

Evolution of the First Balanced Scorecard: 1987-1992[©]

by

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Presentation date:	Venue:	Notes
Various	Various	Current

The following pages contain examples of Analog's scorecard covering the five-year period of FY1988 through FY1992. I have noted the year-to-year changes along with their rationale.

Slide 1

ADI QIP GOALS (IC OPERATIONS)			
<u>METRIC</u>	<u>1987</u>	<u>HALF-LIFE</u>	<u>1992</u>
EXTERNAL			
On time delivery	85%	9	>99.8%
Outgoing defect levels	500 PPM	9	<10 PPM
Lead time*	10 wks	9	<3 wks
INTERNAL			
Manufacturing Cycle Time	15 wks	9	4-5wks
Process Defect Levels	5000 PPM	6	<10 PPM
Yield	20%	9	>50%
Time to Market	36 mths	24	6 mths

**WHILE AGGRESSIVELY PURSUING
CORPORATE-WIDE COST MANAGEMENT**

*at 95% level of service

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c. 1987

This is the original long-term “unbalanced” scorecard. It represented the small set of non-financial goals that focused on results (external) as well as their process drivers (internal).

This chart was published by Analog’s CEO in a 1989 Sloan Management Review article.

Slide 2

QUARTERLY PERFORMANCE AUDIT

Division: _____

	FY 87		88Q1		88Q2		88Q3		88Q4		FY 88	
	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT	BHMK
Revenues												
ROA												
Intros												
NPBR												
Customer Service												
TTM												
Mfg Cycle Time												
Yield												
PPM												

submitted: _____ quarterly review: _____ annual review: _____
 (within 2 wks of quarter's end) (written review) (div. presentation to Ray's Staff)

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c. August 20, 1987.

This is my prototype for the first balanced scorecard. It contained the vital few metrics that would show Analog's progress in achieving its 1988-1992 strategic plan objectives. This scorecard contains a balanced mix of financial/non-financial, results/process, leading/lagging, etc., metrics.

Evolution of the First Balanced Scorecard: 1987-1992

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QUARTERLY PERFORMANCE AUDIT DIVISION: _____

	FY 87	Q1 88		Q2 88		Q3 88		Q4 88		Q4 88	
	BHMK	BHMK	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT
<i>FINANCIAL</i>											
REVENUE											
REVENUE GROWTH											
PROFIT											
ROA											
<i>NEW PRODUCTS</i>											
NP INTROS											
NP BOOKINGS											
NPBR											
NP AVG. 3 RD YEAR REV.											
TIME TO MARKET											
<i>Q/P</i>											
ON TIME DELIVERY											
LEADTIME											
CYCLE TIME											
YIELD											
OUTGOING PPM											
PROCESS PPM											
COST											
EMPL. PRODUCTIVITY											
TURNOVER											

SUBMITTED: _____ QUARTERLY REVIEW: _____ ANNUAL REVIEW: _____
(within 2 wks of quarter's end) (written review) (div presentation to Ray's staff)

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Slide 3
c. 1987-1988 Scorecard

My proposed scorecard went through several revisions over the next few months as I built consensus for its implementation and use. Notice the increased number of metrics, a temptation that was present from the very beginning. I decided not to resist too much since buy-in was my primary objective and pruning could be left as a future refinement.

Some of the measures that we put on that scorecard had been tracked for several years (e.g. on time delivery and new product booking ratio). Others were in the process of being defined (e.g. cycle time and yield). But cost and employee productivity were there as goalless "place-holders" as we labored to find good operational definitions. The last one, labor turnover, was the best measure that we could think of at the time of how well we were satisfying our employees.

At the bottom of the scorecard you can see the links to our TOM effort (review of results by the scorecard's owner) and to Analog's traditional management processes (presentation to the CEO's staff).

Slide 4

CORPORATE SCORECARD											
	FY 88	Q1 89		Q2 89		Q3 89		Q4 89		Q4 89	
	BHMK	BHMK	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT
<i>FINANCIAL</i>											
REVENUE											
REVENUE GROWTH											
PROFIT											
ROA											
<i>NEW PRODUCTS</i>											
NP INTROS											
NP BOOKINGS											
NPBR											
NP AVG. 3 RD YEAR REV.											
TIME TO MARKET											
<i>Q/P</i>											
ON TIME DELIVERY	91.3%	93.1%		94.5%		95.7%		96.6%		96.2%	
LEADTIME											
CYCLE TIME											
YIELD											
OUTGOING PPM											
PROCESS PPM											
COST											
EMPL. PRODUCTIVITY											
TURNOVER											

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c. July 13, 1988

This update of the 1988 scorecard was the starting point for improvement discussions.

