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Charles J. Pineno
Shenandoah University

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SIMULATION OF THE WEIGHTING OF BALANCED SCORECARD METRICS BASED ON THE PRODUCT LIFE CYCLE

Charles J. Pineno, Shenandoah University

ABSTRACT

An organizational strategy framework for aligning strategy and knowledge management (KM) is considered the balanced scorecard. The frameworks have different, but overlapping perspectives. This research paper considers the balanced scorecard as a basis for a simulation.

The balanced scorecard represents a technique used in the strategic management of firms. It is the comprehensive set of measures or metrics that is used to communicate and evaluate achievement of the corporate mission and strategy of the business. The balanced scorecard traditionally includes both objective and subjective measures divided into four major areas: 1) Financial Perspective; 2) Customer Perspective; 3) Internal Business Process; and 4) Learning Process and Growth Perspective (Kaplan and Norton, 1997).

Many products do not simply enter the market with instant success or suddenly depart without warning. Therefore, for these products, management must develop strategies within each stage of the product's life cycle. The balanced scorecard can be formulated to outline the strategies for each stage of the product's life cycle. The uniqueness and central focus of this research paper is applying the dimension of the balanced scorecard framework to the product life cycle. The simulation illustrates changes in the numbers for each measure or metric followed by a variation in the weighting based on categories or major areas.

THEORY

A group of faculty developed a conceptual framework to measure the business impact of knowledge management (KM) in the context of the corporation's initiation into a network of knowledge communities. Their framework highlights the importance of a comprehensive planning/measurement perspective as well as the alignment of KM to business strategy. In addition, their framework introduces the concepts of the knowledge quotient (KQ) and a product's life cycle (Pal, ET.AL., 2004).

An organizational strategy framework for aligning strategy and KM is considered the balanced scorecard. When employed, it provides the potential for a comprehensive strategic measurement framework integrating both KM and operational perspectives of an organization. The balanced scorecard provides a comprehensive framework that is able to map the knowledge community metrics to organizational and knowledge community strategy. These metrics are forward-looking in terms of vision and strategy (Pal, et. al., 2004).

KM requires theoretical support in order to be applicable, universal, and rightly claim its place among academic disciplines in this knowledge age. In 1999, Dr. Michael Stankosky began to survey what was being said, written, and practiced around the world regarding KM. What emerged from his work was a strong multidisciplinary theory. The key point to stress is that Stankosky was not researching the study of knowledge, but researching how to manage knowledge (DiGiacomo, 2003).

In the literature review of KM, many authors dealt with the subject of knowledge and learning. Stankosky viewed an employee as possessing intellectual capital that could be turned into organizational knowledge. Therefore, the identification and integration of key elements is the essence of a successful KM system according to Stankosky's theory (DiGiacomo, 2003).

BACKGROUND INFORMATION

The balanced scorecard is a customer-based planning and process improvement system aimed at focusing and driving the change process. This is done by translating strategy into an integrated set of financial and non-financial measures that both communicates the organizational strategy to the members of the organization and provides them with actionable feedback on the attainment of organizational objectives.

When a product is initially developed, generally the product will not be profitable. Therefore, profit should not be a major concern. Other factors, such as growth of sales and effectiveness of marketing will be better variables to measure future success. One of the main benefits of the balanced scorecard is, unlike the financial statements, it measures more factors other than monetary gains or losses. For example, the balanced scorecard can report market share, which is not in financial statements, but is important to management to know what their market share is. This is why it is very useful to use balanced scorecard for reporting the success of a product during its life cycle.

According to Fielden (1999), corporations across the world have begun leveraging the power of balanced scorecards for converting the organization's vision and strategy into measurable targets. Introduced in 1992 by Robert S. Kaplan and David P. Norton as a management tool, balanced scorecards provide executives with the ability to develop measures that accurately forecast the health and wealth of an organization. Providing the ability to translate strategy into action rapidly, measurably, and knowledgeably, a balanced scorecard also aligns strategy within an organizational structure to tap into hidden assets and knowledge. Moreover, by connecting both internal and external groups with these strategies, continual learning and growth can be achieved. According to Bailey, Chow, and Haddad (1999), a partial list of users of balanced scorecards includes AT&T, Brown and Root, Intel, 3Com, Elf Atochem, the AM&R division of Mobil Oil, and Tenneco. In the service sector, adopters of the balanced scorecard include the international accounting firms of KPMG Peat Marwick and Ernst and Young. The balanced scorecard, when revealed to outside evaluators and investors, also accurately and succinctly communicates the health of the firm.

Bailey, Chow, and Haddad (1999) summarized the following benefits from the use of balanced scorecards across the range of business users:

1. Promoting the active formulation and implementation of organizational strategies
2. Making organizational strategies up-to-date and highly visible
3. Improving communication within the organization
4. Improving alignment among divisional or individual goals and the organization's goals and strategies
5. Aligning annual or short-term operating plans with long-term strategies
6. Aligning performance evaluation measurements and long-term strategies

PREPARATION OF THE BALANCED SCORECARD

Testing Causality

One of the main features of the balanced scorecard should be to present a comprehensive set of measures covering performance of a business and its success in strategy implementation. A strategy is a set of relationships (hypotheses) about cause and effect. The measurement system should make the relationships among the objectives and measures explicit so that they can be managed and validated (Kaplan and Norton, 1997). The comprehensiveness is achieved by including measures that interact on the basis of an established cause-and-effect relationship. For example, the subjective measure of customer satisfaction is usually correlated with the market share growth of the business. This approach may prove to be a useful tool in evaluating the existence of causality relationships between different measures to be included in the balanced scorecard. The sensitivity analysis may show what effect, if any, a marginal change in one measure would have on other measures included in the balanced scorecard.

