

Multivariate Analysis of Employee Surveys & Customer Surveys: Using New Computer Technology to Collect, Analyze, & Display Data

Palmer Morrel-Samuels* EDS Center for Advanced Research and
Cognitive Science & Machine Intelligence Lab, University of Michigan

ABSTRACT

An example of a customized employee survey is examined. The theoretical foundation of the work is outlined by describing recent advances in psychology and computer technology, and by describing recent research (by Kaplan and Norton, 1992, 1993) on the Balanced Scorecard. Multivariate statistics are used to examine the links that exist in the customer's company between employee motivation, productivity, quality, and profitability.

INTRODUCTION

Today many companies depend on survey data from employees and customers. However, in the apparent majority of cases, the full benefits of employee surveys are never realized because companies administer poorly-designed surveys and rely almost exclusively on univariate descriptive statistics for analysis. Now it has become more feasible and economically practical -- because of advances in psychology and computer technology -- to formulate effective questionnaires, to examine survey data comprehensively without undue time demands, and to display the results from those analyses in a graphic format that is both comprehensible and useful to those who lack training in statistics or psychology. Improvements in survey methodology are particularly important in the business world because employee surveys play a role in planning and evaluating virtually every intervention being used now to reinvigorate and reorganize companies. For example, surveys are an integral part of programs associated with Change Management, Business Process Reengineering, organizational learning, Total Quality Management, and Strategic Planning, to name but a few. The remainder of this paper will provide some background information on survey methodology, describe the Balanced Scorecard approach to analyzing business performance, and will furnish an example from a large employee survey that is being administered both before and after several EDS-sponsored interventions are implemented by a customer.

DEVELOPMENTS IN PSYCHOLOGY

Recent developments in experimental psychology have made it possible to design tests that limit the deleterious effects of response biases. Specifically, much has been learned in the last two decades about the wording of questions and the selection of response alternatives, so that questionnaires now have a greater likelihood of maintaining the reliability and validity that are essential for

their utility: Without good reliability, responses are so inconsistent and elastic that a respondent's answers at the beginning of the test contradict his or her answers at the end; Without good validity, responses are consistent but irrelevant, so that results have little or no bearing on the concepts, events, and attitudes that the test designers had intended to measure. (See Schwarz 1994 for a particularly good review of these issues.) The advances are important because they make it easier to design valid and reliable surveys that will provide solid business utility for the customer.

DEVELOPMENTS IN COMPUTER TECHNOLOGY

Developments equally conducive to good survey research have occurred in the technological domain. New software (Such as MaCATI® or Sawtooth®) and hardware (Such as EDS' Collaborator®) have been developed that makes computer-based survey administration simple and relatively inexpensive even in big corporations. Moreover, new software for statistical analysis (specifically JMP®) makes it possible to analyze large datasets in a fraction of the time required by text-driven programs, and to display those results (e.g., with a Sharp Datashow® and MORE®) in a manner that presents complex statistical information in straightforward graphs that can be used by a general audience.

THE BALANCED SCORECARD -- THE ORIGINAL FORMULATION

The Balanced Scorecard is a system for measuring a company's performance both within and between its important domains (Kaplan and Norton, 1992, 1993). According to this approach, performance measures fall into four groups: Measures that capture a company's financial performance; Measures that reflect the customer's perspective; Measures that pertain to the production processes and work output, and; Measurements that quantify the extent to which the company has established a working environment that fosters organizational learning and innovation (Figure 1). The strength of the approach is that it encourages a broad, functionalist view of the systems that comprise a business. When applied properly, it provides a method for selecting fair and informative measurements in each of the four domains, for evaluating the links between and within those domains, and for assessing the impact of organizational changes (e.g., interventions associated with BPR, TQM, Change Management, etc.) over time.

