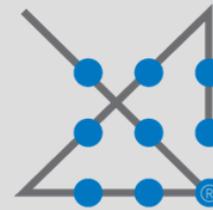




European Network for Business
and Industrial Statistics

IsENBIS 21.10.2012



KPA

Insights through analytics

www.kpa-group.com

Integrating Operational and Financial Risks

Ron S. Kenett

ron@kpa-group.com

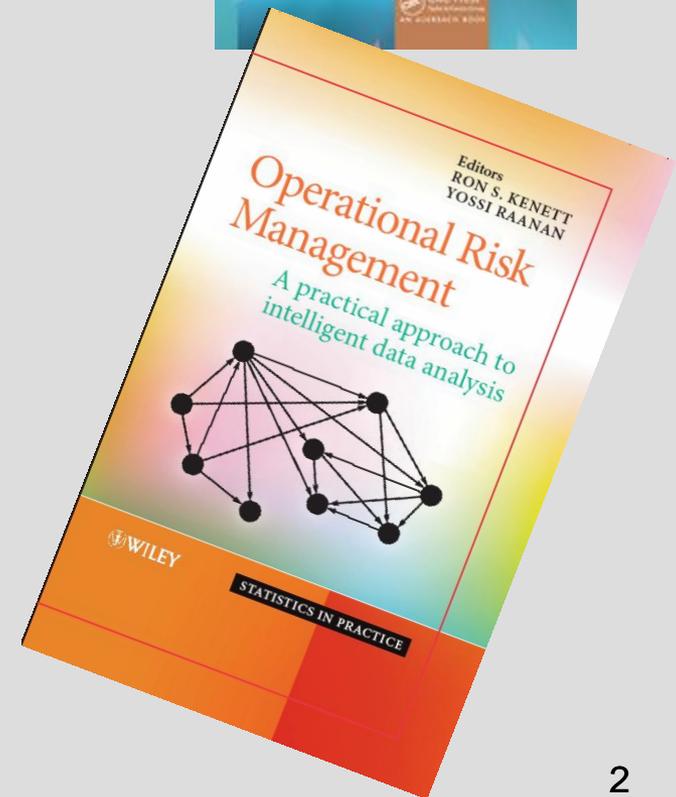
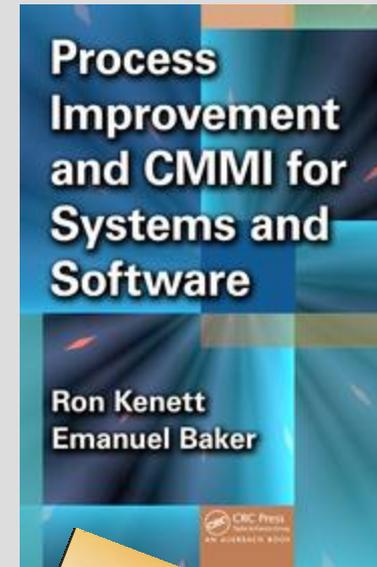
KPA Ltd., Raanana

University of Turin, Italy

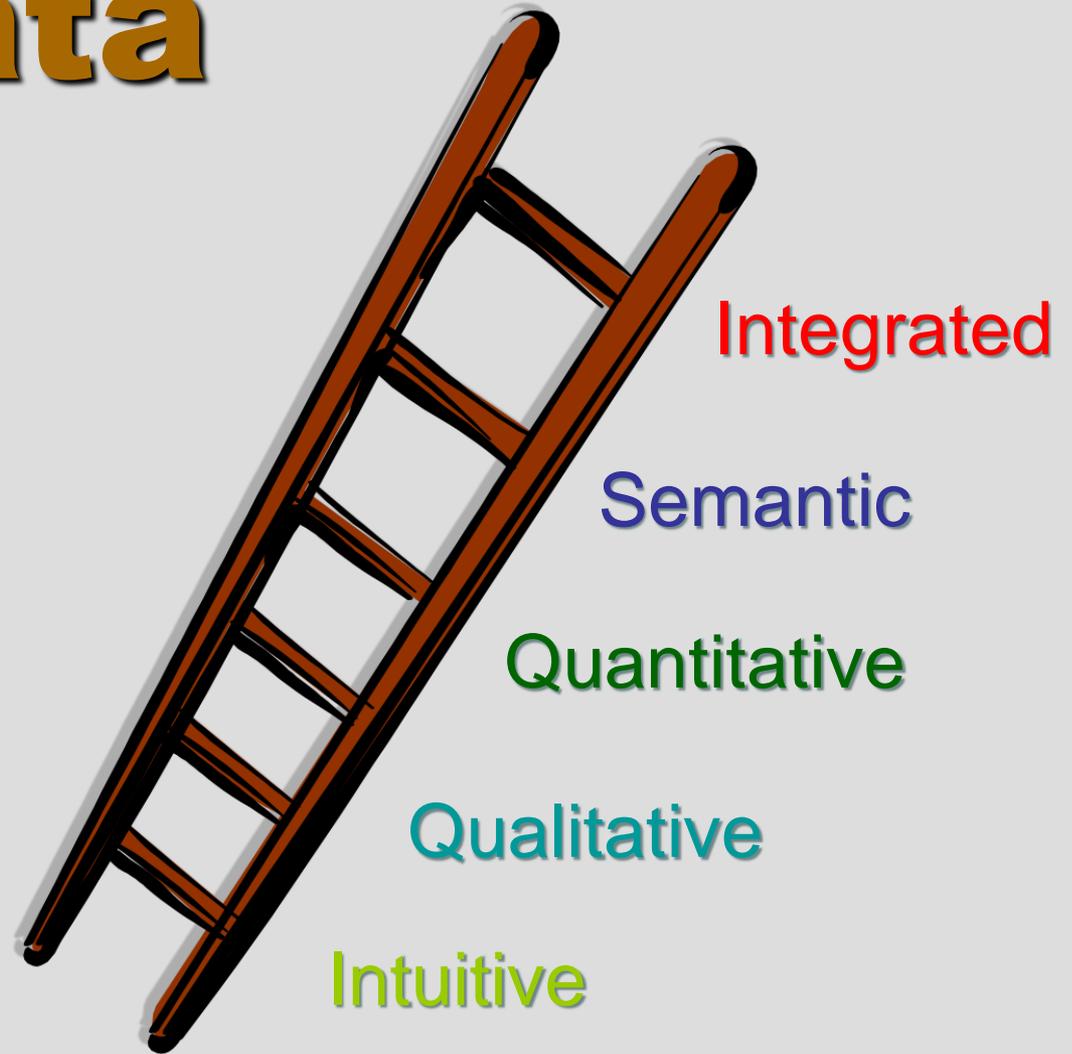
Center for Finance and Risk Engineering, NYU-Poly, New York

Agenda

1. Risk data
 - Qualitative data
 - Semantic data
 - Financial data
 - Operational data
2. Case studies
3. Integrating risks



Risk Data



Function	Failure Mode	Failure Effects	Severity (S)	Causes of Failure	Occurrence (O)	Controls	Detection (D)	RPN (Risk)	Plan
FCTN	FAILURE MODE	EFFECT		CAUSE		CONTROL			PLAN
HPLC DS Impurities Method	Unknown Impurity is quantified which is not present in batch	Repeat Testing (if specification initially fails or atypical result is observed)	3	Contamination - glassware	4	Method states that Wheaton vial should be used in preference to volumetric flasks. Blank Injections	4	48	Develop wash procedure for Volumetric flasks (Detergent could react with Drug Substance)
		Repeat Testing (if specification initially fails or atypical result is observed)	3	Contamination - sample handling	2	Blank Injections should pick up any aberrant peaks	2	12	Ensure Blank Solutions are prepared exactly the same way as for samples
		Repeat Testing (if specification initially fails or atypical result is observed)	3	Contamination - solvents	2	Blank Injections should pick up any aberrant peaks	2	18	Ensure Blank Solutions are prepared exactly the same way as for samples
		Report invalid results	10	Contamination - glassware	4	Method states that Wheaton vial should be used in preference to volumetric flasks. Blank Injections	4	160	Develop wash procedure for Volumetric flasks
		Report invalid results	10	Contamination - sample handling	2	Blank Injections should pick up any aberrant peaks	2	40	Ensure Blank Solutions are prepared exactly the same way as for samples
		Report invalid results	10	Contamination - solvents	3	Blank Injections should pick up any aberrant peaks	2	60	Ensure Blank Solutions are prepared exactly the same way as for samples
		Report invalid results	10	HPLC method cannot detect it	2	Orthogonal analytical techniques should pick up other unknowns	3	60	Brainstorm what potential impurities can be produced by process. Assess whether current methodology would pick these up
		Report invalid results	10	Co-elution with another named peak	2	None although considerable elevation in named impurity would lead to repeat testing	3	60	Assess impurity profile against historical batches
		Repeat Testing (if specification initially fails or atypical result is observed)	3	Poor quantification of peaks (setting of RT window)	2	Test mixture with elevated imps.	2	12	Improve HPLC training

FMEA



Qualitative

Beta Testing of a System



Heavy/Light Workload
SME/Large Company
Basic/Sophisticated Usage

1 site per run
8 systems
9 respondents
per site:
○ 3 decision makers
○ 3 technical experts
○ 3 operations staff

2 sites per run
8 systems
9 respondents
per site

Questionnaire

System 1950 Update Beta Customer Survey

Dear customer,

As part of the Beta test that your company is taking part of I would like to ask you some questions regarding the System 1950 Update. We value your feedback and intend to use it as the basis for future improvements of the hardware and software. Please answer the following questions, which should take an estimated 30 minutes of your time.

