HOW MUCH PROFIT
Is Your Current Plan Leaving
ON THE TABLE?

A Demand-Driven Plan Can Show You...and Assure it Never Happens Again

WHITE PAPER WITH CASE STUDY

INSIGHT, Inc. is a world leader in providing supply chain software and consulting services. Our commercial and custom solutions are designed specifically to meet daunting challenges in a dynamic, global marketplace: strategic supply chain design, strategic sourcing/outsourcing, risk management, mergers and acquisitions, optimal production plans and schedules, transportation procurement and operations, detailed facility operations analysis, and so on. We relentlessly focus on enabling our clients to outsmart their competitors and deliver verifiable bottom-line results. Contact: Jeff Karrenbauer, President, 703 956 1423 or jkarrenbauer@insightoutsmart.com

Arkonas is a management consulting firm specializing in Performance Management. Through years of unparalleled experience in various industries, Arkonas helps companies of all industries maximize their profitability by using state of the art methodologies. Contact John Miller, President; 832 628 7630 or jmiller@arkonas.com

Dybvig Consulting is a boutique firm specializing in the integration of two analytical approaches: predictive analytics and prescriptive optimization techniques with activity-based costing data to create a Demand-Driven Plan model. The client's DDP model maximizes the ROI of its total sales and marketing expenditures by simultaneously optimizing the forecast for maximum profit and the supply chain for optimal feasibility. Contact Alan Dybvig, Managing Partner; 609 947 2565 or alan@enterprisemasterplan.com

The authors wish to thank Glenn Sabin, Managing Principal of **ZS Associates**' office in Princeton, N.J., for his essential contribution to our effort—specifically, the technical practicality of enterprise response functions. Mr. Sabin can be reached at glenn.sabin@zsassociates.com.

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1. DDP Summary

a. DDP Value Proposition

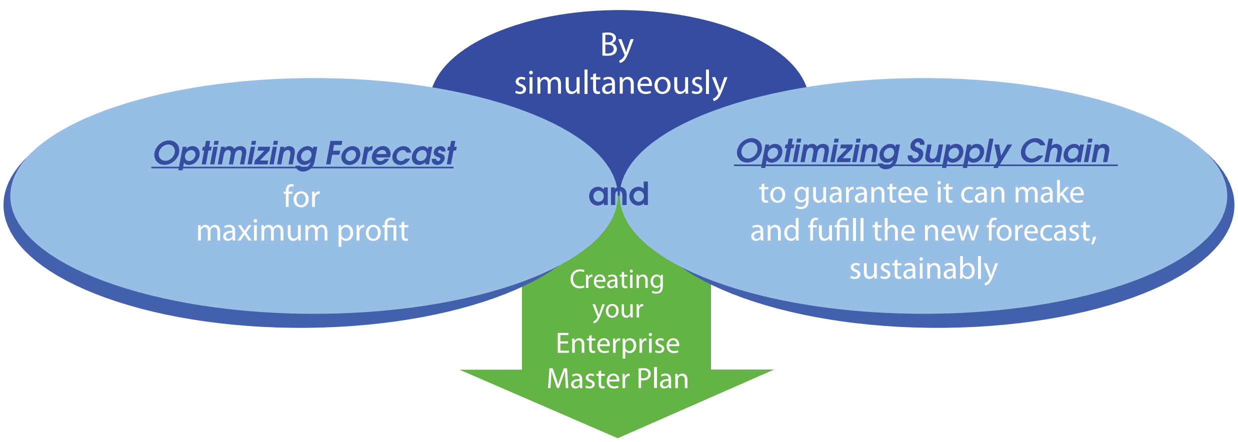
This white paper elaborates considerably on an article published in the May/June issue of Wiley's *Journal of Corporate Accounting and Finance* titled "Demand-Driven Plan (DDP): Next Generation Planning with Activity-Based Costing."

The elaborations include:

i. A more complete explanation than available in the Wiley article of the DDP value proposition; specifically that of creating **an optimized projected income statement**.

This is accomplished by designing, simultaneously, both:

1. **An enterprise forecast that is maximally profitable**, identifying the profit that the current forecast is leaving on the table, **something never before possible**. See Exhibit 1 below for how a DDP is created.