Determining Optimal Targets

KM approach may help determine optimal targets for each of the measures included in the balanced scorecard. The approach here may be to weigh all the measures of the balanced scorecard and calculate a weighted average "success indicator". Then, the changes to one or a series of measures may be tested to maximize the "success indicator". Measures that maximize the "success indicator" should be included as targets in the balanced scorecard. One of the versions of this "success indicator" was developed by Liberatone and Miller (1998). The extract of their "performance index" calculation is presented in Table A. It is suggested that the performance index, as developed by Liberatone and Miller (1998), is provided as background information that may be used as an illustration to determine optimal targets for the balanced scorecard as shown in Table A. This research paper expands on the format in Table A with the consideration of target and actual values.

TABLE A
PERFORMANCE MEASURE INDEX

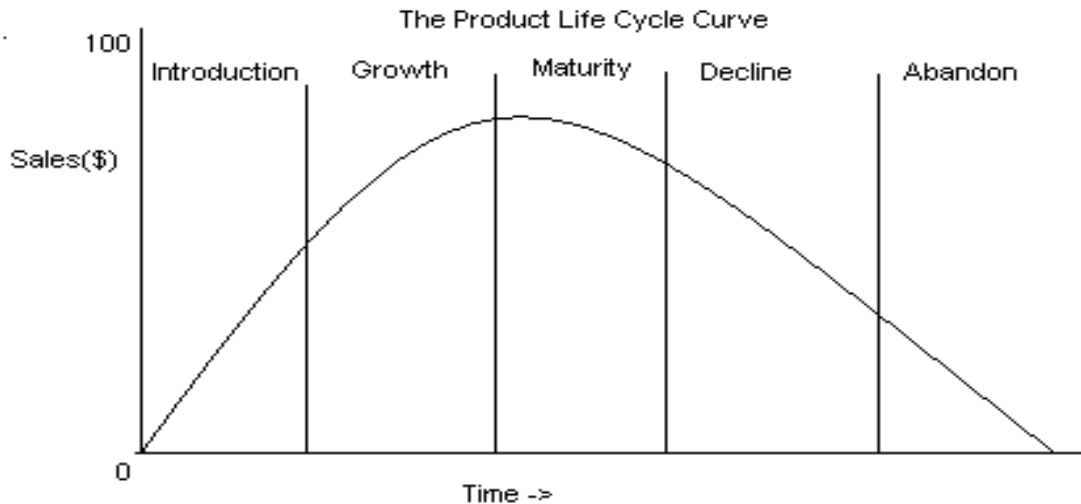
MEASURE	BASELINE	CURRENT	INDEX	WEIGHTING	WEIGHTED
	VALUE	VALUE	POINTS	%	POINTS
ROE	10	10.5	105	7	7.35
MARKET SHARE	30	31	103.33	7	7.23
CASH FLOW	100,000.00	101,000.00	101	6	6.06
SALES GROWTH	10	11	110	6	6.6
OPERATING INC.	66,000.00	70,000.00	106.06	7	7.42
ORDER FILL RATE	84	85	101.19	6	6.07
LINE FILL RATE	96	97	101.04	7	7.07
NUM. OF CUSTOMERS' PART-PS	30	30	100	3	3
CUST. SATISFACTION RATING	90	90	100	7	7
MANUF. CYCLE TIME	10	10	100	7	7
UNIT COST	1	0.98	98	7	6.86
NEW PRODUCT ACT VS PLANNED INTRO	40	39	97.5	3	2.93
EMPL. SATISFACTION RATING	80	76	95	4	3.8
ORDER FULFILLMENT CYCLE TIME	10	10	100	7	7
PROD. DEV. TO MARKET CYCLE TIME	30	30	100	7	7
PERCENT OF SALES FROM NEW. PROD.	20	21	105	3	3.15
MANUFACTURING YIELD	95	94	98.95	6	5.94
				100	
			PERFORMANCE INDEX		101.48

Source: Liberatone and Miller, 1998.

PRODUCT LIFE CYCLE

Generally, products do not simply enter the market with instant success or suddenly depart the market without warning. They have life cycles which tend to typify their sales. The typical life cycle of a product is characterized in Figure 1 below. The figure illustrates a generalized rate of changing sales throughout the entire life of the product. For many products, management must develop strategies within each stage of the product's life cycle. The balanced scorecard can be formulated to outline the strategies for each stage of the product's life cycle. The short-term or long-term strategies vary depending on the product. Rather than consider the short-lived products such as clothing fashions or long-lived products such as basic steel, the research considers any products that fall within the extremes.

FIGURE 1



Source: Adopted and adapted from Hoyer and MacInnis, 2001.

Corporate Commitment

The development of products requires a commitment at all levels of the company from the CEO to those responsible for actually creating and producing the products. There are fundamental levels to this commitment that can provide feedback continuously and refine the processes of the company. First, the company's mission itself is the strategic goal that drives the company's short-term and long-term operating goals. This parallels the development of the balanced scorecard from the vision to the mission statement. The product development outcome is then sold to a target customer group. The balanced scorecard measures can reflect if a product has met customers' expectations (Clinton and Graves, 1999).

It should be noted that organizations do not need to find the perfect organizational structure for their strategy. A far more effective approach is to choose an organizational structure that works without major conflicts and then designs a customized strategic system to align that structure with the strategy (Kaplan and Norton, 2006).

METHODOLOGY: THE REALM OF STRATEGIES

The process of building a balanced scorecard can be done in many ways. Kaplan and Norton (2001) have defined a four-step process that may be used across a wide range of organizations. The processes include:

1. **Define the measurement architecture** – When a company initially introduces the Balanced Scorecard, it is more manageable to apply it on the strategic business unit level rather than the corporate level. However, interactions must be considered in order to avoid optimizing the results of one business unit at the expenses of others.
2. **Specify strategic objectives** – The top three or four objectives for each perspective are agreed upon. Potential measures are identified for each objective.

3. **Choose strategic measures** – Measures that are closely related to the actual performance drivers are selected for evaluating the progress made toward achieving the objectives.

4. **Develop the implementation plan** – Target values are assigned to the measures. An information system is developed to link the top level metrics to lower-level operational measures. The scorecard is integrated into the management system.