Before starting with the questions let me explain that on this survey you will be asked about the various new features of the System 1950 Update. The questionnaire's objective is to hear your opinion regarding the improvements made in the System 1950 Update compared to the System 1950. The questionnaire will focus on your level of satisfaction from the improvement in your productivity, print quality and profitability generated by the new features.

In order to answer these questions please state the number which best reflects how satisfied you feel about the subject asked, on a scale from 1 to 5 when:

- 5 means Very high satisfaction level
- 4 means High satisfaction level
- 3 means Average satisfaction level
- 2 means Low satisfaction level
- 1 means Very Low satisfaction level

And 0 means Not relevant- you did not use the feature

Thank you in advance for your cooperation

John Doe
Technical Marketing
Systems Inc.

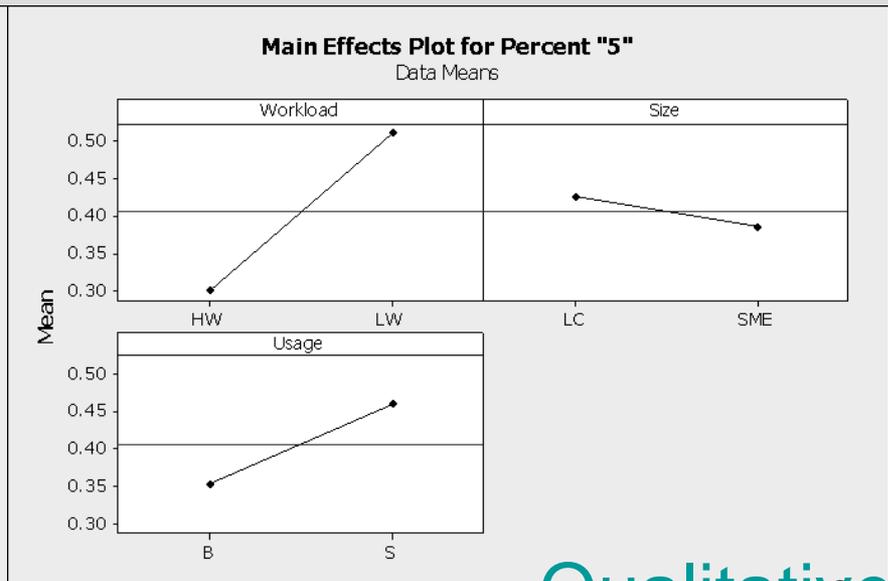
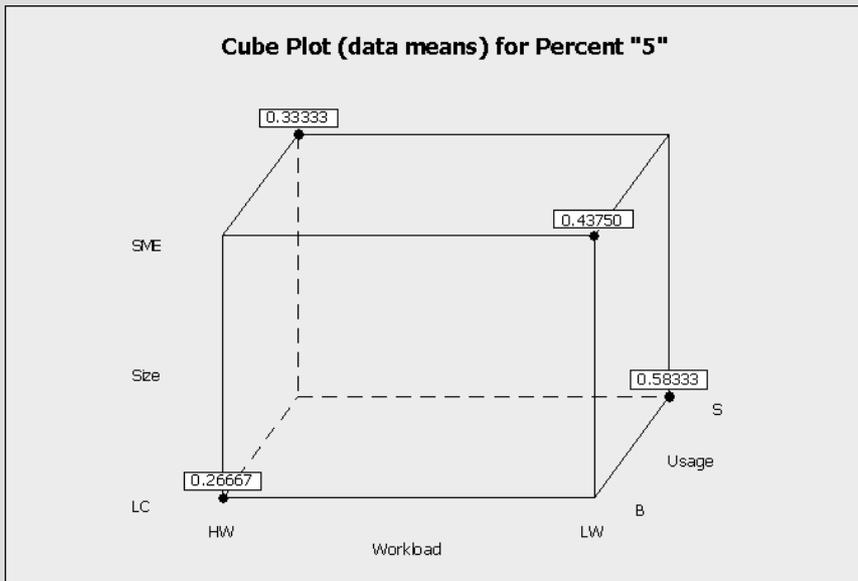
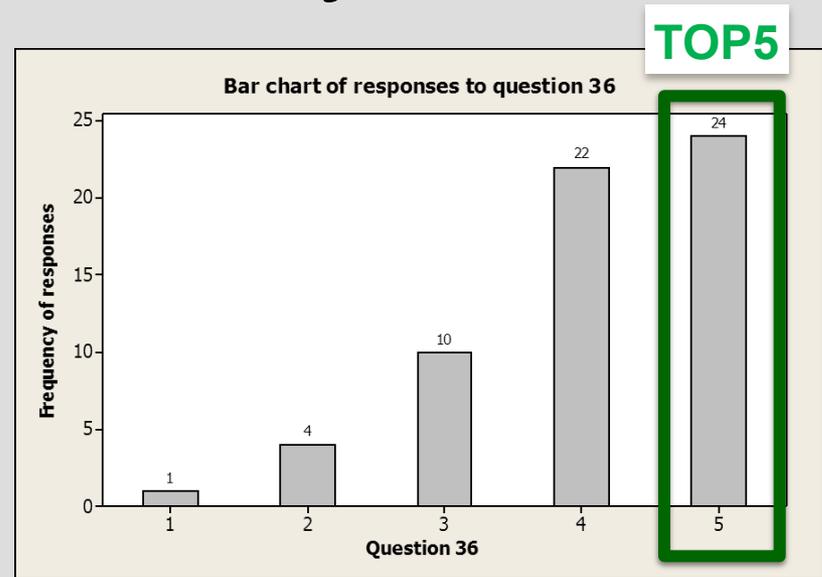
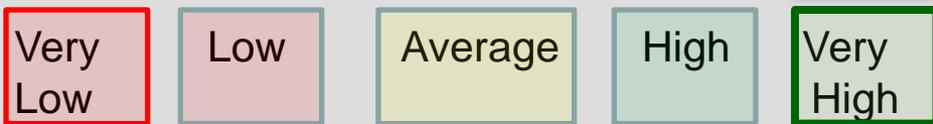
#	Questions	Responses					
1	What is your company name?						
2	What is your name?						
3	What is your title? Technical, Supervisor, plant manager, other (please specify)	1. Operator	2. Supervisor	3. Manager	4. Other	Very High	Not relevant
Site Preparation		Very Low	Low	Average	High	Very High	Not relevant
4	Your satisfaction level with the site preparation instructions	1	2	3	4	5	0
5	Your satisfaction level with the site preparation timing	1	2	3	4	5	0
6	Your satisfaction level with the site preparation requirements	1	2	3	4	5	0
Installation		Very Low	Low	Average	High	Very High	Not relevant
7	Your satisfaction level with the shipment timing	1	2	3	4	5	0
8	Your satisfaction level with the installation length	1	2	3	4	5	0
9	Your satisfaction level with the cleanliness of equipment after installation	1	2	3	4	5	0
Training		Very Low	Low	Average	High	Very High	Not relevant
10	Your satisfaction level with the operator training	1	2	3	4	5	0
11	Your satisfaction level with the technical training	1	2	3	4	5	0
12	Your satisfaction level with the on site training	1	2	3	4	5	0
Production ramp up		Very Low	Low	Average	High	Very High	Not relevant
13	What was the expected usage of system 1950 Update	1	2	3	4	5	0
14	Actual usage of system 1950 Update during beta test	1	2	3	4	5	0
15	What is the billable usage during the beta test? (%)	5	25	50	75	95	0
Diagnostics		Very Low	Low	Average	High	Very High	Not relevant
16	In how many problems did you use the diagnostics tools? (%)	5	25	50	75	95	0
17	In how many of these cases did the diagnostics tool help resolve the problem? (%)	5	25	50	75	95	0
Reliability and maintenance		Very Low	Low	Average	High	Very High	Not relevant
18	How many cases of part replacements did you experience during the beta test?	1	5	10	15	20	0
19	Your satisfaction level with component A replacement procedure	1	2	3	4	5	0
20	Your satisfaction level with component B replacement procedure	1	2	3	4	5	0
21	Your satisfaction level with component C replacement procedure	1	2	3	4	5	0
22	Your satisfaction level of other replacements and handling procedures	1	2	3	4	5	0
23	Comments:						
Overall productivity		Very Low	Low	Average	High	Very High	Not relevant
24	Rate the overall productivity of System 1950 Update	1	2	3	4	5	0
25	Rate the failure rate in the System 1950 Update	1	2	3	4	5	0
26	Rate the improvement in supplies that can be used in the System 1950 Update	1	2	3	4	5	0
27	Rate the improvement in the System 1950 Update utilization level	1	2	3	4	5	0
28	Rate the performance of system user interface	1	2	3	4	5	0
29	Rate the ease-of-use when fixing a technical problem	1	2	3	4	5	0
Software		Very Low	Low	Average	High	Very High	Not relevant
30	The number of restarts needed when using the System 1950 Update was	5	25	50	75	95	0
31	Comments on main software restart cause:						
32	Rate the user interface connectivity:	1	2	3	4	5	0
33	Comments on user interface connectivity:						
Overall satisfaction level		Very Low	Low	Average	High	Very High	Not relevant
34	Your satisfaction level of improvements in the quality of the System 1950 Update	1	2	3	4	5	0
35	Your satisfaction of improvements in the ease-of-use of the System 1950 Update	1	2	3	4	5	0
36	What is your overall satisfaction level from the System 1950 Update?	1	2	3	4	5	0
37	If you were in the market to buy a system, with what likelihood would you purchase the System 1950 Update?	1	2	3	4	5	0
38	General comments on the System 1950 Update:						