Creating a DDP: Exhibit 1

Further, by optimizing the traditionally developed projected income statement, the Demand-Driven Plan (DDP) assures all the enterprise's other annual planning applications are executing to the maximally profitable forecast with the optimally feasible supply chain. This includes financial (FP&A), operational (S&OP) and marketing & sales (marketing mix-modeling and sales resource optimization) applications. In so doing, the DDP also assures all the functional silos are harnessed to the maximally profitable forecast.

2. **The optimally feasible and sustainable supply chain required to make and fulfill the new forecast.**

ii. More details of the DDP "proof of concept" (POC) case study. The authors built a "proof of concept" DDP model using data from an earlier ABC engagement and demonstrated the firm had left an additional 25-150% profit opportunity on the table, depending on the scenario.

b. Action Plan: Get a Free Proposal

1. Call Jeff Karrenbauer, President, INSIGHT, 703.956.1423 or 703.999.1259 (cell)
    - Jeff will describe how a calibration model will be built of last year's income statement.
    - It will show how much revenue and profit was "left on the table" because total sales and marketing ependitures were not maximized.
2. He will schedule a meeting (web or onsite) to describe the process in more detail.
    - He will also get a feeling for the complexities of your business.
3. In discussions with his partners, he will develop a FREE proposal.
4. Finally, accept Jeff's Proposal.
    - And get to work implementing DDP's unique financial and operational modeling analytics to optimize your projected income statement for maximum profit.

2. *Demand-Driven Plan (DDP)* "Next Generation" Forecasting & Planning

a. Optimizing a Projected Income Statement:

It requires all of the following modeling considerations be observed:

1. The model must be **activity-based** because the supply chain software upon which a DDP model is based is unit-based.
2. **Supply chain** must be variable in model
3. **Objective function** (i.e., what you're trying to optimize) must be profit
4. **Solver** must be prescriptive ("what is the best X?") and not scenario analysis (what will happen if we do "X"?) (See Appendix I for an illustration)
5. The solution must be developed by *simultaneously* considering all variables.
6. **Forecast** must be variable in the model and must be **unit-based** since the model is activity-based.

These six considerations are accomplished by integrating into traditional supply chain network design software (1-5) response functions (6) developed by traditional marketing-mix modeling software.

b. Essential data elements:

Given the modeling software required to create a DDP exists (described by Jeff Karrenbauer, President of INSIGHT, at the Fall, 2013 CAM-I meeting held Naperville, IL on September 10, 2013), the following data elements are required to create the model:

i. Forecast

The revenue line of the projected income statement DDP model is the unit forecast multiplied by the appropriate prices and summed. Thus, the ***unit-based forecast is the first essential*** element in developing an optimized projected income statement.

As described in the Introduction, this white paper explains in considerable detail how a DDP creates an optimized projected income statement by designing an enterprise forecast that is maximally profitable. See Appendix II for detail.

ii. Cost Functions

As is true of any supply chain network design (upon which a DDP model is based), the model structure of the projected income statement is a series of geographically-located nodes connected by links arranged in a hierarchy, procurement to customer. (See attachment III.) The nodes contain facilities and within the facilities, activities and products. These nodes and links are appropriately constrained (e.g., capacities).

However, the flows within the network (e.g., across a node, within a facility, through an activity) are not known because they are the answer to the question: "What is the optimal supply chain configuration to make, fulfill and service the forecast?" Thus, the ***second essential element*** for developing an optimized projected income statement is an understanding of unit costs and how they vary with volume. These relationships are referred to as ***cost functions***.

Cost functions are defined by Dr. Charles Horngren as "descriptions of how a cost changes with changes in the level of an activity or volume relating to that cost." Cost functions describe, mathematically, the relationship between activity changes (units, weight or volume) and the cost changes driven by the volume changes.

Cost functions must be a combination of fixed and/or linearly variable volumes, given the mathematical programming techniques that are used to optimize the DDP model. These include:

- linearly variable with increases or decreases in activity
- Fixed costs that don't change with activity at all.
- Stepwise fixed
- Any combination of fixed and linear

Thus, plotting the cost function with changes in cost on y axis (dependent variable) and changes in units of volume on x axis (independent variable) yields the following cost = slope x activity. The slope is expressed as cost/activity and is the **key mathematical factor** in the cost functions.

How are cost functions developed? There are four ways available to develop the slope of these cost function curves:

1. Accounting: See Appendix IV
2. Statistical: See Appendix IV
3. Engineering: See Appendix IV
4. Activity-based Costing: See Appendix V

Finally, both COGS and general and administrative expense (G & A) costs in the projected income statement are modeled with activity-based cost functions.

iii. Response Functions

The ***third essential element*** required for developing an optimized projected income statement is exactly the opposite of the second; specifically, how units vary as a function of total sales and marketing expenditures. These are referred to as ***enterprise response functions***.