Evolution of the First Balanced Scorecard: 1987-1992

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CORPORATE SCORECARD											
	FY 88	Q1 89		Q2 89		Q3 89		Q4 89		FY 89	
	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT
FINANCIAL											
REVENUE											
REVENUE GROWTH											
PROFIT											
ROA											
NEW PRODUCTS											
NP INTROS											
NP BOOKINGS											
NPBR											
NP AVG. 3 RD YEAR REV.											
TIME TO MARKET											
QIP											
ON TIME DELIVERY											
OUTGOING PPM											
LEADTIME											
COST											
EMPL. PRODUCTIVITY											
DIRECT TURNOVER											
INDIRECT TURNOVER											
I.C. PRODUCTS											
PROCESS PPM											
CYCLE TIME											
YIELD											
ASSEMBLED PRODUCTS											
PROCESS PPM											
CYCLE TIME											
YIELD											

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July 13, 1988.

The Corporate QIP Council made several improvements on July 13, 1988.

The major change in the scorecard resulted from our recognition that although the results metrics: delivery, outgoing quality and leadtime (as seen by customers) applied equally to all of our products, the process metrics: processes defect level, cycle time and yield differed significantly for our two major businesses of ICs and assembled products. It made no sense to aggregate these on the corporate scorecard, and so we tracked them separately.

Although we persisted with cost and productivity placeholders, good metrics defied our discovery. We also recognized that direct and indirect turnover had very different business implications and so we decided to track them separately.

Evolution of the First Balanced Scorecard: 1987-1992

Slide 6

CORPORATE SCORECARD											
	FY 88	Q1 89		Q2 89		Q3 89		Q4 89		FY 89	
	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT
FINANCIAL											
REVENUE											
REVENUE GROWTH											
PROFIT											
ROA											
NEW PRODUCTS											
NP INTROS											
NP BOOKINGS											
NPBR											
NP AVG. 3 RD YEAR REV.											
TIME TO MARKET	17.6	16.4		15.4		14.5		13.6			
QIP											
ON TIME DELIVERY	92.7%	94.2%		95.4%		96.4%		97.1%			
OUTGOING PPM	280	222		176		140		111			
LEADTIME	5.8	5.2		4.7		4.4		4.1			
COST											
EMPL. PRODUCTIVITY											
DIRECT TURNOVER											
INDIRECT TURNOVER											
I.C. PRODUCTS											
PROCESS PPM	2932	2327		1847		1466		1163			
CYCLE TIME	6.6	6.2		5.8		5.6		4.8			
YIELD	28.8%	38.6%		46.8%		53.6%		59.4%			
ASSEMBLED PRODUCTS											
PROCESS PPM	NA	NA		NA		NA		NA			
CYCLE TIME	4.6	4.1		3.8		3.5		2.8			
YIELD	88.8%	90.6%		92.1%		93.4%		94.4%			

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c. 1988.

Once the 1989 scorecard format was established by the Corporate QIP Council, I proposed these as our overall corporate goals based on the five-year plan and the agreed upon improvement half-lives.