Group	Workload	Size	Usage
1	HW	SME	B
2	LW	SME	B
3	HW	LC	B
4	LW	LC	B
5	HW	SME	S
6	LW	SME	S
7	HW	LC	S
8	LW	LC	S

Group	Workload	Size	Usage
2	LW	SME	B
3	HW	LC	B
5	HW	SME	S
8	LW	LC	S

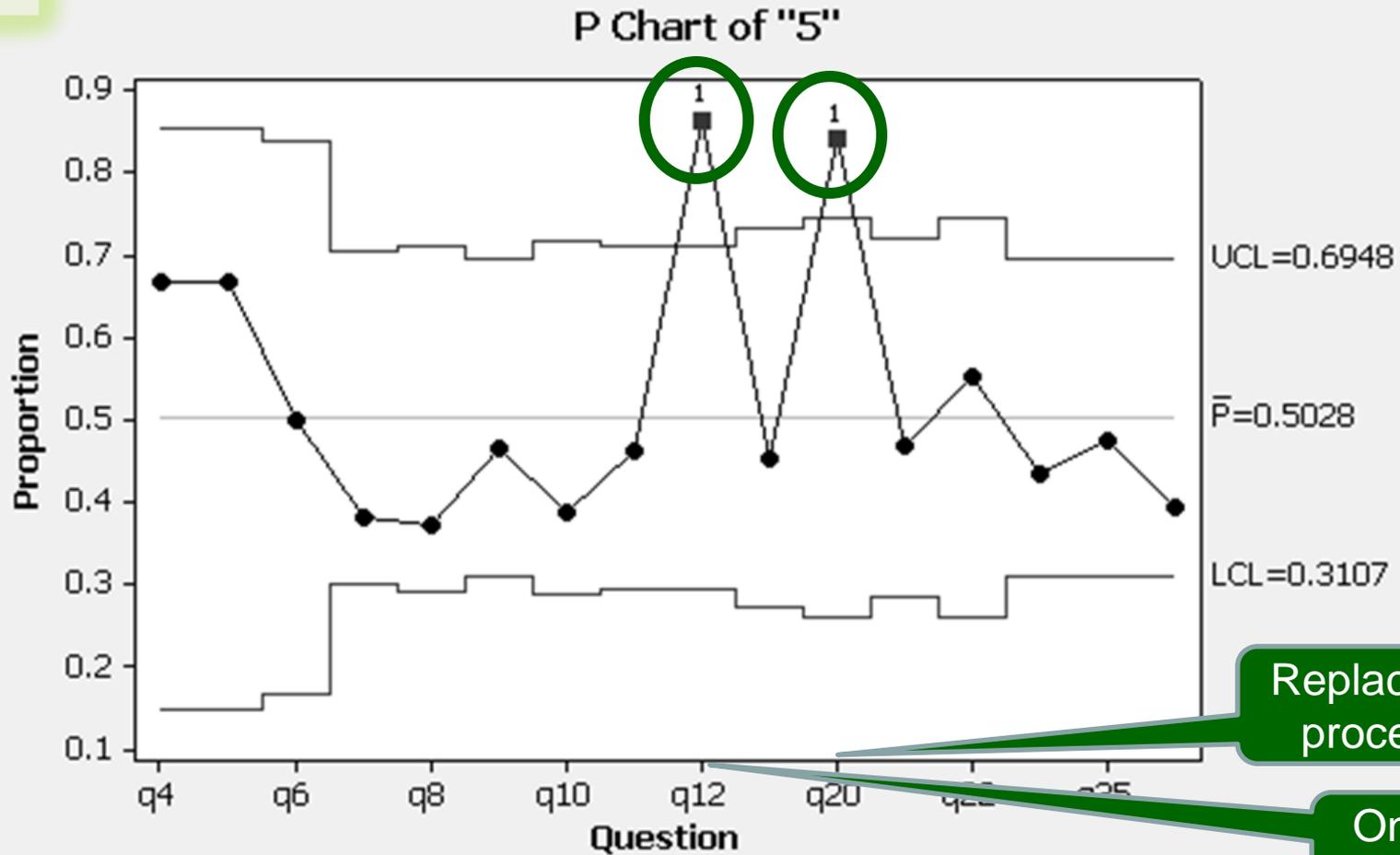
Beta Testing of a System

What is your overall level of satisfaction from the system under test:



Beta Testing of a System

TOP5



Replacement procedure

On site training

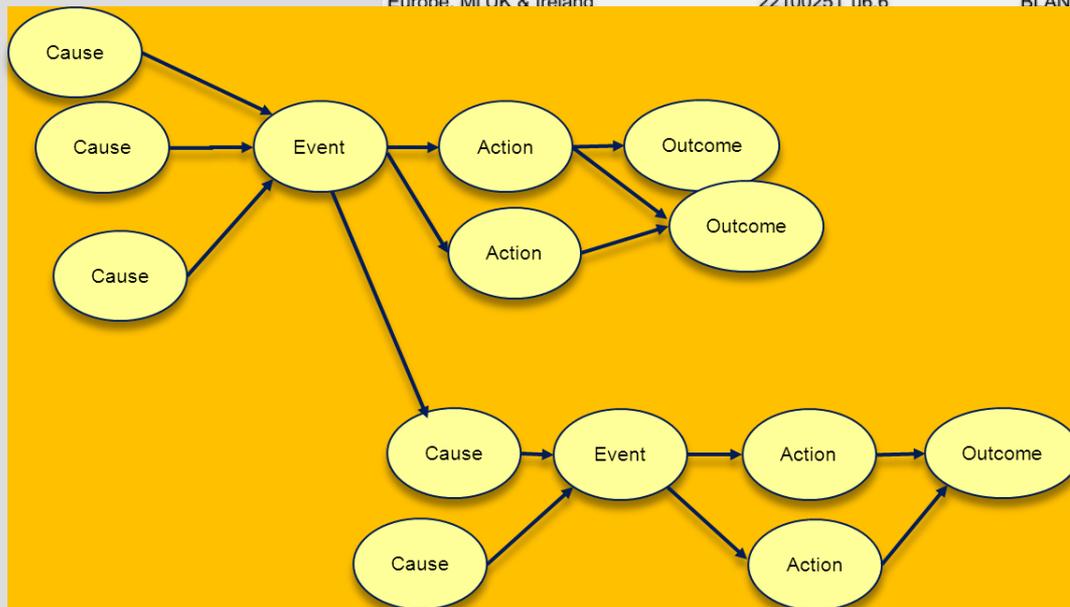
Tests performed with unequal sample sizes