The success of the outlined strategies based on the product life cycle can be measured by using balanced scorecard metrics. The illustrations demonstrate the application of the metrics within the four major areas of the balanced scorecard. The example developed utilized 10 metrics within each of the four major areas which include the financing perspective, the customer perspective, the internal business process, and the learning process and growth perspective. The 10 metrics per major area were selected to illustrate possibilities and provide equal balance among the four major areas. This example may be considered information overload. However, in reality an organization may choose what is specifically applicable to their business environment.

RESULTS

Table B below explains the weighting of the major areas in each age of the product life cycle. Each metric is a percentage of the total percentage for each of the major areas. For example, in the introduction stage the financial perspective is 10% with each metric weighted as 1%, the customer perspective is 40% with each metric weighted as 4%, the internal process is 30% with each metrics weighted is 3%, and the learning process is 20% with each metric weighted is 2%. The weighting of the metrics within each major area varies as the product proceeds through the product life cycle. The determination of the percentages within the balanced scorecard is conceptual with a view towards the emphasis as a product goes through the life cycle. For example, the financial perspective would tend to be the focal point during the maturity stage. The customer perspective, on the other hand, would tend to decline over time from a peak at the introduction in the life cycle. The determination of percentages within the balanced scorecard is conceptual with a view towards changes as a product goes through the life cycle. For example, the financial perspective would tend to be the focus point during the maturity stage. The customer perspective on the other hand, would tend to decline over time from a peak at the introduction stage in the life cycle. The internal business process perspective would tend to be emphasized at each end of the product life cycle for various reasons such as planning and need. The learning process percentages are portrayed as rising in each stage to the maximum level of 50% and before the decline and abandon stages. Of course, management may weight the major areas and metrics differently.

TABLE B

	INTRODUCTION	GROWTH	MATURITY	DECLINE	ABANDON
FINANCIAL PERSPECTIVE	10%	20%	30%	20%	10%
CUSTOMER PERSPECTIVE	40%	30%	20%	10%	10%
INTERNAL BUSINESS	30%	20%	10%	20%	30%
LEARNING PROCESS	20%	30%	40%	50%	50%

This research is designed to demonstrate a possible weighting that reflects what the emphasis would be based on the life cycle stage. For example, within the introduction stage the largest percentage is assigned to the customer perspective area and the least percentage to the financial perspective area. The internal business and learning process areas fall somewhere in between.

The actual applications of the four major areas within each of the balanced scorecards by product life cycle stage are demonstrated in Tables C, D, E, F, and G. Each table develops the metrics with numbers for the baseline value, target value, and actual value. The data was partially derived as a simulation and partially derived from a corporation in the manufactured homes industry through a survey. The figures were included as necessary and appropriate. The weighting was arbitrary to demonstrate the possible effectiveness that could be derived with careful planning and implementation. The weighting was developed to reflect generally accepted results with the product life cycle stages. The above results tend to match the slope of the product life cycle and the possible optimum outcome with the highest “weighted points” being demonstrated in the maturity stage. In practice the optimum application of the percentages would need to be based on certain constraints. The changes in the values are determined with the differences noted in a separate column. The actual value is compared with the baseline value with the result converted to an index that is multiplied by the weighting of the metric to result in a “weighted points” number. The sum of the “weighted points” numbers results in an actual performance index that may be used by management as an overall assessment of success. By changing the weighting, the emphasis shifts within the four major areas and that should result in maximizing the performance index. The higher the performances index the higher the expected financial return. The resulting actual performance index numbers include:

Table C – Introduction: 103.33

Table D – Growth: 105.34

Table E – Maturity: 107.35

Table F – Decline: 107.21

Table G – Abandon: 106.13

TABLE C

INTRODUCTION

MEASURE	BASELINE VALUE	TARGET VALUE	CHANGE	ACTUAL VALUE	CHANGE	DIFFERENCE IN CHANGE	INDEX POINTS	%	WHEIGHTED POINTS
FINANCIAL PERSPECTIVE									
ROI	10.00	11.50	1.15	10.30	1.03	(0.12)	103.00	0.01	1.03
MARKET SHARE	30.00	35.00	1.17	37.00	1.23	0.07	123.33	0.01	1.23
CASH FLOW	100,000.00	103,000.00	1.03	105,000.00	1.05	0.02	105.00	0.01	1.05
SALES GROWTH BASED ON UNITS	10.00	11.50	1.15	10.60	1.06	(0.09)	106.00	0.01	1.06
OPERATING INCOME	66,000.00	72,600.00	1.10	73,500.00	1.11	0.01	111.36	0.01	1.11
FIXED COST PER FLOOR	10,000.00	9,500.00	0.95	10,200.00	1.02	0.07	102.00	0.01	1.02
EVA	80,000.00	85,000.00	1.06	84,000.00	1.05	(0.01)	105.00	0.01	1.05
UNIT COST	1.00	0.90	0.90	0.95	0.95	0.05	95.00	0.01	0.95
REVENUE GROWTH	200,000.00	220,000.00	1.10	210,000.00	1.05	(0.05)	105.00	0.01	1.05