Elaborating, response functions have been around for decades and link sales or marketing activities to forecast/revenue results. Specifically, they relax the assumption of a fixed forecast by predicting volumes/revenues at different levels of sales or marketing effort. Sales response functions are used to size and allocate the sales force resource (sales resource optimization (SRO))while marketing response functions are used to size and allocate the marketing budget (marketing- mix modeling (MMM)).

Response functions are the reverse of cost functions because the independent variable is not units but rather sales and marketing expenditures. The dependent variable is units. Units are, also, frequently multiplied by price to yield revenues as the dependent variable.

These relationships are used to inform critical resource allocation decisions including how big the sales or marketing budget should be, and to which products and/or customers should these resources be allocated. As a result, this process can lead to changes in individual product or customer expenditures.

In these approaches, the supply chain is fixed and the objective is to maximize the contribution of the sales and marketing efforts after accounting for the costs of these promotions and a fixed product margin. It is not common to account for changes in margin as a function of the expected product demand.

There are a broad range of methods that can be used to estimate response functions, which differ in the time/ effort involved and the precision that can be achieved. A partial list of these methods includes:

- In-market tests to isolate the impact of individual promotions
- Econometric methods that rely on statistical analysis to estimate the sales impact of prior sales and marketing activities
- Expert sessions that provide a structured process to solicit and refine estimates of the impact that a promotion will have

Regardless of how the response functions are derived, they can be compared to actual results and re-calibrated as needed. This is analogous to the financial variance analysis process.

Enterprise response functions are an emerging application of these same techniques and are provided by software firms specializing in sales resource optimization and marketing mix modeling. They enable maximizing the profit of an entire activity-based plan by:

1) Replacing a fixed contribution margin with profit based on the actual costs required to make and fulfill the forecasted demand
2) Using both sales and marketing expenditures as the drivers of the enterprise's forecast.

Summarizing, the S of SC&A is modeled as enterprise response functions.

iv. Other

There is also a collection of other modeling elements which, taken together, represent the ***fourth essential element***. These elements include an understanding of constraints (e.g., capacities).

Elaborating, all constraints, including capacities, must be identified as they are an explicit requirement for optimization. Further, in most cases, these constraints can be relaxed. Examples include:

- Limits on procurement availability
- Manufacturing capacity
- Sales and marketing expenditure limits
- DC throughput, storage
- Energy consumption
- Carbon emissions
- Targets for inventory and customer service
- Transportation link restrictions
- Supply/demand imbalances (e.g., inventory build ahead vs. over time)
- Constraints on total sales and marketing expenditures

3. DDP Model Works

a. Proof of Concept case study (See Appendix VI for details)

It started out as a simple comment six years ago, "*Imagine relaxing the assumption of a fixed forecast to solve for the optimum level of sales and marketing investment that provides the highest profit and ROI.*" Planning and Budgeting, Arkonas One Eighty Newsletter, February, 2008

The software required to accomplish this, INSIGHT Integrated Enterprise Optimizer (IEO), was already under development at INSIGHT, a provider of software used for optimizing a supply chain network. The concept was simple: Using IEO, create a DDP model of the current projected income statement as traditionally developed. Next, relax both the assumptions of a fixed forecast with response functions and that of a fixed supply chain with cost functions and, finally, optimize the model. The resulting Demand-Driven Plan (DDP) produces the maximally profitable forecast that the projected income statement's resources are capable of making and fulfilling. Simultaneously, enterprise-wide, IEO resizes and reallocates these same resources to support the manufacture, fulfillment and support of the new forecast; i.e., the supply chain is assured to be optimally feasible.

But would it work; would it actually demonstrate a substantial profit improvement? It was a difficult question since no firm had been found willing to proceed without credible proof that it would deliver what it promised. In other words, a "proof of concept" (POC) model was required. Rather than inventing data, it made more sense to find an existing set of actual data and use it to create the POC model.

The modeling results most readily available were of a previous ABC engagement conducted by one of the authors. Fortunately, the data incorporated the entire income statement. So, an investigation was made into the match between the ABC data developed and the data requirements for a DDP model. Specifically, whether the DDP model POC cost function slopes could be developed from the ABC data.