Qualitative

Beta Testing of a System

NA Call Data- Apr sheet

Title	Resolution	Engineer Name	Engineer Title -Queue	Primary Case #	Assist Case #	Call Date	Time Opened	Close Date		
FSE	ONSITE	DARLING JOE	FSE	C276646		3/21/2006	12:04	3/26/2006		
FSE	ONSITE	DARLING JOE	FSE	C277372		3/27/2006	13:49	3/29/2006		
T1/HW	ASSIST	RICKET BRENT	REMOTE	C277629	C2776291	3/29/2006	8:36	3/29/2006		
T2/HW	REMOTE	SHEPHERD DOUGLAS	REMOTE	C2776291		3/29/2006	8:37	3/29/2006		
FSE	ONSITE	DARLING JOE	FSE	C277822		3/30/2006	8:12	4/16/2006		
FSE	ONSITE	DARLING JOE	FSE	C277849		3/30/2006	8:22	4/19/2006		
FSE	ONSITE	DARLING JOE	FSE	C277850		3/30/2006	8:22	4/19/2006		
		Region	Sub Region	Press Serial #	Soft. Version	Blk/Pip	Rep. Date	Rep. Time	Eng#	Total Imp.
FSE	ONSITE	DARLING JOE	Europe, Mi UK & Ireland	22100251	u6.6	BLANKET	04/29/06		63216 P1	16196170
FSE	ONSITE	DARLING JOE	Europe, Mi UK & Ireland	22100251	u6.6	BLANKET	04/28/06		123414 P1	16182194
FSE	ONSITE	DARLING JOE	Europe, Mi UK & Ireland	22100251	u6.6	BLANKET	04/27/06		131001 P1	16136797
FSE	ONSITE	DANIEL JONATHAN	Europe, Mi UK & Ireland	22100251	u6.6	BLANKET	04/26/06		145624 P1	16088645
T1/HW	REMOTE	ERICKSON BRAND	Europe, Mi UK & Ireland	22100251	u6.6	BLANKET	04/26/06		91927 P1	16076021
T2/HW	ASSIST	SHEPHERD DOUG	Europe, Mi UK & Ireland	22100251	u6.6	BLANKET	04/25/06		181859 P1	16060043
FSE	ONSITE	DANIEL JONATHAN	Europe, Mi UK & Ireland	22100251	u6.6	BLANKET	04/25/06		120410 P1	16028682
FSE	PHONE	DARLING JOE	Europe, Mi UK & Ireland	22100251	u6.6	BLANKET	04/24/06		62332 P1	15999836
		Europe, Mi UK & Ireland		22100251	u6.6	BLANKET	04/23/06		62344 P1	15978330
		Europe, Mi UK & Ireland		22100251	u6.6	BLANKET	04/20/06		204659 P1	15943678
						BLANKET	04/20/06		115903 P1	15923964
						BLANKET	04/20/06		63043 P1	15905455
						BLANKET	04/19/06		135447 P1	15884725
						BLANKET	04/19/06		63704 P1	15854039
						BLANKET	04/18/06		63527 P1	15806987
						BLANKET	04/13/06		65457 P1	15782720
						BLANKET	12/4/2006		124647 P1	15757103
						BLANKET	11/4/2006		180533 P1	15727376
						BLANKET	10/4/2006		163457 P1	15696524
						BLANKET	7/4/2006		171259 P1	15676034
						BLANKET	6/4/2006		175451 P1	15648151
						BLANKET	6/4/2006		64137 P1	15613026
						BLANKET	5/4/2006		172634 P1	15595906

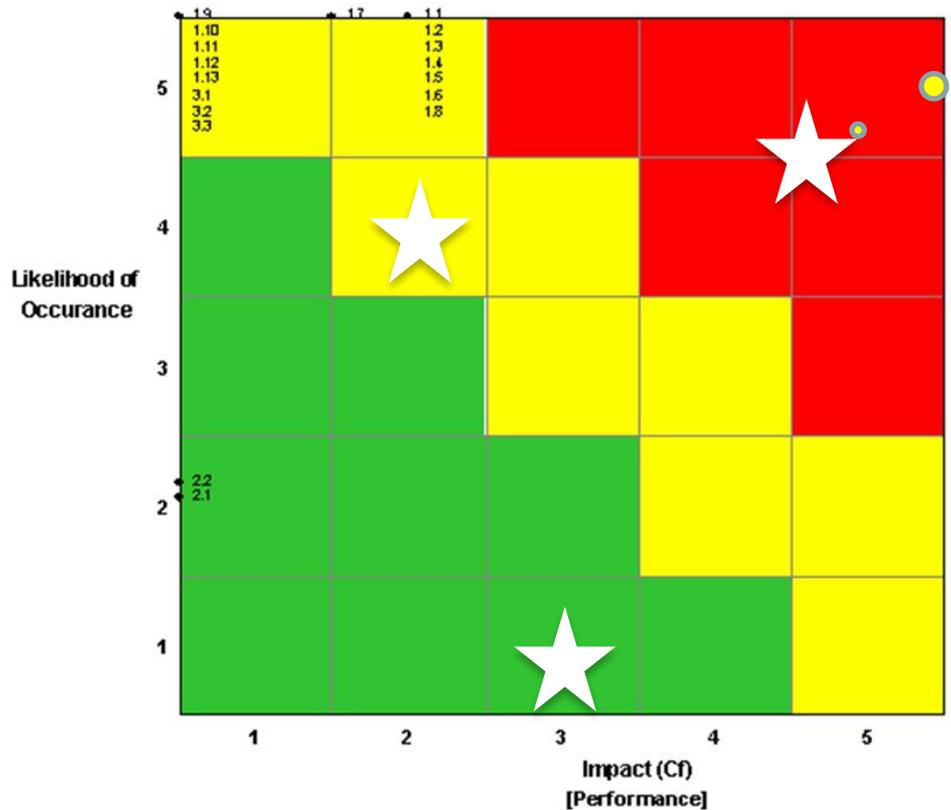


Quantitative

Beta Testing of a System



Beta Press



- 1.1 Mapping potential participants
- 1.2 Segmenting potential participants
- 1.3 Planning the test allocation
- 1.4 Communication: letters and expectation setting
- 1.5 Planning Beta Duration
- 1.6 Planning number of participants
- 1.7 Logistics considerations
- 1.8 Reporting processes
- 1.9 Defining Beta Objectives
- 1.10 Setting Beta Success Criteria (SC)
- 1.11 Training
- 1.12 Documentation
- 1.13 Database
- 2.1 Design of feedback questionnaire
- 2.2 Operational Data Control
- 3.1 Analyse Beta Data
- 3.2 Risk Assessment
- 3.3 Presenting results

Printed: 16 Jul 2006

INTERNATIONAL
STANDARD

ISO
31000

First edition
2009-11-15

Risk management — Principles and
guidelines

Management du risque — Principes et lignes directrices



GUIDE 73

Risk management — Vocabulary

Management du risque —
Vocabulaire

SI 14971

תקן ישראלי ת"י 14971

ISO 14971: 2000, FDAM 1: 2002

אדר א התשס"ג - פברואר 2003

February 2003
ICS CODE: 11.040.01

התקנים רפואיים - יישום ניהול סיכונים להתקנים רפואיים

Medical devices - Application of risk management to medical devices



IEC/ISO 31010

Edition 1.0 2009-11

INTERNATIONAL
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NORME
INTERNATIONALE

Risk management – Risk assessment techniques

Gestion des risques – Techniques d'évaluation des risques

BS 31100:2011

Risk management – Code of
practice and guidance for
the implementation of
BS ISO 31000

Semantic Data in a Bank Logbook

Booked on fixed income trade that was in the wrong partfund code. Have cancelled trade re

Cash contribution not invested due to incorrect fax number used by client. Not a BGI error bu

Client sent in an instruction to invest £1.7m in their M&S Investment Portfolio (MSIP) o

Barclays Private Clients (BPC) conduct the asset allocation for the LIPS (L&G Investment

EBF

"Booked on fixed income trade that was in the wrong partfund code.
Have cancelled trade resultant in error of 15000"

"Cash contribution not invested due to incorrect fax number used by
client. Not our error but noted due to performance impact on the
fund."

"The client sent a disinvestment instruction that was incorrectly
processed as an investment. Due to a positive movement in the
equity markets the correction of the error led to a gain."

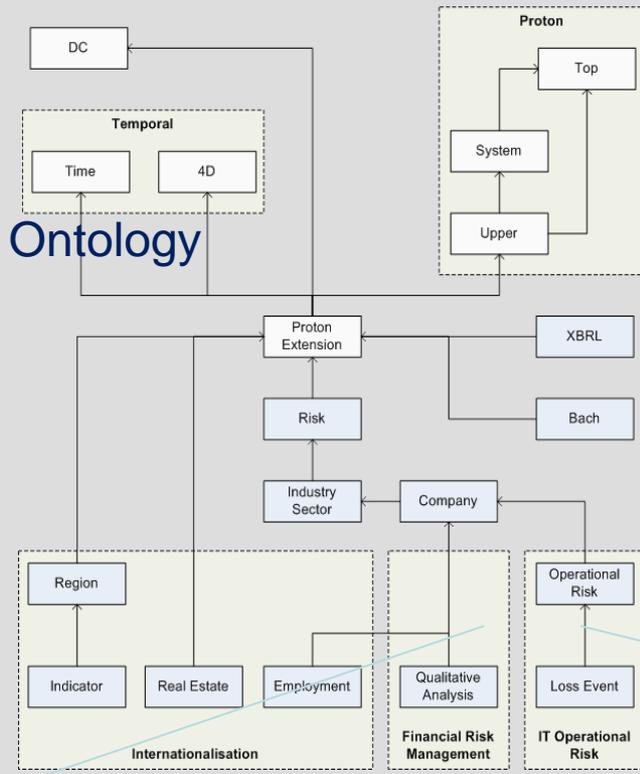
Historic prices were sent to Hewitts with a zero price by Fund Accounting in error on 03.03.03