% OF SALES FROM NEW PRODUCTS	20.00	20.00	1.00	20.00	1.00	-	100.00	0.01	1.00
COSTUMER PERSPECTIVE									
ORDER FILL RATE.	84.00	85.00	1.01	80.00	0.95	(0.06)	95.24	0.04	3.81
LINE FILL RATE	96.00	98.00	1.02	90.00	0.94	(0.08)	93.75	0.04	3.75
NUMBER OF DEALER PARTNERSHIPS	30.00	33.00	1.10	34.00	1.13	0.03	113.33	0.04	4.53
CUSTOMER SATISFACTION RATING	90.00	103.50	1.15	98.00	1.09	(0.06)	108.89	0.04	4.36
CUSTOMER RETENTION	95.00	100.00	1.05	95.00	1.00	(0.05)	100.00	0.04	4.00
MANUFACTURING CYCLE TIME	10.00	10.00	1.00	10.00	1.00	-	100.00	0.04	4.00
INCREASE DEALER BASE	50.00	55.00	1.10	53.00	1.06	(0.04)	106.00	0.04	4.24
DEALER RETENTION	10.00	12.00	1.20	11.00	1.10	(0.10)	110.00	0.04	4.40
RETAIL PRODUCTION SATISFACTION	100.00	105.00	1.05	110.00	1.10	0.05	110.00	0.04	4.40
RETAIL SERVICE SATISFACTION	100.00	108.00	1.08	104.00	1.04	(0.04)	104.00	0.04	4.16
INTERNAL BUSINESS PROCESS									
MANUFACTURING YIELD	95.00	95.00	1.00	95.00	1.00	-	100.00	0.03	3.00
NEW PRODUCT	50.00	55.00	1.10	60.00	1.20	0.10	120.00	0.03	3.60
ACTUAL VS PLANNED INTRODUCTION	40.00	40.00	1.00	40.00	1.00	-	100.00	0.03	3.00
ORDER FULFILLMENT CYCLE TIME	70.00	75.00	1.07	65.00	0.93	(0.14)	92.86	0.03	2.79
MANUFACTURING CYCLE TIME	30.00	30.00	1.00	30.00	1.00	-	100.00	0.03	3.00
% OF PROCESS WITH ADVANCED CONTROLS	50.00	60.00	1.20	55.00	1.10	(0.10)	110.00	0.03	3.30
INVENTORY RETURNS	24.00	28.00	1.17	30.00	1.25	0.08	125.00	0.03	3.75
ORDER DELIVERY TIME	10.00	8.00	0.80	7.00	0.70	(0.10)	70.00	0.03	2.10
BACKLOG	25.00	20.00	0.80	20.00	0.80	-	80.00	0.03	2.40
% OF COST REDUCTION	10.00	15.00	1.50	5.00	0.50	(1.00)	50.00	0.03	1.50
LEARNING PROCESS AND GROWTH PERSPECTIVE									
HOURS OF TRAINING	20.00	25.00	1.25	22.00	1.10	(0.15)	110.00	0.02	2.20
CYCLE TIME	10.00	9.00	0.90	9.50	0.95	0.05	95.00	0.02	1.90
PRODUCT DEVELOPMENT	50.00	55.00	1.10	45.00	0.90	(0.20)	90.00	0.02	1.80
% OF FRONT LINE WORKERS EMPOWERED TO MANAGE PROCESS	70.00	60.00	0.86	65.00	0.93	0.07	92.86	0.02	1.86
% OF MANUFACTURING PROCESSES WITH REAL TIME FEEDBACK	5.00	10.00	2.00	7.00	1.40	(0.60)	140.00	0.02	2.80
# OF IMPROV. IN PROCESS CONTROL	85.00	90.00	1.06	80.00	0.94	(0.12)	94.12	0.02	1.88
SKILLS OF EMPLOYEES	8.00	9.00	1.13	8.50	1.06	(0.06)	106.25	0.02	2.13
EMPLOYEE SATISFACTION SURVEY	80.00	90.00	1.13	85.00	1.06	(0.06)	106.25	0.02	2.13
PRODUCT DEVELOPMENT TO MARKET CYCLE TIME	10.00	11.00	1.10	10.00	1.00	(0.10)	100.00	0.02	2.00
% OF EMPLOYEES TRAINED IN PROCESS AND QUALITY MANAGEMENT	5.00	10.00	2.00	10.00	2.00	-	200.00	0.02	4.00
								1	
ACTUAL PERFORMANCE INDEX									103.33

TABLE D**GROWTH**

MEASURE	BASELINE	TARGET	CHANGE	ACTUAL	CHANGE	DIFFERENCE	INDEX	%	WHEIGHTED
	VALUE	VALUE		VALUE		IN CHANGE	POINTS		POINTS
FINANCIAL PERSPECTIVE									
ROI	10.00	11.50	1.15	10.30	1.03	(0.12)	103.00	0.02	2.06
MARKET SHARE	30.00	35.00	1.17	37.00	1.23	0.07	123.33	0.02	2.47
CASH FLOW	100,000.00	103,000.00	1.03	105,000.00	1.05	0.02	105.00	0.02	2.10
SALES GROWTH BASED ON UNITS	10.00	11.50	1.15	10.60	1.06	(0.09)	106.00	0.02	2.12
OPERATING INCOME	66,000.00	72,600.00	1.10	73,500.00	1.11	0.01	111.36	0.02	2.23
FIXED COST PER FLOOR	10,000.00	9,500.00	0.95	10,200.00	1.02	0.07	102.00	0.02	2.04
EVA	80,000.00	85,000.00	1.06	84,000.00	1.05	(0.01)	105.00	0.02	2.10
UNIT COST	1.00	0.90	0.90	0.95	0.95	0.05	95.00	0.02	1.90
REVENUE GROWTH	200,000.00	220,000.00	1.10	210,000.00	1.05	(0.05)	105.00	0.02	2.10
% OF SALES FROM NEW PRODUCTS	20.00	20.00	1.00	20.00	1.00	-	100.00	0.02	2.00
COSTUMER PERSPECTIVE									
ORDER FILL RATE.	84.00	85.00	1.01	80.00	0.95	(0.06)	95.24	0.03	2.86
LINE FILL RATE	96.00	98.00	1.02	90.00	0.94	(0.08)	93.75	0.03	2.81
NUMBER OF DEALER PARTNERSHIPS	30.00	33.00	1.10	34.00	1.13	0.03	113.33	0.03	3.40
CUSTOMER SATISFACTION RATING	90.00	103.50	1.15	98.00	1.09	(0.06)	108.89	0.03	3.27
CUSTOMER RETENTION	95.00	100.00	1.05	95.00	1.00	(0.05)	100.00	0.03	3.00
MANUFACTURING CYCLE TIME	10.00	10.00	1.00	10.00	1.00	-	100.00	0.03	3.00
INCREASE DEALER BASE	50.00	55.00	1.10	53.00	1.06	(0.04)	106.00	0.03	3.18
DEALER RETENTION	10.00	12.00	1.20	11.00	1.10	(0.10)	110.00	0.03	3.30
RETAIL PRODUCTION SATISFACTION	100.00	105.00	1.05	110.00	1.10	0.05	110.00	0.03	3.30
RETAIL SERVICE SATISFACTION	100.00	108.00	1.08	104.00	1.04	(0.04)	104.00	0.03	3.12
INTERNAL BUSINESS PROCESS									
MANUFACTURING YIELD	95.00	95.00	1.00	95.00	1.00	-	100.00	0.02	2.00
NEW PRODUCT	50.00	55.00	1.10	60.00	1.20	0.10	120.00	0.02	2.40
ACTUAL VS PLANNED INTRODUCTION	40.00	40.00	1.00	40.00	1.00	-	100.00	0.02	2.00
ORDER FULFILLMENT CYCLE TIME	70.00	75.00	1.07	65.00	0.93	(0.14)	92.86	0.02	1.86
MANUFACTURING CYCLE TIME	30.00	30.00	1.00	30.00	1.00	-	100.00	0.02	2.00
% OF PROCESS WITH ADVANCED CONTROLS	50.00	60.00	1.20	55.00	1.10	(0.10)	110.00	0.02	2.20
INVENTORY RETURNS	24.00	28.00	1.17	30.00	1.25	0.08	125.00	0.02	2.50
ORDER DELIVERY TIME	10.00	8.00	0.80	7.00	0.70	(0.10)	70.00	0.02	1.40
BACKLOG	25.00	20.00	0.80	20.00	0.80	-	80.00	0.02	1.60
% OF COST REDUCTION	10.00	15.00	1.50	5.00	0.50	(1.00)	50.00	0.02	1.00
LEARNING PROCESS AND GROWTH PERSPECTIVE									
HOURS OF TRAINING	20.00	25.00	1.25	22.00	1.10	(0.15)	110.00	0.03	3.30
CYCLE TIME	10.00	9.00	0.90	9.50	0.95	0.05	95.00	0.03	2.85