What was learned was very important. The two seemingly unrelated, activity-based analytic techniques: 1) activity-based costing and 2) a DDP model share common activity-based costing data architecture. Both techniques build their models with fixed and linearly variable relationships between costs and activity (units, weight or volume). Thus a DDP model is considerably easier to build if activity-based cost data is available. This is, as described in Appendix V, the three key ABC data elements (i.e., activity consumption rates, resource consumption rates and cost factors) when multiplied are the slope of the DDP model's cost function curves.

The authors, in other words, found a third way to create cost functions, in addition to the four (See Appendix IV). Specifically one that **did not** require any further customer involvement beyond that required for the original ABC engagement. Without this ABC/cost function arithmetic identity, the authors would have had to convince a firm to go to expense and take time to develop the cost functioin curves, traditionally with **no** assurance the DDP model created would improve profit at all, let alone significantly.

b. Results

The structure of the DDP proof of concept model includes:

- One facility: US plant/distribution center
- Two products: standard and custom
- Nine customers: 5 regions in North America area (NA) and 2 each in Europe/Middle East (E/ME) and Far East (FE)
- 8 response functions
  - 6 for the 3 areas (NA, E/ME and FE)
    - One for +/- 20% sales/marketing expenditures off baseline in each area
    - One for customer and one for regular product
  - 2 for FE area
    - One for +200% and -20% sales/marketing expenditures off baseline
    - One for customer and one for regular product

Scenarios	Maximize Revenue	Maximize Profit	Sales/Marketing	Sales/Marrketing ROI	Activity capacity exceeded
Baseline	$136.3 m	$12.7m	$28m	45%	None
Revenue max	$143.8m (6%)	$16.3m (28%)	$28.6m	27% improvement	1 (labor)
Profit max	$140.9m (3%)	$19.8m (56%)	$23.6m	87% improvement	1 (labor)

Exhibit 2: Far East 20%

Scenarios	Maximize Revenue	Maximize Profit	Sales/Marketing	Sales/Marrketing ROI	Activity capacity exceeded
Baseline	$136.3 m	$12.7m	$28m	45%	None
Revenue max	$173.4m (6%)27	$30.0m (136%)	$34m	96% improvement	5 (labor) 2 machine
Profit max	$170.5m (25%)	$33.5m (164%)	$39m	158% improvement	4 (labor) 2 machine

Exhibit 3: Far East 200%

4. Conclusion

As described above, a DDP model allows for the first time something never before possible: the ***optimization of a projected income statement***. It accomplishes this by simultaneously and optimally balancing supply, demand, and profitability with all appropriate constraints.

Thus, DDP model's functionality truly represents the next generation planning, both financially and operationally. Further, it does not employ "new" or "untested" analytics. Rather, it is simply the integration of three different and robust sets of analytics (i.e., mixed integer and linear math programming, predictive analytics and activity-based costing) that have been commercially successful for decades.

Appendix I: Prescriptive Solutions; A numerical illustration of their necessity

An DDP POC case study model relaxes two fundamental constraints in traditional planning models: that of a fixed supply chain and that of a fixed forecast. Adding response functions to a POC model to relax the assumption of a fixed forecast increases the number of scenarios that would have to be run if the solution was to be determined by scenario analysis (i.e., descriptively) (NOTE: These scenarios are in addition those required to evaluate the supply chain scenarios.)

That is the only way to determine, descriptively, which of the various scenarios (which answer the question: "What would happen if we do X?") answers the much more important question: "What is the best X?"

There are three factors in the model which determine the answer to the question. They are Products (P), Objective functions (OF) and Customers (C).
The number of products and objective functions increases the number of scenarios multiplicatively. Unfortunately, the number of customers increases the number of scenarios exponentially. This is because every customer has 2 possible "states:" that of having more demand purchased for them by the model or not having had demand purchased. Thus, the total number of customer demand configurations is 2 to the number of customers.

Two examples demonstrate, overwhelmingly, when descriptive solutions MUST yield to normative for anything like a realistic, actionable model.

1. This yields for the McCoy POC model where P=2, OF = 2 and C = 9, 2 x 2 x 2 to the 9th (= 512) or 2048 scenarios.

2. For a more realistic model where P = 10, OF = 2 and C = 50, the answer is 10 x 2 x 2 to the 50th (= 10 to the 15th) or 2 x 10 to the 16th.