Purchase instruction was received from Transitions for 16,264,591,827 Indonesian Rupiah, (ID

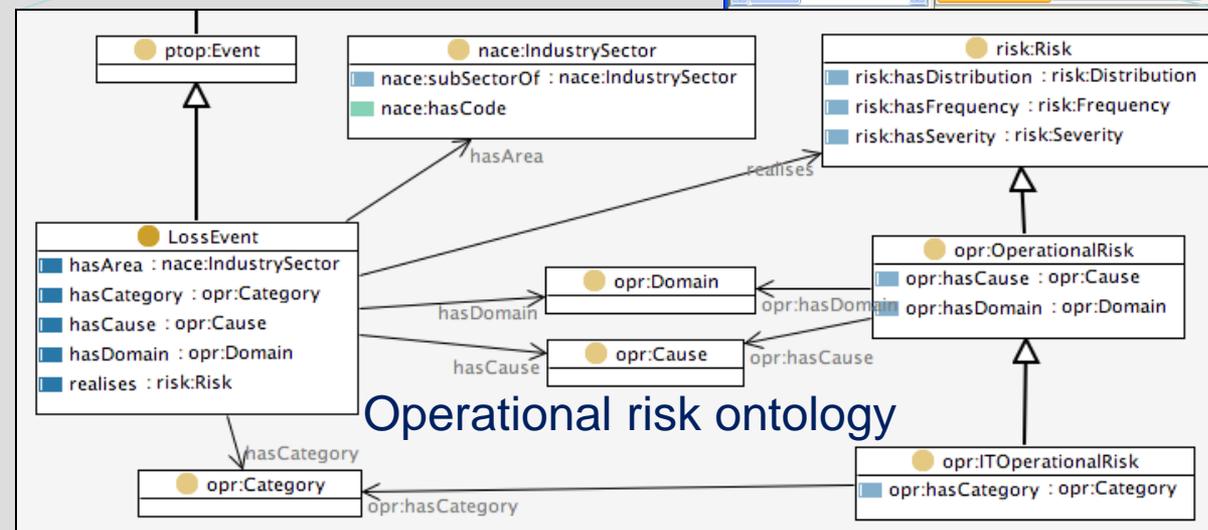
Asset Allocation provided Alex with a paper trade instruction to buy £2.6m index-linked gilts

Income was posted to the Capital account in error which caused the fund to breach.I rebalan

Client instructed a disinvestment of \$195,070.00, however the cashflow instruction sent to th



Ontology



Operational risk ontology

A Telcom Operator Case Study

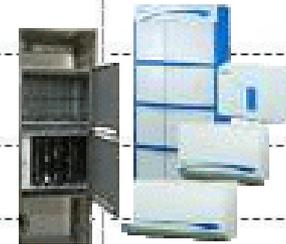
- Compute operational risk scores by combining information from PBX logs with CRM and technical data.
- Combine XBRL financial data to determine credit scores.
- Integrate risk scores for overall integrated risk management.





Logs of Telecom System

SITE NAME	CCS VERS	SYS. TYPE	GC DUP	GC VER	LAST BOOT & CAUSE	DC_SNAP	SNAP SHOT	NET	ALARMS	POOL FAULT	RESOURCES	SYSTEM & TASK RESTART	TEST DATE-TIME
90006	14.66.35	HDC		8.4	2-SEP -2007 09:20		0			p14_tab-177 cpn_tab-10	DTMF-15	RESET_POWER_UP-1 TOTAL_RESTARTS-1	11-Sep-2007 04:00:51
90009	11.11.17	SX		7.23	AUG -07-20 08:06 AM		116			p14_tab-255 p16_ma-4 call_tab-24 call_rec-25		NMI_WD-1 SUSPECT_ACF-1 RESET_POWER_UP-1 TOTAL_RESTARTS-1	11-Sep-2007 04:03:19
90021	11.11.17	MEX		38.13	6-JUN -2006 11:38		0			p14_tab-235			11-Sep-2007 04:10:00
90033	11.11.16	SX		7.19	14-FEB -2007 05:56		0	PCM TIME SLOT		p14_tab-39			11-Sep-2007 04:13:13
90049	11.11.17	SX		7.23	4-AUG -2007 13:29		0			status-255 features-255 timers-255 ts_pool-255			11-Sep-2007 04:17:20
90067	11.11.17	SX		7.23	25-MAY -2007 10:31		0			p14_def-1 p14_tab-177 call_tab-1 call_rec-1	DTMF-9	OVERLOAD-1	11-Sep-2007 04:32:00
90098	11.11.16	SX		38.13	25-JUL -2007 11:47		0			p14_tab-219 call_tab-5			11-Sep-2007 04:40:30
90100	11.11.16	SX		7.5	1-APR -2007 23:22		0			p14_tab-29 p16_ma-2 call_tab-12 call_rec-32			11-Sep-2007 04:42:00
90105	15.68.14	IPx50		8.5	14-AUG -2007 15:54		0	CARD SUBUNIT		p14_tab-106			11-Sep-2007 04:44:50
90118	11.11.11	SX		38.10	23-NOV -2006 16:31		0	CARD SUBUNIT		p14_tab-38			11-Sep-2007 04:51:00
90125	11.11.16	SX		0.0	19-AUG -2007 15:10		0			status-255 features-255 timers-255 *:-3		POWER_FAIL-1 SUSPECT_ACF-1 RESET_POWER_UP-1 TOTAL_RESTARTS-1	11-Sep-2007 04:58:10
90126	14.66.35	SVC		38.10	SEP -25-20 11:42 AM		0			p14_def-9 p14_tab-227			11-Sep-2007 05:01:16
90128	11.11.16	SX		38.10	4-JUN -2006 07:48		0			p14_tab-19		RDY_TMOUT-2 OVERLOAD-7 POWER_FAIL-12	11-Sep-2007 05:04:00





Site	Type	Ports	Trunks	Phones	Complaint	Action
90009	High Tech	956	246	116		
90009	High Tech	956	246	116		
90009	High Tech	956	246	116		
90009	High Tech	956	246	116		
90009	High Tech	956	246	116		
90009	High Tech	956	246	116		
90021	Municipalities	66	34	2		
90033	Transportation	491	316	123		
90033	Transportation	491	316	123		
90033	Transportation	491	316	123		
90033	Transportation	491	316	123		
90033	Transportation	491	316	123		
90033	Transportation	491	316	123		
90033	Transportation	491	316	123		
90033	Transportation	491	316	123		
90033	Transportation	491	316	123		
90049	Municipalities	423	114	119		
90049	Municipalities	423	114	119		
90049	Municipalities	423	114	119		
90049	Municipalities	423	114	119		
90049	Municipalities	423	114	119		
90049	Municipalities	423	114	119		

CRM Data



Public Companies

XBRL Reports

General search Financial

From date * 01/04/2008

To date * 11/04/2009

Free text

Reporter name ELECTRA LTD.

List

Fields marked with * are required

< [01 02 03 04 05 06 07 08 09 10 11 12 13 14 15] > Updated as of 11/04/2009 19:35:49 (Magna server time)

Results 300-2

18/05/2008 19:36	2008-01-136773	Financial Report	31/03/2008
18/05/2008 17:58	2008-01-136578	Financial Report	31/03/2008

AUDIOCODES LTD. AND ITS SUBSIDIARIES
CONDENSED CONSOLIDATED BALANCE SHEETS

U.S. dollars in thousands

	December 31, 2006	December 31, 2005
ASSETS		
CURRENT ASSETS:		
Cash and cash equivalents	\$ 25,171	\$ 70,957
Short-term bank deposits and structured notes	28,658	61,929
Short-term marketable securities and accrued interest	29,422	9,863
Trade receivables, net	30,501	17,990
Other receivables and prepaid expenses	3,309	4,891
Inventories	16,093	11,562
Total current assets	133,154	177,192
LONG-TERM INVESTMENTS:		
Long-term bank deposits and structured notes	30,435	27,781
Long-term marketable securities	19,942	49,791
Investments in companies	3,999	1,112
Deferred tax assets	3,742	2,489
Severance pay funds	7,231	5,406
Total long-term investments	65,349	86,579



Quantitative

The Data



One year

CRM Report

PBX	Open On..	Code	Problem	Severity	Trunk	SLT	DKT	Type
94095	28/05/2009 09:38	23	version change from support	2	170	103	383	Finance
94095	12/05/2009 09:28	23	version change from support	2	170	103	383	Finance
94095	03/05/2009 15:11	23	version change from support	2	170	103	383	Finance
94095	10/05/2009 16:00	333	Customer remote handling	3	170	103	383	Finance
94095	10/05/2009 14:50	333	Customer remote handling	3	170	103	383	Finance
94095	19/05/2009 12:28	334	Customer remote handling	3	170	103	383	Finance
94095	11/05/2009 16:27	334	Customer remote handling	3	170	103	383	Finance
94095	26/05/2009 17:02	E202	Remote Programing	3	170	103	383	Finance
94095	26/05/2009 10:32	E202	Remote Programing	3	170	103	383	Finance
94095	24/05/2009 13:00	E202	Remote Programing	3	170	103	383	Finance
94095	10/05/2009 17:39	E202	Remote Programing	3	170	103	383	Finance
94095	05/05/2009 18:58	E202	Remote Programing	3	170	103	383	Finance
94095	05/05/2009 14:26	E202	Remote Programing	3	170	103	383	Finance
94095	05/05/2009 07:59	E202	Remote Programing	3	170	103	383	Finance
94095	04/05/2009 15:39	E202	Remote Programing	3	170	103	383	Finance