PRODUCT DEVELOPMENT	50.00	55.00	1.10	45.00	0.90	(0.20)	90.00	0.03	2.70
% OF FRONT LINE WORKERS EMPOWERED TO MANAGE PROCESS	70.00	60.00	0.86	65.00	0.93	0.07	92.86	0.03	2.79
% OF MANUFACTURING PROCESSES WITH REAL TIME FEEBACK	5.00	10.00	2.00	7.00	1.40	(0.60)	140.00	0.03	4.20
# OF IMPROV. IN PROCESS CONTROL	85.00	90.00	1.06	80.00	0.94	(0.12)	94.12	0.03	2.82
SKILLS OF EMPLOYEES	8.00	9.00	1.13	8.50	1.06	(0.06)	106.25	0.03	3.19
EMPLOYEE SATISFACTION SURVEY	80.00	90.00	1.13	85.00	1.06	(0.06)	106.25	0.03	3.19
PRODUCT DEVELOPMENT TO MARKET CYCLE TIME	10.00	11.00	1.10	10.00	1.00	(0.10)	100.00	0.03	3.00
% OF EMPLOYEES TRAINED IN PROCESS AND QUALITY MANAGEMENT	5.00	10.00	2.00	10.00	2.00	-	200.00	0.03	6.00
								1	
ACTUAL PERFORMANCE INDEX									105.34

TABLE E

MATURITY

MEASURE	BASELINE	TARGET	CHANGE	ACTUAL	CHANGE	DIFFERENCE	INDEX	%	WHEIGHTED
	VALUE	VALUE		VALUE		IN CHANGE	POINTS		
FINANCIAL PERSPECTIVE									
ROI	10.00	11.50	1.15	10.30	1.03	(0.12)	103.00	0.03	3.09
MARKET SHARE	30.00	35.00	1.17	37.00	1.23	0.07	123.33	0.03	3.70
CASH FLOW	100,000.00	103,000.00	1.03	105,000.00	1.05	0.02	105.00	0.03	3.15
SALES GROWTH BASED ON UNITS	10.00	11.50	1.15	10.60	1.06	(0.09)	106.00	0.03	3.18
OPERATING INCOME	66,000.00	72,600.00	1.10	73,500.00	1.11	0.01	111.36	0.03	3.34
FIXED COST PER FLOOR	10,000.00	9,500.00	0.95	10,200.00	1.02	0.07	102.00	0.03	3.06
EVA	80,000.00	85,000.00	1.06	84,000.00	1.05	(0.01)	105.00	0.03	3.15
UNIT COST	1.00	0.90	0.90	0.95	0.95	0.05	95.00	0.03	2.85
REVENUE GROWTH	200,000.00	220,000.00	1.10	210,000.00	1.05	(0.05)	105.00	0.03	3.15
% OF SALES FROM NEW PRODUCTS	20.00	20.00	1.00	20.00	1.00	-	100.00	0.03	3.00
COSTUMER PERSPECTIVE									
ORDER FILL RATE.	84.00	85.00	1.01	80.00	0.95	(0.06)	95.24	0.02	1.90
LINE FILL RATE	96.00	98.00	1.02	90.00	0.94	(0.08)	93.75	0.02	1.88
NUMBER OF DEALER PARTNERSHIPS	30.00	33.00	1.10	34.00	1.13	0.03	113.33	0.02	2.27
CUSTOMER SATISFACTION RATING	90.00	103.50	1.15	98.00	1.09	(0.06)	108.89	0.02	2.18
CUSTOMER RETENTION	95.00	100.00	1.05	95.00	1.00	(0.05)	100.00	0.02	2.00
MANUFACTURING CYCLE TIME	10.00	10.00	1.00	10.00	1.00	-	100.00	0.02	2.00
INCREASE DEALER BASE	50.00	55.00	1.10	53.00	1.06	(0.04)	106.00	0.02	2.12
DEALER RETENTION	10.00	12.00	1.20	11.00	1.10	(0.10)	110.00	0.02	2.20
RETAIL PRODUCTION SATISFACTION	100.00	105.00	1.05	110.00	1.10	0.05	110.00	0.02	2.20
RETAIL SERVICE SATISFACTION	100.00	108.00	1.08	104.00	1.04	(0.04)	104.00	0.02	2.08
INTERNAL BUSINESS PROCESS									
MANUFACTURING YIELD	95.00	95.00	1.00	95.00	1.00	-	100.00	0.01	1.00