Evolution of the First Balanced Scorecard: 1987-1992

Slide 7

FY1990 CORPORATE SCORECARD											
FINANCIAL	End FY89	Q1 90		Q2 90		Q3 90		Q4 90		FY 90	
	ACTUAL	BHMK	ACTUAL	BHMK	ACTUAL	BHMK	ACTUAL	BHMK	ACTUAL	BHMK	ACTUAL
SALES						120.2	120.7				
SALES GROWTH YTY						6.0	6.5				
CONTRIBUTION MARGIN						8.8	6.4				
ROA (CM)						10.4	7.8				
<i>OIP</i>											
ON TIME DELIVERY (To FCD)						97.7	95.3				
% CRDs NOT MATCHED						29.2	51.7				
EXCESS LEADTIME						2.4	2.7				
LABOR TURNOVER						16.8	19.7				
<i>MANUFACTURING METRICS: IC PRODUCTS</i>											
OUTGOING PPM						984	706				
PROCESS PPM						1350	1116				
CYCLE TIME						15.8	62.6				
YIELD						43.3	38.0				
<i>MANUFACTURING METRICS: ASSEMBLED PRODUCTS</i>											
OUTGOING PPM						1276	1744				
PLUG-IN YIELD						92.2	90.8				
CYCLE TIME						19.9	23.9				
% COST OF SCRAP/REWORK						7.4	8.4				
<i>NEW PRODUCTS</i>											
BOOKINGS POST-85 PROD	ACTUAL	FY87 PLAN	ACTUAL	FY87 PLAN	ACTUAL	FY87 PLAN	ACTUAL	FY87 PLAN	ACTUAL	FY87 PLAN	ACTUAL
						46.7	45.9				
FORECAST 3 rd YR BOOKINGS of new product releases	FY89	1Q90	2Q90	3Q90	4Q90	FY90					

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c. 1989.

The 1990 scorecard reflected our conscious decision to start the transition from measuring delivery performance against our promise date (FCD), to measuring it against the customer's requested delivery date (CRD).

A detailed revenue model had shown us that our existing new product metrics were poor predictors of our future performance and so we decide to replace these metrics with a detailed product tracking system. However, the desire to have some metrics associated with innovation on the scorecard led to the inclusion of two measures of how well we were on track to our 1988-1992 strategic plan. We therefore included absolute bookings of products introduced post-1985 and the aggregate forecast of third year bookings for the current vintage of new products.

Slide 8

FY 1991 ADI CORPORATE SCORECARD

FINANCIAL	End FY 90	Q1 91		Q2 91		Q3 91		Q4 91		FY 91	
	ACTUAL	BHMK	ACTUAL	BHMK	ACTUAL	BHMK	ACTUAL	BHMK	ACTUAL	BHMK	ACTUAL
SALES	485.2	140.0	133.1	144.0		146.0		150.0		580.0	
SALES GROWTH YTY	7.0	27.7	21.4	23.7		21.1		8.3		19.5	
CONTRIBUTION MARGIN	6.0	5.7	4.6	8.9		20.2		12.5		9.4	
ROA (CM)	7.1	7.0	5.7	11.1		12.7		16.0		11.8	
QIP											
ON TIME DELIVERY (to FCD)	94.9	95.0	89.9	95.8		96.4		97.0		97.0	
% CRD's NOT MATCHED	52.2	49.9	54.5	47.5		45.7		44.2		44.0	
EXCESS LEADTIME	2.7	16.7	3.0	16.7		16.6		16.7		16.7	
EMPLOYEE TURNOVER	13.3	4.3	11.0	4.1		4.2		4.0		4.0	
MANUFACTURING METRICS: IC PRODUCTS											
OUTGOING PPM	587	647	541	508		411		329		328	
PROCESS PPM	981	772	816	657		546		450		453	
CYCLE TIME	65.4										
YIELD	38.4	34.0	35.6	33.6		37.9		40.0		39.7	
MANUFACTURING METRICS: ASSEMBLED PRODUCTS											
OUTGOING PPM	1503	386	849	312		296		282		273	
PLUG-IN YIELD	90.9	48.5	48.8	48.6		48.8		48.9		48.9	
CYCLE TIME	23.0	10.6	8.6	10.3		10.2		10.1		10.1	
% COST OF SCRAP/REWORK	8.1	5.9	4.1	5.5		5.2		4.9		4.9	
NEW PRODUCTS											
	ACTUAL	FY 87 PLAN	ACTUAL	FY 87 PLAN	ACTUAL	FY 87 PLAN	ACTUAL	FY 87 PLAN	ACTUAL	FY 87 PLAN	ACTUAL
BOOKINGS POST-85 PROD	165.3	56.7	54.5	64.7		70.5		77.3		269.2	
FORECAST 3rd YR BOOKINGS of new product releases	FY 90	Q1 91	Q2 91	Q3 91	Q4 91	FY 91					

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c. 1990.