Financial Report

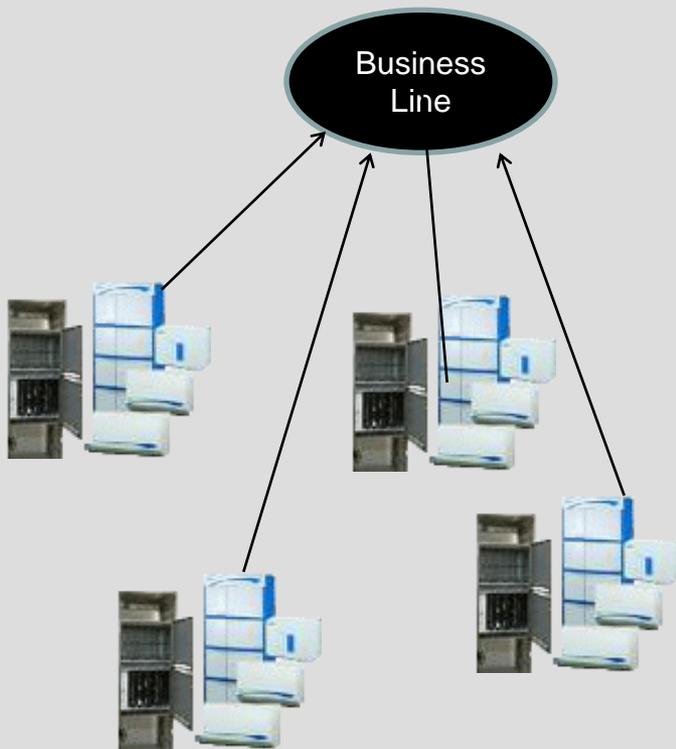


PBX 91068	Jan-08	Sep-09
Period (Quarter & Year or Annual)	IFRS	IFRS
Balance Sheet		
Balance Sheet Total	114,677	150,808
Current Assets	58,935	73,681
Non-Current Assets	55,742	77,128
Equity	26,963	37,073
Of which: Minority Rights	0	3,564
Current Liabilities	82,884	106,720
Non-Current Liabilities	4,831	7,016
Profit & Loss Statement		
Total Revenues	161,560	162,790
Gross Profit	66,506	65,708
Operational Profit	9,001	7,192
Pre-Tax Profit	4,826	5,667
Net Profit	4,876	6,136
Net Profit attributed to Share Holders	#VALUE!	6,193
Basic Earnings Per Share	5	6
Additional Data		
Dividend		
Net Cash from regular Operations	18,874	17,141
Financial Ratios		
Market to Equity		
Multiplier		
Equity to Balance Sheet		
Return on Equity		

Diagnostic Report

SITE NAME	CCS VERS	SYS. TYPE	GC VER	LAST BOOT & CAUSE	DC. SNAP	SNAP SHOT	POOL FAULT	RESOURCES	SYSTEM & TASK RESTART	TESTING DATE-TIME
91068	11.11.17	4gc	7.23	SEP-12-2009 06:15		0	p14_tab-101	DTMF-12		08-APR-2010 06:22:06
92780	15.85.16	HDC	7.23	21-MAY-2009 13:20		0	p14_tab-70			08-APR-2010 06:45:36
94486	10.21.05	4gc	7.23	07-Feb-2008 09:45 PM		0:0	status-31 features-2 timers-2 ts_pool-34	RESET_POWER_UP-7 TOTAL_RESTARTS-9 GENERAL_P-1		08-APR-2010 07:15:24
94095	15.68.28	4gc	7.23	16-Jun-2009 06:17 PM		0:0	p14_tab-197 p16_ma-78 call_tab-7 call_rec-15	RESET_POWER_UP-7 TOTAL_RESTARTS-9 GENERAL_P-1		08-APR-2010 07:33:47

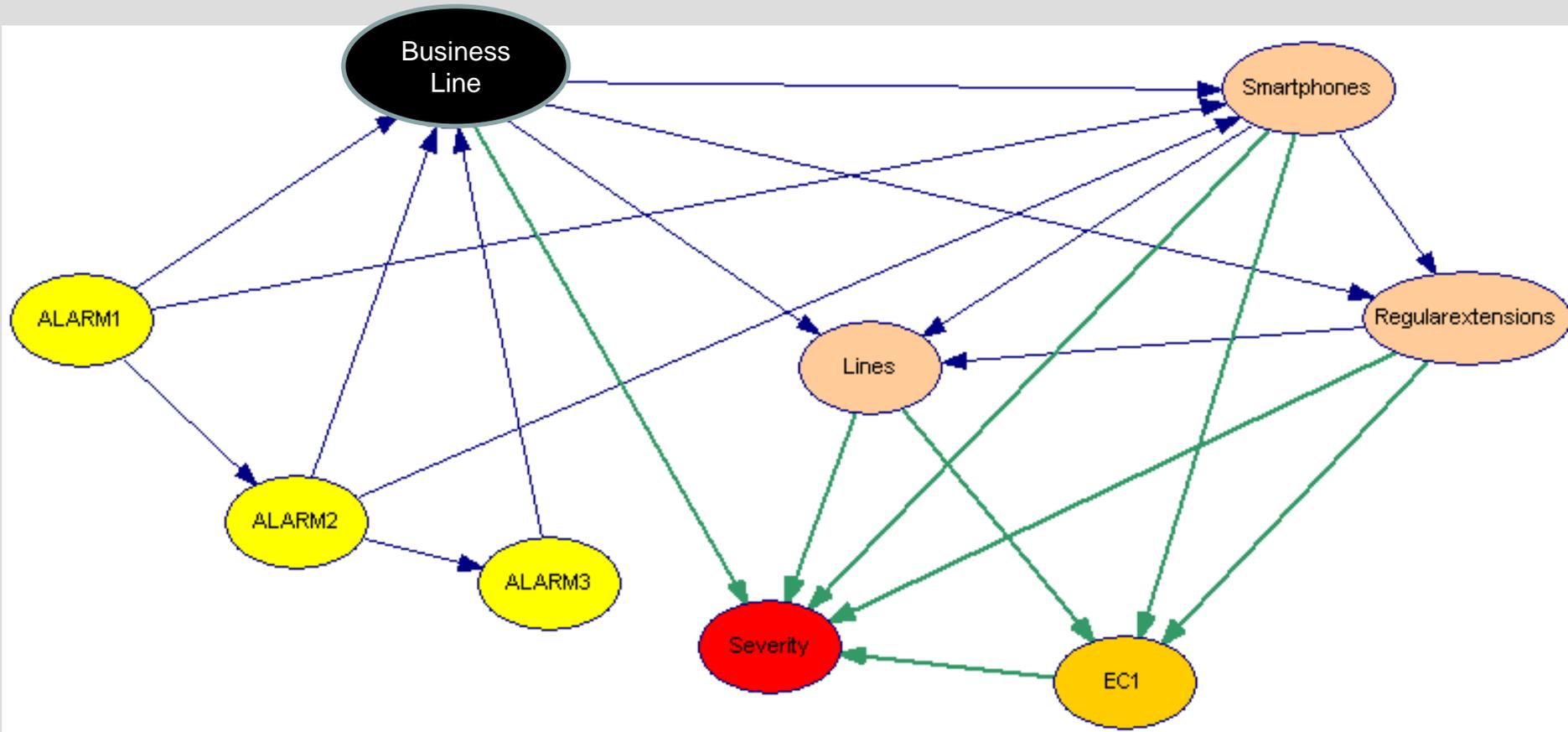
Integrated



Business Line	Total Events
Health	699
Banking	481
Defence	323
General	270
Finance	260
Industry	248
Cooperatives	225
Municipalities	221
Government owned company	209
Hotels	197
Leisure and Consumerism	153
Transportation	134
Lawyer/accountant offices	83
Education	56
Computers	49
Operating company	49
Electronics	42
Elderly citizens' home	40
Government	25
Construction	4



Bayesian Network Cause and Effect Analysis





OpR Data - by problem severity

Hardware

Software

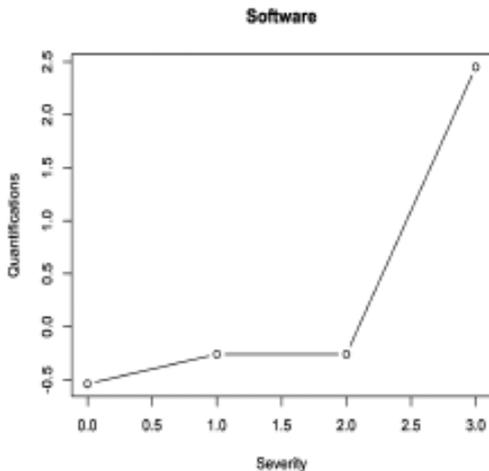
PBX	Business Line	H_H	H_M	H_L	SF_H	SF_M	SF_L	...
1	Banking	0	0	2	1	0	3	...
2	Defence	0	0	1	1	3	0	...
3	Health	2	0	0	1	1	1	...
4	Finance	0	1	0	2	1	0	...
...
n	...	2	0	1	2	0	1	...