THE BALANCED SCORECARD -- A REVISION & EXPANSION

By simplifying and broadening the terms of Kaplan and Norton's model it becomes apparent that the approach can be even more powerful than their initial formulation suggests. Specifically, we can modify their terms so that we address profitability, productivity, quality as it has an impact on the customer, and employee motivation. This adapted model is consistent with Kaplan and Norton's intention and with recent work from other authors on the Balanced Scorecard (e.g., Hubbard, 1992; Kiely, 1992; Wallace, 1992) but establishes categories that are both exhaustive and mutually exclusive, characteristics that the original model apparently lacks. (See Figure 2.) We can also modify the initial model by including an explicit link between the financial measures and the measures of organizational learning and innovation; as Kaplan and Norton's diagrams show (see pp. 72 & 136 of the 1992 and 1992 articles respectively) the authors typically omit this link from their analysis. The oversight is especially problematic given the fact that the domain of employees' attitudes and perceptions is where the corporate culture's norms concerning organizational learning reside. Accordingly, this portion of their model is both inadequately differentiated and is less connected to the other domains of the enterprise than it should be. Moreover, the nature of the method for evaluating links between motivation and the remaining domains is not specified by the authors any more than to say that it "will likely require simulation or cost modeling" (Kaplan & Norton, 1992, pg. 79). In the reformulation adopted here we will define the domains as listed above (viz., profitability, productivity, quality, and motivation), will use multiple regression, partialled correlations, and logistic regression to test for the presence of links in the model, and will explicitly include the connective link between motivation and profitability. Figure 3 shows a diagram of this adapted model, and highlights the areas that represent elaborations of Kaplan and Norton's original work.

EMPLOYEE SURVEYS IN LARGE ORGANIZATIONS -- AN EXAMPLE

The first task that confronts anyone working within the Balanced Scorecard framework is to establish a set of measures that will track the company's performance accurately and comprehensively. Actually, this task is a familiar one in the behavioral sciences: Psychologists have been working productively with the notion of convergent and divergent validity for quite some time (Campbell & Fiske, 1959). In every case, the specifics of this step will vary; appropriate measures of quality in one business may be entirely inappropriate in another, and the same is true to a greater or lesser extent for each of the remaining measurement domains. In our own work at EDS Survey Services this customization process is an important part of insuring that the customer's intervention is tailored to his or her specific needs. An example of the measures adopted with a recent customer -- an SBU of a large Fortune 500 electronics and communications company -- is shown in Figure 4. Note that measurements of the employee's domain (motivation) are broken down into two parts: the employee survey was constructed to tap five broad

attitudes (concerning the company's leadership, organizational communication, its teamwork, the perceived need to change in the organization, and its readiness to change); It also tapped six factors that provided an index of the activities that commonly occupied the company's employees (teaming, networking, serving, specializing, complaining, and just managing to cope). The five attitude scales and the six activity factors will be referred to consistently throughout the remainder of this paper, but it is important to bear in mind that they are customer-specific: Other consulting engagements with other customers would use different customized surveys and, most likely, would reveal different relationships between and within the measurement domains (see Figure 4).

THE APPLIED SOLUTIONS

Just as surveys and measurements are customized to fit each unique situation, the psychometric and econometric challenges that must be overcome are also unique. In the case of the example being described here, we solved a number of difficulties by: 1) Using z-scores, so that measures of quality could be disaggregated at the local level without jeopardizing our ability to make intra-domain comparisons; 2) Using multivariate multiple regression, so that ratings of productivity and profitability could be analyzed from both the senior executive who had overall responsibility for the SBU and from the division managers who were responsible for overseeing day-to-day operations. (See Figure 5.)

INTERCONNECTIONS BETWEEN THE FOUR DOMAINS

With the expanded and simplified model we have adopted here, it is possible to examine both the inter-domain links (e.g., between profitability and quality) as well as the intra-domain links (e.g., between a unit's assessed need for change and the quality of its leadership). As our diagram suggests, the valence of those links can be either positive, negative, or both. For example, one measure of productivity may be associated with a corresponding increase in quality when it is measured by one metric, while the inverse relationship may coexist between different measures of productivity and quality. (See Figure 6.)

TOP TRIAD: THE MANAGER'S VIEW & THE EXECUTIVE'S VIEW

An analysis of the partialled correlations and the regression coefficients from the customer's data on profitability, productivity and quality revealed that, in general, the executive's view and the divisional manager's view were diametrically opposed. For example, from the executive's perspective, high productivity was associated with strong profits, whereas managers believed that high productivity eventually led to lower profits -- presumably because increased productivity spawned production errors that eventually would erode profits. It is interesting to note that, in this case at least, the manager's view is different from the executive's view in precisely the same way that *Gemeinschaft* (Community) is different from *Gesellschaft* (Society), the former being based on relationships and traditions, and the latter being based on formal agreements and rational processes (Tonnie, 1887). In any event it is clear that the two views of the organization differ, and will

have a bearing on the manner in which business interventions are formulated and evaluated by the two groups. (See Figure 7.)