3. When the numbers of possible solutions are expanded to include relaxing the assumption of a fixed supply chain, the case for scenario analysis becomes just that much more absurd. In this case, the integer variables are not absence of presence of a customer responding to a response function. Rather it is the absence of presence of a facility, product, activity, etc in the solution. This increases the possible solutions to, literally, more stars than there are in the universe which is 10 to the 24th.

Appendix II: Forecasting Detail

The Beyond Budgeting Round Table (BBRT) is an international shared-learning network of member organizations with a common interest in transforming their performance management models to enable sustained, superior performance. For more details, see **BBRT**.

One of the central performance management tenants of BBRT is that a *quality forecast process* is essential. Steve Player, chairman of BBRT NA and co-author of *Future Ready: How to Master the Business Forecast*, has very succinctly described **just such a process**. Included are the important distinctions between strategic and execution forecasts , business as well as clarifications between goals, budgets and forecasts. A forecast process approach the BBRT has emphasized is that of the **Rolling Forecast**.

Our concern in this white paper is with business forecasts. Business forecasting is described by Morlidge and Player, *Future Ready: How to Master the Business Forecast*, (p. 67) as:

"Business forecasting takes place when it is possible to steer the business within the constraints of existing goals, scope and structure of the business.

Our concern is the medium term, which we call the business forecast. We chose this name because, while the short term or execution forecast primarily concerns those that are required to deliver goods and services, and strategy is primarily the job of senior management, the business horizon usually involves the **entire organization** in some fashion."

Given a high quality forecast process, what are the various techniques by which a forecast can be created? Referencing *Future Ready*, Chapter 4, "Mastering Models: Mapping the Future", (pages 87-124),

> "There are three types of models can be used to produce a forecast...
> 1. Despite the disapproval of professional forecasters in academia, the majority of business forecasting and budgeting processes rely on **judgment techniques**....
> 2. The second type of forecast model is the **mathematical model**...Many businesses use sophisticated mathematical modeling to forecast volume, perhaps factoring in the effect of weather on the size of the market or advertising on market share...
> 3. Given a reasonable amount of historical data, we can use the third type of model: the statistical (i.e., extrapolation) model. Statistical models employ **extrapolation** techniques to generate forecasts"

Another characterization of the differences between **mathematical models and extrapolation models** can be found in Hanssens, Parsons, Schultz, *Market Response Models*, pages 377-378, 386-389. Quoting:

"**Extrapolative forecasts** use only the time series of the dependent variable. Thus, a sales forecast is made only on the basis of the past history of the sales series...**Explanatory (i.e. mathematical) forecasts** go beyond extrapolative by including causal factors thought to influence the dependent variable of interest."

In addition to Morlidge & Player and Hanssens et al, explanatory forecasting is also discussed in Charles Chase's *Demand-Driven Forecasting*, second edition, 2011. The process described below, relaxes the assumption of a fixed forecast by employing what the author characterizes as "demand-sensing" techniques, more typically referred to as response functions. The solution is not optimal, however, because descriptive techniques (what will happen if we do "X?") and not prescriptive techniques (i.e., what is best "X?") are used to develop the new forecast.

Demand-driven Forecasting Process
1. Demand Sensing: *Uncover market opportunities and key business drivers (sales and marketing)*
2. Demand Shaping: *Using what if scenarios, demand planners shape future demand based on sales/marketing plans* a) optimize sales and marketing tactics and strategies (sales and marketing) b) assess financial impact (finance) c) finalize unconstrained demand forecast (sales and marketing)
3. Demand shifting: *Match unconstrained demand to supply* a) consensus planning meeting (sales, marketing, finance and operations) b) rough cut capacity planning review (operations)
4. Demand Response: *Constrained demand used to develop supply plan* a) revised demand response (sales and marketing) b) create supply response (operations)

Forecasting Process from *Demand-Driven Forecasting*: Exhibit 1

Another explanatory forecast process is described in Hanssens et al, ibid, pages 16-17 and 390-396.

Finally, explanatory or mathematical "business" forecasts have also been used for decades **within the sales and marketing functions** to size and allocate their respective resources, optimally.

A comparison of **explanatory and extrapolative forecasting techniques is illuminating** (next page).