NEW PRODUCT	50.00	55.00	1.10	60.00	1.20	0.10	120.00	0.01	1.20
ACTUAL VS PLANNED INTRODUCTION	40.00	40.00	1.00	40.00	1.00	-	100.00	0.01	1.00
ORDER FULFILLMENT CYCLE TIME	70.00	75.00	1.07	65.00	0.93	(0.14)	92.86	0.01	0.93
MANUFACTURING CYCLE TIME	30.00	30.00	1.00	30.00	1.00	-	100.00	0.01	1.00
% OF PROCESS WITH ADVANCED CONTROLS	50.00	60.00	1.20	55.00	1.10	(0.10)	110.00	0.01	1.10
INVENTORY RETURNS	24.00	28.00	1.17	30.00	1.25	0.08	125.00	0.01	1.25
ORDER DELIVERY TIME	10.00	8.00	0.80	7.00	0.70	(0.10)	70.00	0.01	0.70
BACKLOG	25.00	20.00	0.80	20.00	0.80	-	80.00	0.01	0.80
% OF COST REDUCTION	10.00	15.00	1.50	5.00	0.50	(1.00)	50.00	0.01	0.50
LEARNING PROCESS AND GROWTH PERSPECTIVE									
HOURS OF TRAINING	20.00	25.00	1.25	22.00	1.10	(0.15)	110.00	0.04	4.40
CYCLE TIME	10.00	9.00	0.90	9.50	0.95	0.05	95.00	0.04	3.80
PRODUCT DEVELOPMENT	50.00	55.00	1.10	45.00	0.90	(0.20)	90.00	0.04	3.60
% OF FRONT LINE WORKERS EMPOWERED TO MANAGE PROCESS	70.00	60.00	0.86	65.00	0.93	0.07	92.86	0.04	3.71
% OF MANUFACTURING PROCESSES WITH REAL TIME FEEDBACK	5.00	10.00	2.00	7.00	1.40	(0.60)	140.00	0.04	5.60
# OF IMPROV. IN PROCESS CONTROL	85.00	90.00	1.06	80.00	0.94	(0.12)	94.12	0.04	3.76
SKILLS OF EMPLOYEES	8.00	9.00	1.13	8.50	1.06	(0.06)	106.25	0.04	4.25
EMPLOYEE SATISFACTION SURVEY	80.00	90.00	1.13	85.00	1.06	(0.06)	106.25	0.04	4.25
PRODUCT DEVELOPMENT TO MARKET CYCLE TIME	10.00	11.00	1.10	10.00	1.00	(0.10)	100.00	0.04	4.00
% OF EMPLOYEES TRAINED IN PROCESS AND QUALITY MANAGEMENT	5.00	10.00	2.00	10.00	2.00	-	200.00	0.04	8.00
								1	
ACTUAL PERFORMANCE INDEX									107.35

TABLE F

DECLINE

MEASURE	BASELINE VALUE	TARGET VALUE	CHANGE	ACTUAL VALUE	CHANGE	DIFFERENCE IN CHANGE	INDEX POINTS	%	WHEIGHTED POINTS
FINANCIAL PERSPECTIVE									
ROI	10.00	11.50	1.15	10.30	1.03	(0.12)	103.00	0.02	2.06
MARKET SHARE	30.00	35.00	1.17	37.00	1.23	0.07	123.33	0.02	2.47
CASH FLOW	100,000.00	103,000.00	1.03	105,000.00	1.05	0.02	105.00	0.02	2.10
SALES GROWTH BASED ON UNITS	10.00	11.50	1.15	10.60	1.06	(0.09)	106.00	0.02	2.12
OPERATING INCOME	66,000.00	72,600.00	1.10	73,500.00	1.11	0.01	111.36	0.02	2.23
FIXED COST PER FLOOR	10,000.00	9,500.00	0.95	10,200.00	1.02	0.07	102.00	0.02	2.04
EVA	80,000.00	85,000.00	1.06	84,000.00	1.05	(0.01)	105.00	0.02	2.10
UNIT COST	1.00	0.90	0.90	0.95	0.95	0.05	95.00	0.02	1.90
REVENUE GROWTH	200,000.00	220,000.00	1.10	210,000.00	1.05	(0.05)	105.00	0.02	2.10