LINKS TO MOTIVATION

As our diagram outlining the links between motivation and the remaining three domains shows, features of the employee's world have a direct association with profitability, quality, and productivity. Because the internal links within the motivation domain are already known (from an analysis of the employee survey) it is possible to pinpoint the three functional units where, for example, quality of the leadership is lowest; the fact that good leadership is associated with strong profits suggests that, for this company at least, a program designed to enhance profits should include a component that addresses the low quality of the leadership in those units of the SBU where supervision is perceived to be substandard. (See Figure 8.)

SUMMARY OF PRE-INTERVENTION RESULTS

The analysis summarized in Figure 9 shows the initial interconnections in the customer's organization. A follow-up survey will be conducted after the EDS-sponsored interventions have been in place for a few months. This will allow us to evaluate the relationship between the four Balanced Scorecard domains and utilization of specific programs in specific functional units. Just as this initial analysis is helpful for crafting a set of interventions, the follow-up analysis will be helpful for evaluating those programs after they are fully implemented. (See Figure 9.)

SPECIFIC RECOMMENDATIONS

The customer has, of course, a unique set of goals as it faces the task of maintaining and enhancing its competitive advantage. In the accompanying figure each domain is keyed (by letter) to the specific interventions that can be expected to have a positive impact upon it; definitions from the original survey questions are listed parenthetically under the diagram's main headings. For example, by restricting teaming -- the extent to which employees hand off work to colleagues when problems arise -- we can expect to see predictable changes in the motivation domain (because we already know which units in the SBU are high or low on this metric) and can also expect to see improvements in quality. (See Figure 10.)

CONCLUSION

It is clearly the case that employee surveys can be, and should be, an integrated part of programs designed to expedite change in the workplace. It seems reasonable to contend that those surveys should be customized to fit customer's needs, that the data should be analyzed comprehensively with statistical software, that the analyses should be incorporated into a broad view of the company as a functional system, and that the results should be part of a Balanced Scorecard analysis that entails both an initial assessment and a follow-up test as well.

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* For additional information contact Palmer Morrel-Samuels, EDS Ctr. for Advanced Research, 2001 Commonwealth Blvd., Ann Arbor, MI 48105 Tel.:(313) 995-0900 palmer@cmi.com

Figures
Multivariate Analysis of Employee Surveys...

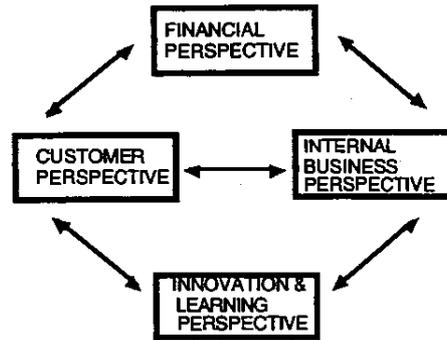


Figure 1 Palmer Morrel-Samuels • EDS Survey Services • 2/9/94

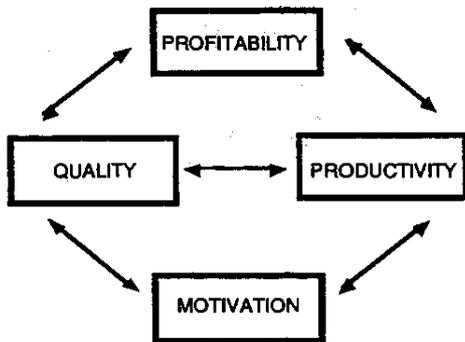


Figure 2 Palmer Morrel-Samuels • EDS Survey Services • 2/9/94

THREE PROBLEMS WITH THE BALANCED SCORECARD (KAPLAN & NORTON, HBS 1092)

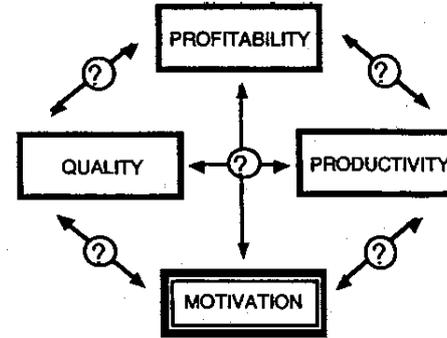
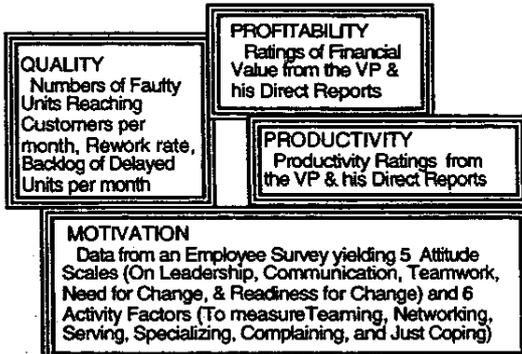
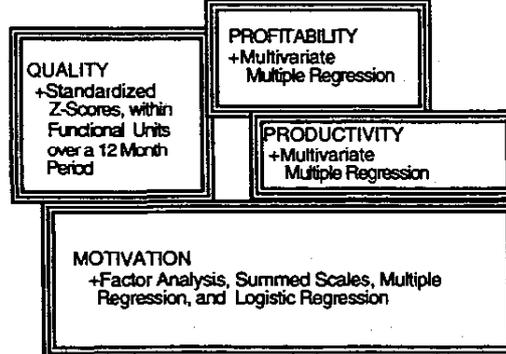