Application	Marketing Mix Modeling	Sales Resource Optimization	Business Forecast Extrapolative	Business Forecast Explanatory
Planning issue	Size and allocate all or a portion of planned marketing budget	Size and allocate all or a portion of planned sales force budget	Develop a product(s) forecast	Develop a product (s) forecast
How forecast developed	Multiple time series	Multiple time series	One time series	Multiple time series
Marketing plans drive forecast (i.e., they are independent variables)	Yes	Yes	No	Yes
Marketing response functions required	Yes	Yes	No	Yes
Forecast's use	Within marketing	Within sales	Within enterprise	Within enterprise
How forecast optimized	Prescriptively	Prescriptively	n/a	Descriptively (i.e., scenario analysis)
Objective function	Profit proxy: contribution margin by product	Profit proxy: contribution margin by product	n/a	Profit proxy: contribution margin by product
Best possible forecast, financially	No	No	n/a	No
Best possible forecast, operationally (e.g., observe constraints)	No	No	n/a	No
Reference Articles	Hanssens, Parsons, Schultz, *Market Response Models*, "Integrating Market response Models in Sales Forecasting at Polaroid," pages 391-393	Sinha and Zoltners, "Sales-Force Models: insights from 25 Years of Implementation, *Interfaces 31:3*, Part 2 of 2, May-June 2001	Morlidge and Player, *Future Ready*, pages 110-112 Hanssens, Parsons, Schultz, ibid, pages 316-316, 377-378, 386-389	D.M.Hanssens, "Order Forecasts, Retail Sales and the Marketing Mix for Consumer Durables", *Journal of Forecasting*, June-July 1998

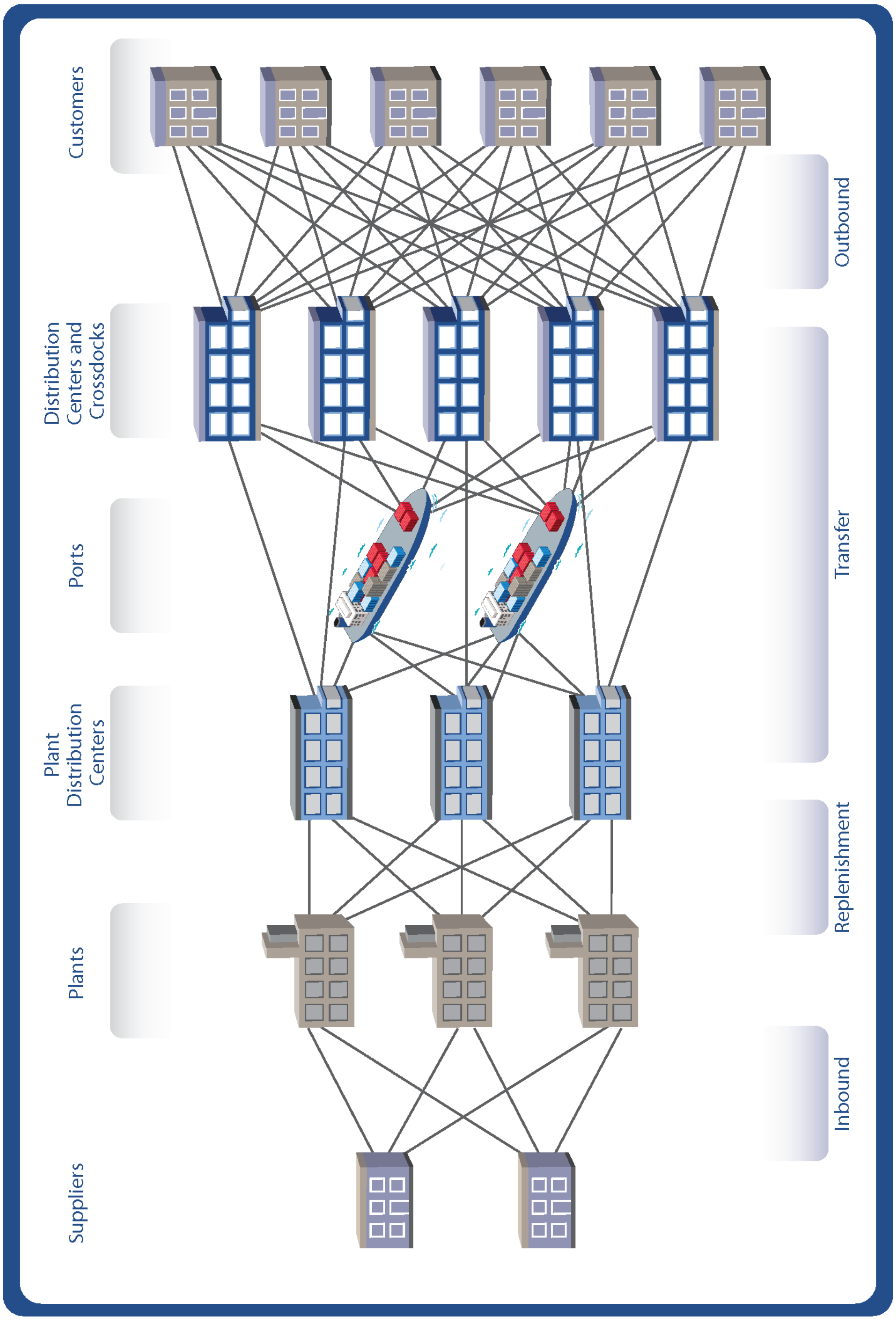
Statistical Forecasting Applications: Exhibit 2