% OF SALES FROM NEW PRODUCTS	20.00	20.00	1.00	20.00	1.00	-	100.00	0.02	2.00
COSTUMER PERSPECTIVE									
ORDER FILL RATE.	84.00	85.00	1.01	80.00	0.95	(0.06)	95.24	0.01	0.95
LINE FILL RATE	96.00	98.00	1.02	90.00	0.94	(0.08)	93.75	0.01	0.94
NUMBER OF DEALER PARTNERSHIPS	30.00	33.00	1.10	34.00	1.13	0.03	113.33	0.01	1.13
CUSTOMER SATISFACTION RATING	90.00	103.50	1.15	98.00	1.09	(0.06)	108.89	0.01	1.09
CUSTOMER RETENTION	95.00	100.00	1.05	95.00	1.00	(0.05)	100.00	0.01	1.00
MANUFACTURING CYCLE TIME	10.00	10.00	1.00	10.00	1.00	-	100.00	0.01	1.00
INCREASE DEALER BASE	50.00	55.00	1.10	53.00	1.06	(0.04)	106.00	0.01	1.06
DEALER RETENTION	10.00	12.00	1.20	11.00	1.10	(0.10)	110.00	0.01	1.10
RETAIL PRODUCTION SATISFACTION	100.00	105.00	1.05	110.00	1.10	0.05	110.00	0.01	1.10
RETAIL SERVICE SATISFACTION	100.00	108.00	1.08	104.00	1.04	(0.04)	104.00	0.01	1.04
INTERNAL BUSINESS PROCESS									
MANUFACTURING YIELD	95.00	95.00	1.00	95.00	1.00	-	100.00	0.02	2.00
NEW PRODUCT	50.00	55.00	1.10	60.00	1.20	0.10	120.00	0.02	2.40
ACTUAL VS PLANNED INTRODUCTION	40.00	40.00	1.00	40.00	1.00	-	100.00	0.02	2.00
ORDER FULFILLMENT CYCLE TIME	70.00	75.00	1.07	65.00	0.93	(0.14)	92.86	0.02	1.86
MANUFACTURING CYCLE TIME	30.00	30.00	1.00	30.00	1.00	-	100.00	0.02	2.00
% OF PROCESS WITH ADVANCED CONTROLS	50.00	60.00	1.20	55.00	1.10	(0.10)	110.00	0.02	2.20
INVENTORY RETURNS	24.00	28.00	1.17	30.00	1.25	0.08	125.00	0.02	2.50
ORDER DELIVERY TIME	10.00	8.00	0.80	7.00	0.70	(0.10)	70.00	0.02	1.40
BACKLOG	25.00	20.00	0.80	20.00	0.80	-	80.00	0.02	1.60
% OF COST REDUCTION	10.00	15.00	1.50	5.00	0.50	(1.00)	50.00	0.02	1.00
LEARNING PROCESS AND GROWTH PERSPECTIVE									
HOURS OF TRAINING	20.00	25.00	1.25	22.00	1.10	(0.15)	110.00	0.05	5.50
CYCLE TIME	10.00	9.00	0.90	9.50	0.95	0.05	95.00	0.05	4.75
PRODUCT DEVELOPMENT	50.00	55.00	1.10	45.00	0.90	(0.20)	90.00	0.05	4.50
% OF FRONT LINE WORKERS EMPOWERED TO MANAGE PROCESS	70.00	60.00	0.86	65.00	0.93	0.07	92.86	0.05	4.64
% OF MANUFACTURING PROCESSES WITH REAL TIME FEEBACK	5.00	10.00	2.00	7.00	1.40	(0.60)	140.00	0.05	7.00
# OF IMPROV. IN PROCESS CONTROL	85.00	90.00	1.06	80.00	0.94	(0.12)	94.12	0.05	4.71
SKILLS OF EMPLOYEES	8.00	9.00	1.13	8.50	1.06	(0.06)	106.25	0.05	5.31
EMPLOYEE SATISFACTION SURVEY	80.00	90.00	1.13	85.00	1.06	(0.06)	106.25	0.05	5.31
PRODUCT DEVELOPMENT TO MARKET CYCLE TIME	10.00	11.00	1.10	10.00	1.00	(0.10)	100.00	0.05	5.00
% OF EMPLOYEES TRAINED IN PROCESS AND QUALITY MANAGEMENT	5.00	10.00	2.00	10.00	2.00	-	200.00	0.05	10.00
								1	
ACTUAL PERFORMANCE INDEX									107.21

TABLE G

ABANDON

MEASURE	BASELINE	TARGET	CHANGE	ACTUAL	CHANGE	DIFFERENCE	INDEX	%	WHEIGHTED
	VALUE	VALUE		VALUE		IN CHANGE	POINTS		POINTS
FINANCIAL PERSPECTIVE									
ROI	10.00	11.50	1.15	10.30	1.03	(0.12)	103.00	0.01	1.03
MARKET SHARE	30.00	35.00	1.17	37.00	1.23	0.07	123.33	0.01	1.23
CASH FLOW	100,000.00	103,000.00	1.03	105,000.00	1.05	0.02	105.00	0.01	1.05
SALES GROWTH BASED ON UNITS	10.00	11.50	1.15	10.60	1.06	(0.09)	106.00	0.01	1.06
OPERATING INCOME	66,000.00	72,600.00	1.10	73,500.00	1.11	0.01	111.36	0.01	1.11
FIXED COST PER FLOOR	10,000.00	9,500.00	0.95	10,200.00	1.02	0.07	102.00	0.01	1.02
EVA	80,000.00	85,000.00	1.06	84,000.00	1.05	(0.01)	105.00	0.01	1.05
UNIT COST	1.00	0.90	0.90	0.95	0.95	0.05	95.00	0.01	0.95
REVENUE GROWTH	200,000.00	220,000.00	1.10	210,000.00	1.05	(0.05)	105.00	0.01	1.05
% OF SALES FROM NEW PRODUCTS	20.00	20.00	1.00	20.00	1.00	-	100.00	0.01	1.00
COSTUMER PERSPECTIVE									
ORDER FILL RATE.	84.00	85.00	1.01	80.00	0.95	(0.06)	95.24	0.01	0.95
LINE FILL RATE	96.00	98.00	1.02	90.00	0.94	(0.08)	93.75	0.01	0.94
NUMBER OF DEALER PARTNERSHIPS	30.00	33.00	1.10	34.00	1.13	0.03	113.33	0.01	1.13
CUSTOMER SATISFACTION RATING	90.00	103.50	1.15	98.00	1.09	(0.06)	108.89	0.01	1.09
CUSTOMER RETENTION	95.00	100.00	1.05	95.00	1.00	(0.05)	100.00	0.01	1.00
MANUFACTURING CYCLE TIME	10.00	10.00	1.00	10.00	1.00	-	100.00	0.01	1.00
INCREASE DEALER BASE	50.00	55.00	1.10	53.00	1.06	(0.04)	106.00	0.01	1.06
DEALER RETENTION	10.00	12.00	1.20	11.00	1.10	(0.10)	110.00	0.01	1.10
RETAIL PRODUCTION SATISFACTION	100.00	105.00	1.05	110.00	1.10	0.05	110.00	0.01	1.10
RETAIL SERVICE SATISFACTION	100.00	108.00	1.08	104.00	1.04	(0.04)	104.00	0.01	1.04
INTERNAL BUSINESS PROCESS									
MANUFACTURING YIELD	95.00	95.00	1.00	95.00	1.00	-	100.00	0.03	3.00
NEW PRODUCT	50.00	55.00	1.10	60.00	1.20	0.10	120.00	0.03	3.60
ACTUAL VS PLANNED INTRODUCTION	40.00	40.00	1.00	40.00	1.00	-	100.00	0.03	3.00
ORDER FULFILLMENT CYCLE TIME	70.00	75.00	1.07	65.00	0.93	(0.14)	92.86	0.03	2.79
MANUFACTURING CYCLE TIME	30.00	30.00	1.00	30.00	1.00	-	100.00	0.03	3.00
% OF PROCESS WITH ADVANCED CONTROLS	50.00	60.00	1.20	55.00	1.10	(0.10)	110.00	0.03	3.30
INVENTORY RETURNS	24.00	28.00	1.17	30.00	1.25	0.08	125.00	0.03	3.75
ORDER DELIVERY TIME	10.00	8.00	0.80	7.00	0.70	(0.10)	70.00	0.03	2.10
BACKLOG	25.00	20.00	0.80	20.00	0.80	-	80.00	0.03	2.40
% OF COST REDUCTION	10.00	15.00	1.50	5.00	0.50	(1.00)	50.00	0.03	1.50
LEARNING PROCESS AND GROWTH PERSPECTIVE									
HOURS OF TRAINING	20.00	25.00	1.25	22.00	1.10	(0.15)	110.00	0.05	5.50
CYCLE TIME	10.00	9.00	0.90	9.50	0.95	0.05	95.00	0.05	4.75