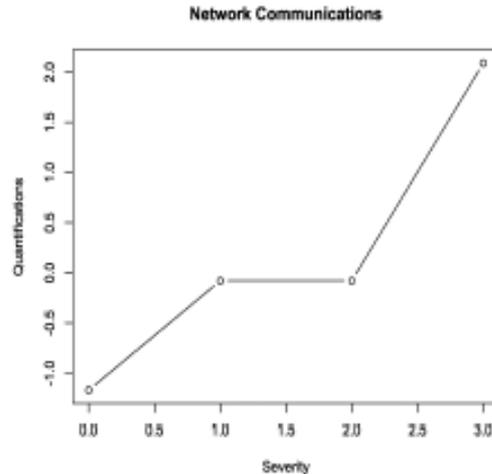


Non Linear Principal Components Analysis

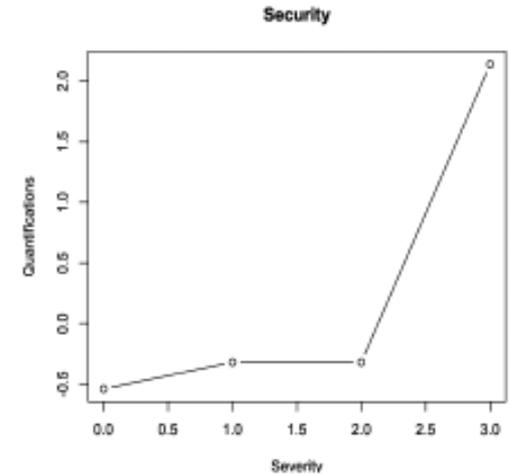
Dimension	Cronbach's α	Variance Accounted For Eigenvalue	% of Variance
1	,503	1,505	50,161
2	-,009	,994	33,130
Total	,900	2,499	83,290



Impact of
software failures



Impact of
Netcom failures



Impact of
Security failures



1st dim.

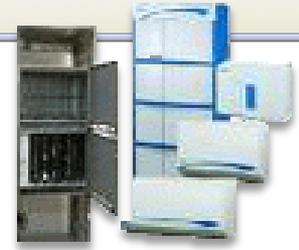
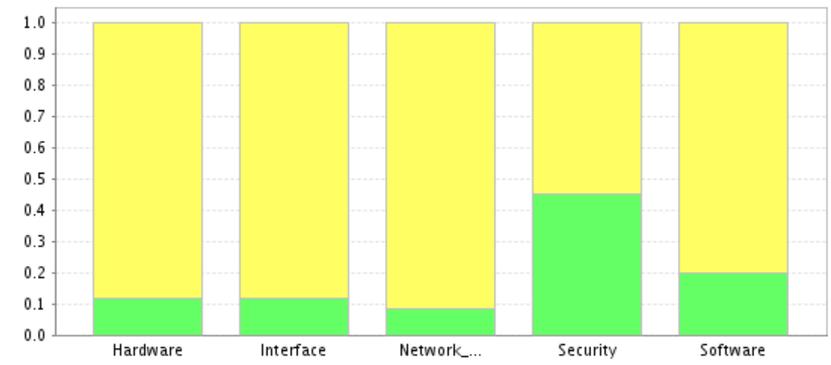
Non Linear Principal Components Analysis



PBX	BusinessLine	Software_Quan	Network_com_Quan	Security_Quan	Scores
31116	Industry	2.45	2.09	-0.54	0.593
32315	General	2.45	-0.08	2.14	0.913
32910	General	-0.54	-0.08	-0.54	0.043
33113	General	-0.54	-0.08	-0.54	0.043
33595	General	2.45	-1.17	2.14	0.867
35098	General	-0.26	-0.08	-0.54	0.087
40366	General	-0.54	-1.17	-0.54	0.000
50049	Finance	-0.54	-0.08	-0.54	0.043
50091	Industry	-0.26	-1.17	-0.32	0.076
50093	Hotels	2.45	-1.17	2.14	0.867
50115	Finance	-0.26	-1.17	-0.32	0.076
50123	Hotels	-0.26	-0.08	2.14	0.493
50181	Finance	-0.54	-0.08	-0.54	0.043
50215	General	2.45	-1.17	-0.54	0.463
60258	Finance	-0.54	-0.08	-0.54	0.043
60260	General	-0.54	-0.08	-0.54	0.043
60408	Finance	-0.54	-1.17	-0.32	0.033
60434	Industry	-0.54	-0.08	-0.54	0.043
60502	General	-0.26	2.09	-0.54	0.173

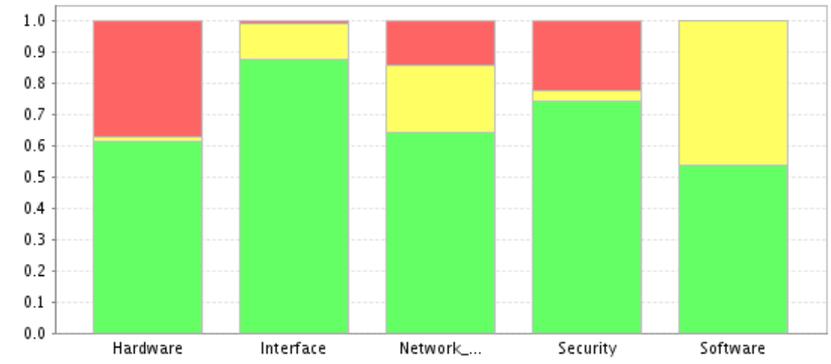


Analysis for customer PBX=92960 (Finance), based on 38 events.



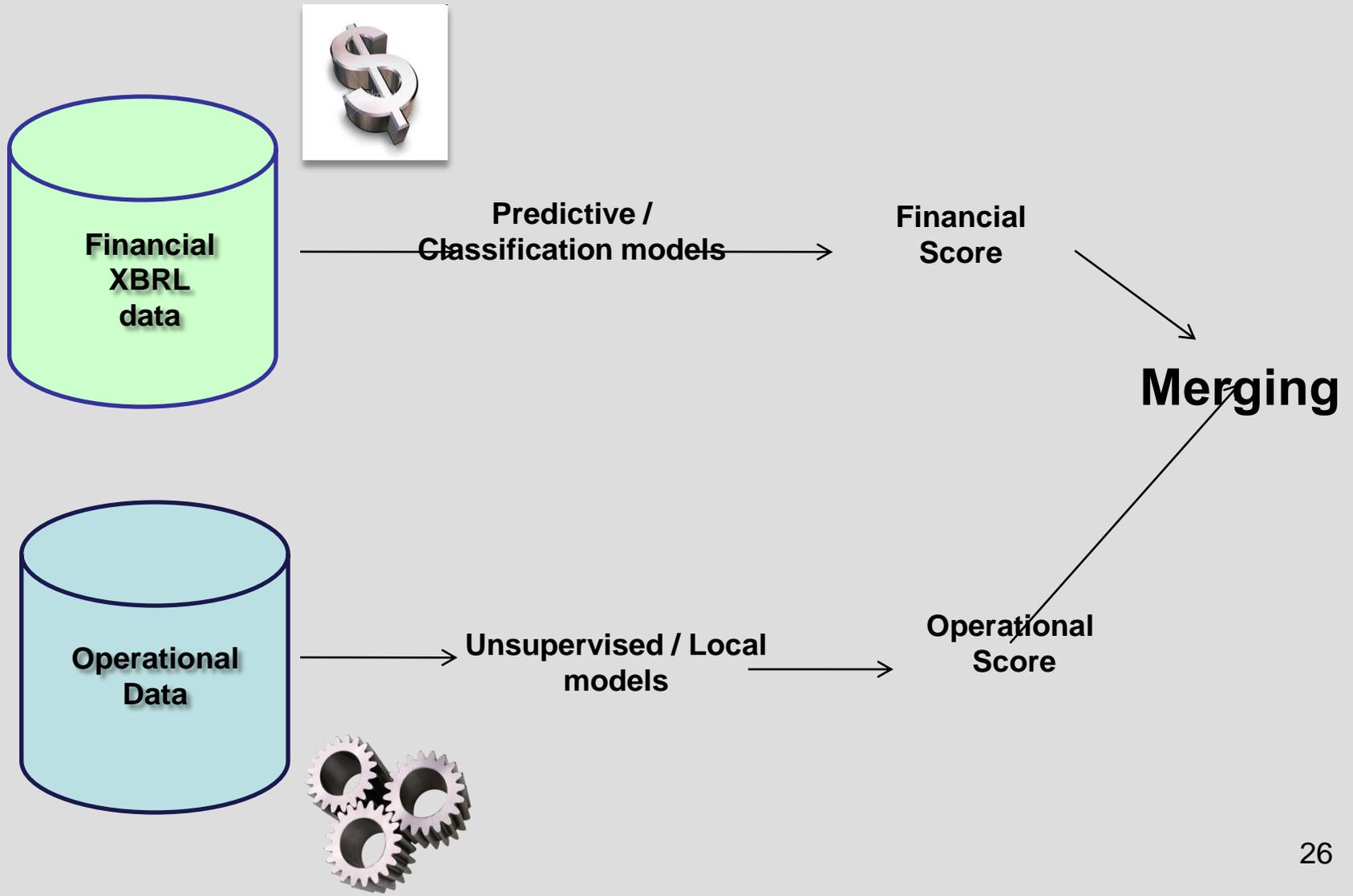
	Hardware	Interface	Network Communications	Security	Software
low	0.120	0.120	0.086	0.450	0.200
medium	0.880	0.880	0.914	0.550	0.800
high	0.000	0.000	0.000	0.000	0.000