Figure 3 Palmer Morrel-Samuels • EDS Survey Services • 2/9/94

THE CUSTOMIZED MEASURES IN 4 DOMAINS



THE APPLIED SOLUTIONS



ALL FOUR DOMAINS ARE INTERCONNECTED

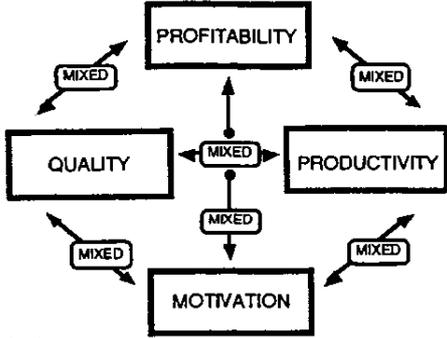


Figure 6 Palmer Morrel-Samuels • EDS Survey Services • 2/9/94

TOP TRIAD: MANAGER'S VIEW & EXECUTIVE'S VIEW

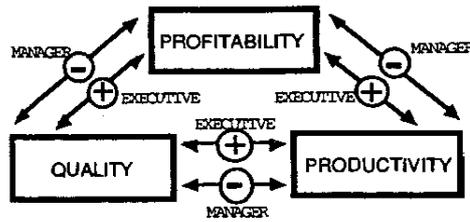


Figure 7 Palmer Morrel-Samuels • EDS Survey Services • 2/9/94

LINKS TO MOTIVATION
(Analysis of Links Within
Domain of Motivation is
Available in the Summary
of the Employee Survey.)

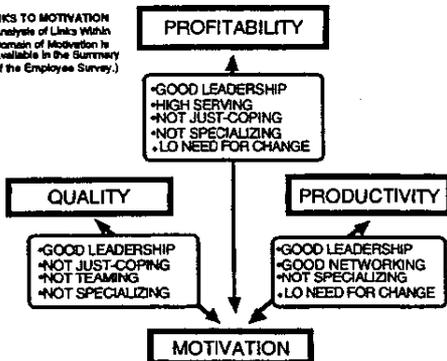


Figure 8 Palmer Morrel-Samuels • EDS Survey Services • 2/9/94

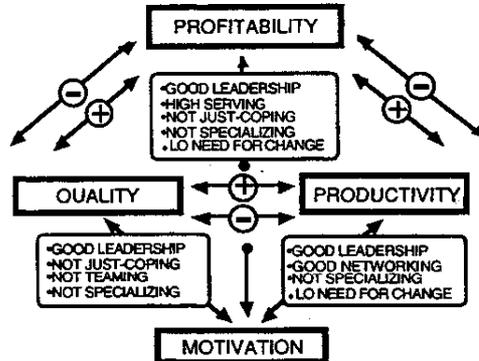


Figure 9 Palmer Morrel-Samuels • EDS Survey Services • 2/9/94

SPECIFIC RECOMMENDATIONS

RESTRICT TEAMING (B) (Handing off problems)

IMPROVE LEADERSHIP (A) (B) (C) (D) (Practice what you preach; Help employees; Know your field of expertise; Avoid unfair punishment)

LIMIT use of SPECIALISTS (A) (B) (C) (D)

IMPROVE work processes where the NEED TO CHANGE is HIGH (Where updates are difficult; Necessary tools are not available; Cross-functional communication is poor; reasonable risks cannot be taken; work processes are not suited to future needs; good ideas are not identified & implemented; and training is not suited to current work needs.) (A) (B) (C) (D)



Figure 10 Palmer Morrel-Samuels • EDS Survey Services • 2/9/94

* Address correspondence to
Palmer Morrel-Samuels
EDS Ctr. for Advanced Research
2001 Commonwealth Blvd.
Ann Arbor, MI 48105
Tel.: (313) 995-0900
email: palmer@cmi.com