The scorecard remained unchanged for 1991 and 1992. I left Analog at the end of 1992 and so I have no firsthand knowledge of its subsequent evolution. However, it is still in use today and looks very similar to its earlier ancestors. One area that has continued to evolve is the set of metrics associated with the new product generation process. More than a third of the metrics on the 1996 scorecard dealt with this process. Of the eight new product metrics on that scorecard, half are process (vs. results) metrics dealing with issues of cycle time, WIP and rework.

Examples of Lower level Scorecards

Evolution of the First Balanced Scorecard: 1987-1992

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AFFILIATE QUARTERLY PERFORMANCE AUDIT AFFILIATE: _____											
	FY 87	Q1 88		Q1 88		Q1 88		Q1 88		Q1 88	
	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT	BHMK	ACT
BOOKINGS											
BOOKINGS YTY GROWTH											
NPBR %											
SALES											
EXPENSES											
AFFILIATE STD MARGIN											
ASSET % of SALES											
BHMK CURRENCY (\$)											
CUSTOMER SERVICE											
EMPLOYEE ATTRITION											

QUARTERLY REVIEW: _____
 (written review)

ANNUAL REVIEW: _____
 (div presentation to Ray's staff)

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c. 1988.

Outside of the US, Analog distributed its products through wholly owned sales affiliates. Here's what we came up with as their scorecard for FY1988.

Evolution of the First Balanced Scorecard: 1987-1992

Slide 11

05-Aug-91		FY91 YIELD QIP SCORECARD						THRU WK 139	

PRODUCTION	1Q		2Q		3Q		4Q		
	GOAL	ACTUAL	GOAL	ACTUAL	GOAL	ACTUAL	GOAL	ACTUAL	
MOD B	81.0%	78.5%	82.0%	79.9%	83.0%	79.4%	83.0%		
MOD C	75.0%	70.8%	76.0%	82.4%	78.0%	84.1%	79.0%		

WAFER FAB	78.0%	76.2%	79.0%	80.7%	80.0%	80.8%	81.0%		
STP	66.0%	69.5%	67.0%	65.1%	70.0%	68.2%	72.0%		
VISUAL	93.0%	92.1%	94.0%	95.1%	94.0%	96.1%	95.0%		
ASSEMBLY +IQC	96.0%	96.4%	94.0%	93.7%	95.0%	94.7%	95.0%		
TEST+BPO	92.0%	89.1%	91.5%	90.5%	91.5%	89.4%	91.5%		

TOTAL CHUTE	42.3%	41.9%	42.7%	42.4%	45.7%	44.8%	48.1%		

©1986-2000 Arthur M. Schneiderman All Rights Reserved. Slide 11 c. 1991-Division yield scorecard

c. 1991

Below the division level scorecards were voluntary and not generally distributed outside of the team responsible for its improvement. Here's an example of one such scorecard. In this case, manufacturing yield is broken down into its component parts. Each of those parts generally had an owner and an improvement team. The total or chute yield appeared on the division's scorecard.

Slide 12

Time & Cost to Market

Definitions of metrics in FY92

- CS Hit rate: The percentage of products that are fully functional and sampled to customers on the first design.
- Time to first SI
- Tape-Outs per product: The total number of tape-outs required to release a product. The first design is one TO. If a one mask tweak or an all level revision is required, this counts as an additional TO.
- Time to market

ADBV		FY92	Q1	Q2	Q3	Q4	FY93
# Products to 1 st Silicon	Plan		9	13	7	7	36
	Actual	18	8				8
Time to 1 st Silicon (months)	Plan	8	10	7	8.4	10.1	8.6
	Actual	11.5	9.1				
CS Hit Rate (%)	Plan	78%	75%	75%	75%	75%	75%
	Actual	72%	100%				22%
# Products Released	Plan	23	6	10	7	10	33
	Actual	26	7				7
Time to Market (months)	Plan	18	24.4	21.1	16.5	17.5	19.7
	Actual	19	25.4				25.4
Tape Outs per Product	Plan	4	3	3	3	3	3
	Actual	4.3	2.7				2.7
WIP	Actual	50	57				

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c. 1993.

Because of slow progress improving the then independent divisional product development processes, the Corporate VP of Technology formed a worldwide team of product development managers. This was the scorecard that they developed. It provided the necessary focus for dramatic improvements in product development as well as the creation of a standard best-practices process.