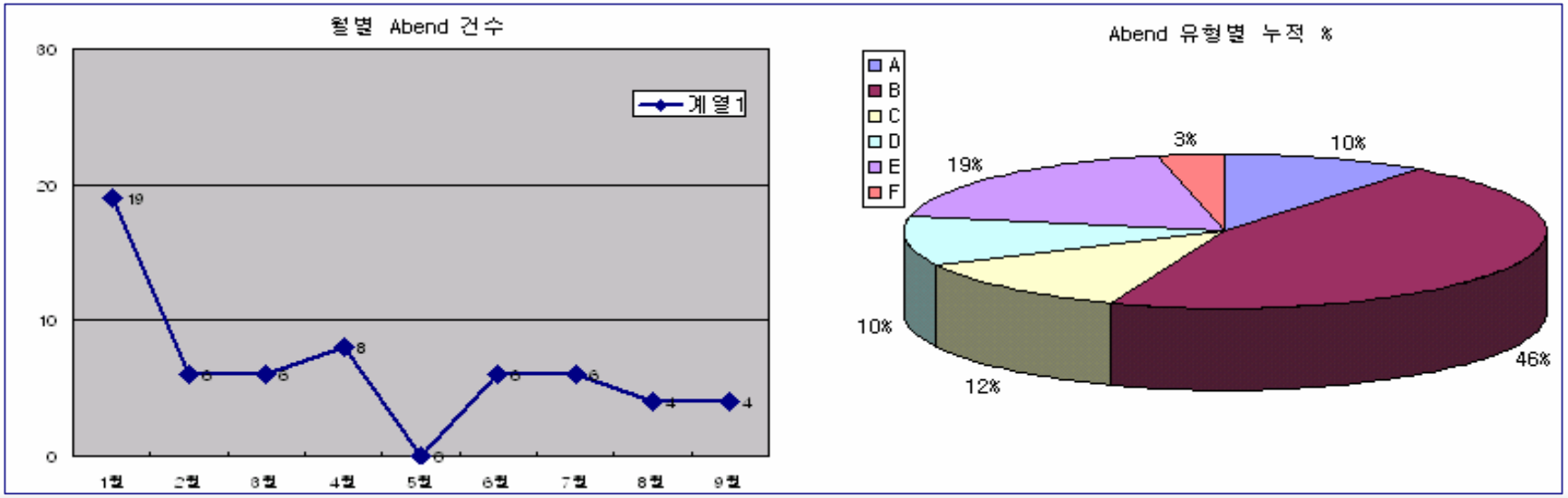
4.4 Management of failure(1/2)

Abnormal End program list by group/team and type

<월별 Abend 유형 집계>

	A	B	C	D	E	F	월별 합계
1월	3	10	1	1	4	0	19
2월	1	2	0	1	2	0	6
3월	0	2	0	1	3	0	6
4월	0	7	1	0	0	0	8
5월	0	0	0	0	0	0	0
6월	0	1	2	0	1	2	6
7월	1	2	3	0	0	0	6
8월	1	2	0	1	0	0	4
9월	0	1	0	2	1	0	4
10월	0	0	0	0	0	0	0
11월	0	0	0	0	0	0	0
12월	0	0	0	0	0	0	0
유형별 합계	6	27	7	6	11	2	

A	System Abend
B	Interface Abend
C	DB 관련 Abend
D	User 필요에 의한 Abend
E	User 실수에 의한 Abend
F	기타



4. SM Data Collecting System

4.4 Management of failure(2/2)

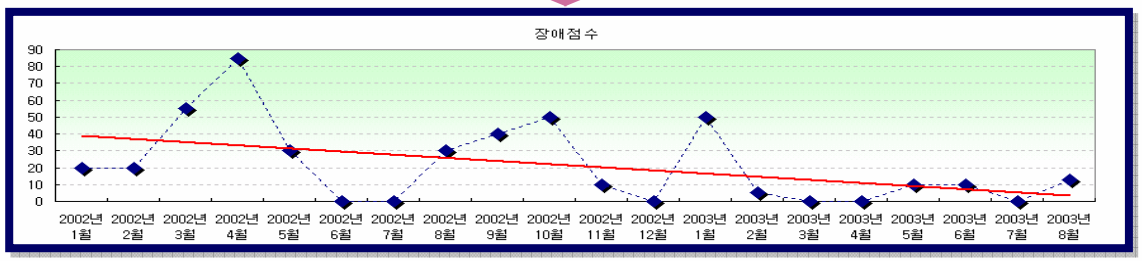
Integrate the management of Abnormal End and Inspection

그룹선택	발급/채권 ALL	LCEA%%	데이타 불러오기
PROC명입력	LCEA4D	45	데이타 불러오기

PROGRAM	최초등록일	총변경횟수	총ABEND횟수	A01	A02	A03	A04	A05	A06	B01	B02	B03	B04	B05	B06	C01	C02	C03	D01	D02	D03	E01	E02	E03	E04	E05
LCEA4DG0	2003-07-03	2	3		-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-
LCEA4DG1	2003-07-03	2	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-
LCEA4DG3	2003-07-03	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
LCEA4DG4																										
LCEA4DG5																										
LCEA4DG6																										
LCEA4DG7																										
LCEA4DG8																										
LCEA4DGB																										
LCEA4DGC																										
LCEA4DGD																										