Average Stats for same Business Line (Finance)



	Hardware	Interface	Network Communications	Security	Software
low	0.614	0.875	0.641	0.741	0.536
medium	0.012	0.117	0.215	0.037	0.464
high	0.373	0.008	0.144	0.222	0.000

Risk assessment





Financial data

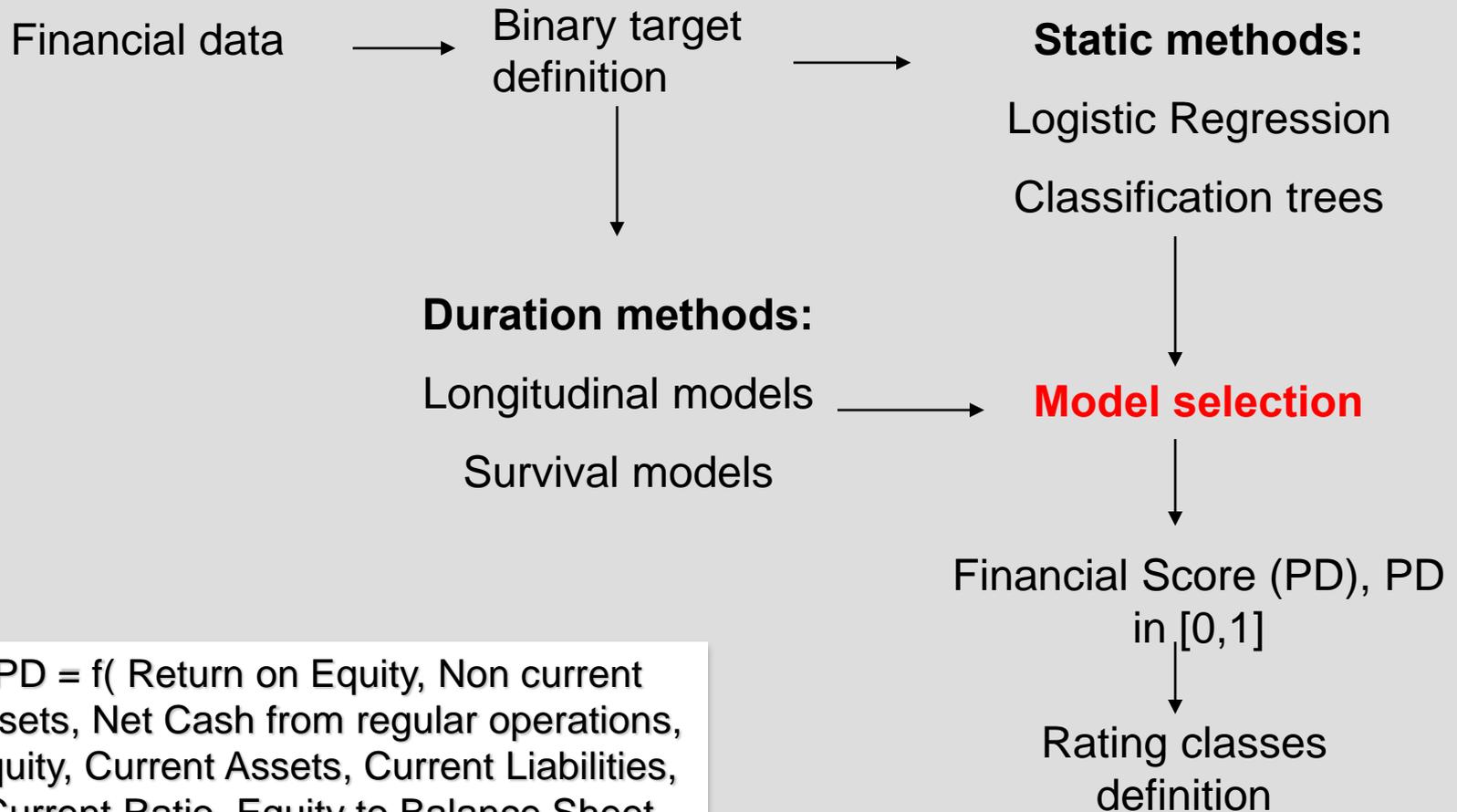
- Collect Balance Sheets
- Extract quantitative information from XBRL balance sheets data
- Derive financial ratios useful to predict the default probabilities of companies
- The target variable is binary (0: good, 1: bad)
- The final data matrix is composed of n companies and p covariates

Financial data: an example



Customer	Financial Ratio 1	Financial Ratio 2	Financial Ratio 3	Financial Ratio p
1	11794200	10921774	393717	627750
2	47947	34813	13134	27058
...	519440	130111	389330	62568
...	111200	94573	16627	12914
...	160747	120877	39870	111038
...	2303915	1101978	1201937	591154
...	97970	70909	27061	34268
n	127953	75586	52367	16526

Predictive/Classification models



PD = f(Return on Equity, Non current Assets, Net Cash from regular operations, Equity, Current Assets, Current Liabilities, Current Ratio, Equity to Balance Sheet Total, Pre-tax Prot, Net Prot).



Financial score

Customer	LogReg 1	LogReg 2	LogReg 3
1	0.590413725	0.483517201	0.60105205
...	1	1	1
...	0.198422752	0.288418151	0.193413586
...	0.311519917	0.25348666	0.4165347
...	0.58567025	0.481172502	0.59679867
...	0.593873953	0.487455978	0.604682691
...	0.606705681	0.499173616	0.616373138
n	0.59845664	0.492608605	0.609354881

The resulting PD are based on logistic regression. More precisely, Reg 1, Reg 2 and Reg 3 consider backward, forward and stepwise selection respectively.

Financial and Operational scores



Customer	Financial Score	Operational Score
1	0.60105205	0.453472222
2	1	1
...	0.193413586	0.440277778
...	0.4165347	0.247916667
...	0.59679867	0.534722222
...	0.604682691	0.360416667
...	0.616373138	0.417361111
n	0.609354881	0.472222222

Financial Score

 π_r^*

Operational Score

 π_r

$$\delta_r = \frac{\sigma^2(\pi_r^*)}{\sigma^2(\pi_r) + \sigma^2(\pi_r^*)}$$

Precision Indicator in group r
 $r=1, \dots, K$

$$I_r = \delta_r \pi_r + (1 - \delta_r) \pi_r^*$$

Integrated Score

The precision indicator is derived on the basis of the variances estimated across “ r ” bootstrapped data sets.

Integrated

Bayesian merging

Customer	Financial Score	Operational Score	Delta	Merged Score
1	0,60105205	0,453472222	0,78431851	0,569221813
2	1	1	1	1
...	0,19341359	0,440277778	0,35931949	0,351574662
...	0,4165347	0,247916667	0,76715999	0,377273676
...	0,59679867	0,534722222	0,4185012	0,56070129
...	0,60468269	0,360416667	0,86303567	0,571226958
...	0,61637314	0,417361111	0,75822335	0,568256677
n	0,60935488	0,472222222	0,52974872	0,544868073

Integrated

Results



Financial
XBRL
data

will we get full payment?

Financial
Score



If the Financial Score is high (closed to 1) the company will probably not pay

is it worthwhile selling to this customer?

will the service contract be profitable?

Merged Score



The Merged Score (from 0 to 1) answers both questions.

Merged scores close to 1: answer is NO

what will be the maintenance overhead?

Operational
Score



If the Operational Score is high (closed to 1) the company's PBX will need maintenance

Integrated

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Thank you for your attention



Risk Data