PRODUCT DEVELOPMENT	50.00	55.00	1.10	45.00	0.90	(0.20)	90.00	0.05	4.50
% OF FRONT LINE WORKERS EMPOWERED TO MANAGE PROCESS	70.00	60.00	0.86	65.00	0.93	0.07	92.86	0.05	4.64
% OF MANUFACTURING PROCESSES WITH REAL TIME FEEDBACK	5.00	10.00	2.00	7.00	1.40	(0.60)	140.00	0.05	7.00
# OF IMPROV. IN PROCESS CONTROL	85.00	90.00	1.06	80.00	0.94	(0.12)	94.12	0.05	4.71
SKILLS OF EMPLOYEES	8.00	9.00	1.13	8.50	1.06	(0.06)	106.25	0.05	5.31
EMPLOYEE SATISFACTION SURVEY	80.00	90.00	1.13	85.00	1.06	(0.06)	106.25	0.05	5.31
PRODUCT DEVELOPMENT TO MARKET CYCLE TIME	10.00	11.00	1.10	10.00	1.00	(0.10)	100.00	0.05	5.00
% OF EMPLOYEES TRAINED IN PROCESS AND QUALITY MANAGEMENT	5.00	10.00	2.00	10.00	2.00	-	200.00	0.05	10.00
								1	
									ACTUAL PERFORMANCE INDEX
									106.13

The simulation illustrates a rising performance index through the maturity stage of the product life cycle and then a decline for the final two stages. This demonstrates that even with changes in the weighting of the metrics within the balanced scorecard categories, the curvilinear results reflect the product life cycle as shown in Figure 1.

DECISION MAKING APPLICATION

Many organizations admit they use a balanced scorecard based on a mixture of financial and non-financial measures. Inherently, such measurement systems are more “balanced” than ones that use financial measures alone. Kaplan and Norton have observed two other scorecard types frequently used in practice: stakeholder (or) constituent scorecard and key performance indicator (KPI) scorecard. KPI scorecards are most frequently used, however, they are not exclusively used in manufacturing, and healthcare organizations, and organizations that implement total quality management. The TQM approach and variants such as the Malcolm Baldrige Award criteria generate many measures to determine and monitor the organization’s processes and progress. This leads to the development of a “Balanced Scorecard” based on existing measurements (Kaplan and Norton, 2001).

This research paper has developed some measures or metrics gathered from a survey of the manufactured homes industry (Pineno, 2004). The number of metrics and categories has been expanded conceptually to approximate a real balanced scorecard in an organization within that industry.

LIMITATIONS AND FUTURE RESEARCH

This research demonstrates a simulation of the metrics in numbers within the balanced scorecard categories. The weighting of the metrics was conceptually drawn up to illustrate different values at different stages of the product life cycle. Future research would include actual data from an organization within the manufactured homes industry and possibly other organizations that utilize a balanced scorecard. The data within the balanced scorecard would need to be traced back to the product life cycle stages of a manufactured home. Another option would be to focus on only the identifiable product life cycle stages as determined by management. Therefore, the reality within an organization would not be entirely identified. As another alternative a different product could be identified that has progressed through the product life cycle and is now close to abandonment. This alternative would require a very extensive and careful study of various organizations within manufacturing such as Hewlett-Packard Company and SUN Microsystems, INC. to mention just a few. This would allow for a testing of how the model holds up considering different products.

CONCLUSIONS

Given today's business environment strategy KM has never been more important. The creators of the revolutionary performance management tool called the Balanced Scorecard introduced a new approach that makes strategy a continuous process. The application of a marketing concept, such as the product life cycle, provides a means for developing an integrated strategy. The research results are based on a simulation indicating a rising and falling performance index. The challenge to management is to focus on the appropriate combination of goals and objectives for the metrics, given a certain time period, that will maximize the performance index and therefore, maximize the financial return of the organization.

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ABOUT THE AUTHOR

Charles J. Pineno is professor of Accounting at Shenandoah University. He holds the Braun Chair in Accounting at the University. Pineno received his Ph.D. and B.S. Degrees from The Pennsylvania State University. His MBA is from the University of Scranton. His prior teaching and administrative experience includes Chair of the Department of Accountancy for 18 years, Director of the Internship Program, and Director of Center for Accounting Education and Research at Clarion University of Pennsylvania. He has presented and published numerous articles as well as co-authored a cost accounting book and ancillary materials. Dr. Pineno has been awarded the outstanding scholarship and research awards at each institution.