PROC 입력	LCEA4DG0	3	데이타 불러오기

JOBNAME	그룹명	발생일	시간	DES	담당자	소그룹장	그룹장	ABEND 유형	ABEND CODE	RETURN CODE	ABEND 발생 STEP	ABEND발생 PROGRAM	관련CSR	ABEND내용	REWORK TIME	조치사항	재발방지대책	기타	INSP. 여부
LCEA4DG0	고객정보	2003-07-13	10:25:00 AM	온라인 DB 반영	황주영	조인규	강효원	D	D03	U3293	10	LCEB4DG0	C20030506539B3		30	잘못된값 수정후 해당RECORD부터 RERUN	비정상값이므로 ABEND 정당		Y
LCEA4DG0	고객정보	2003-07-13	3:07:00 AM	온라인 DB 반영	황주영	조인규	강효원	C	C01	U3185	10	LCEB4DG0	C20030506539B3	DEADLOCK	0	RERUN	"대량작업시, DBA와 KTIC에 협조요청"		Y
LCEA4DG0	고객정보	2003-07-13	2:01:00 AM	온라인 DB 반영	황주영	조인규	강효원	C	C01			CEB4DG0	C20030506539B3	DEADLOCK	0	RERUN	"대량작업시, DBA와 KTIC에 협조요청"		Y



5.1 Key Process Metrics (1/2)

- Define metrics for key process
- Collect data for process metric
- Manage and monitor process metric

Process metric	Objective of management	Supplementary metric
•**CSR On-time delivery rate**	•Understanding the status of CSR delayed – Aging Chart •Confirm optimal # of CSR is registered by comparing CSR Backlog to CSR effort expended etc.	•CSR Aging Chart •# of CSR not completed •CSR Backlog
•**Rate of CSR effort expended by phase**	•Confirm whether proper # of CSR effort is expended •Use for CSR plan	

5.1 Key Process Metrics (2/2)

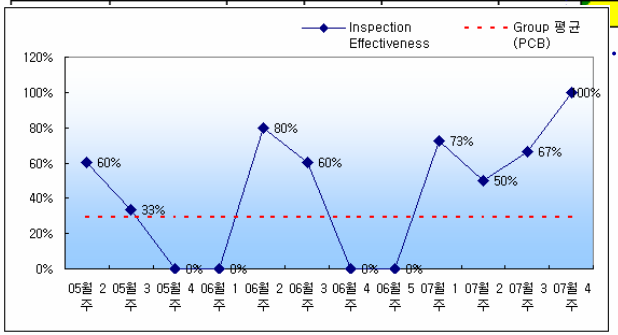
Process metric	Objective of management	Supplementary metric
• **Re-release Rate (Error Rate)**	• Corrective action are taken when error rate is over the upper limit • Establish method for the reduction of error rate by using the supplementary metric (such as inspection effectiveness) • Identify the rate of Non-CSR by reason for delivery and # of Non-CSR • Analyze the reasons for re-release and prevent recurrence (see whether it undergone inspection)	• Inspection Effectiveness • Test Effectiveness • Inspection Defect Density • Rate of CSR effort expended by phase • Rate of Non-CSR by reason for delivery
• **Inspection Effectiveness**	• Analyze improvement of efficiency connected with error rate • Analyze the correlation between inspection effectiveness and error rate • Validation for inspection data	• Test Effectiveness • Inspection Rate • Preparation Rate • Inspection Hit Rate
• **Inspection Defect Density**	• Identify mutual relation among inspection measurement • Predict # of defect for next project or CSR from identifying defect density by specific period	• Error Rate • Inspection Effectiveness • Inspection Rate • Preparation Rate

5.2 Analysis and Monitoring of Inspection Process Performance

Group	가맹점시스템Group	조회	상세조회
년도	2003		
월	전체		

Inspection Effectiveness(주별)

월/주	Inspection Defect	Test Defect	User Defect	Inspection Size	수정 Loc	Inspection Effectiveness	Test Effectiveness	Inspection Defect Density	Test Defect Density	Group 평균 (PCB)
12	**47**	**17**	**10**	**18,439**	**15,517**	**64%**	**63%**	**2.55**	**1.10**	**29%**
05월 2주	3	2	0	436	298	60%	100%	6.88	6.71	29%
05월 3주	3	3	3	2,320	3,037	33%	50%	1.29	0.99	29%
05월 4주	0	0	1	597	511	0%	0%	0.00	0.00	29%
06월 1주	0	1	2	898	790	0%	33%	0.00	1.27	29%
06월 2주	8	2	0	1,226	395	80%	100%	6.53	5.06	29%
06월 3주	9	6	0	2,742	2,563	60%	100%	3.28	2.34	29%
06월 4주	0	0	1	741	642	0%	0%	0.00	0.00	29%
06월 5주	6	1	0	3,900		0%	100%	1.54		29%
07월 1주	8	1	2	1,664	1,306	73%	33%	4.81	0.77	29%
07월 2주	1	0	1	785	533	50%	0%	1.27	0.00	29%
07월 3주	2	1	0	1,659	2,173	67%	100%	1.21	0.46	29%
						100%		4.76	0.00	29%



Group PPB tracking

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