This comparison indicates very clearly the shortcomings of current explanatory and extrapolative forecasting applications; most significantly, the absence of an **enterprise-wide forecast that is optimal** (i.e., maximally profitable) **something never before possible**.

Appendix III

INSIGHT OUTSMART

Supply Chain: Comprehensive Scope



Appendix IV: Traditional Cost Function Curve Development

1. Accounting Approach

The most popular approach to facility data preparation is based on a detailed analysis of historical cost accounting records. The basic idea is to assemble all relevant cost accounting records, remove extraneous information, ensure comparability, separate fixed and variable costs, perform consistency checks, and prepare final model inputs. If you choose the accounting approach, we recommend that you follow the step-by-step procedure outlined below.

Step Action

1 Identify all accounts that contain facility operating costs.

2 Obtain historical data for each account identified in Step 1 for each facility active during the base period of the study.

3 Identify and remove from each account any costs that are not related to facility operations.

4 Carefully study reporting standards and practices by facility location. Attempt to identify discrepancies that would yield misleading results. The basic idea is to ensure later *apples-to-apples* comparisons across facilities.

5 Identify and *temporarily* remove cost differences between facilities which are due to regional influences (for example, labor and utility rate differentials). You may wish to use the Regional Cost Indices included in SAILS to facilitate this effort. This is done to ease Steps 6-8.

6 Separate facilities by generic type and mission. For example, distribution centers should, at a minimum, be segregated into owned, leased, and public categories. Use additional subdivisions as required to account for important operating differences: dry vs. refrigerated, bulk vs. bin, etc. Review the discussion of noncomparable facilities, as necessary.

7 Analyze carefully the results from Step 6 for consistency across facilities. Within a given facility type, perform ratio tests such as those described earlier. If discrepancies are present, you must attempt to explain them. Remember that you have already accounted for extraneous costs (Step 3), reporting practice inconsistencies (Step 4), regional influences (Step 5), and mission differences (Step 6). If discrepancies persist, then you are likely faced with the delicate (and potentially explosive) matter of managerial and/or labor force performance deficiencies. Unless you have *compelling* evidence to suggest that such problems are *inherent*, we recommend that you do not represent them in your model. Choose a representative set of costs and ignore substandard operating practices. From a strategic point of view, such variances should not be the basis for a network redesign.

8 Categorize each account as either fixed or variable. (Refer to our earlier definitions of fixed and variable costs, if necessary.) This step will almost certainly involve some judgment calls on your part.

9 Reintroduce regional differences removed at Step 5.

10 Prepare final inputs for your model.

2. Statistical Analysis Approach

One of the most difficult challenges that you must face when analyzing historical facility costs is the segregation of accounts into fixed and variable categories. The statistical approach circumvents this problem because it is completely independent of the nature of individual cost accounts. The basic idea is to derive a mathematical function that best describes the observed relationship between total cost and facility volume. The statistical technique that you will normally use is single variable linear regression.

The statistical approach to facility data preparation is summarized next:

Step Action

1-7 Follow steps 1-7 from Accounting Approach, earlier.

8 Perform regression analysis of total facility costs (dependent variable) and volume (independent variable). Interpret resulting equation coefficients as follows:
y-intercept: fixed cost
slope: variable costs

9-10 Follow steps 9-10 from Accounting Approach.

These cost coefficients probably will bear little resemblance to those you derive via the accounting approach. Nevertheless, if the equation fits observed historical data reasonably well, it is equally valid. Furthermore, you are relieved of the difficult task of attempting to classify accounts as fixed or variable. Rather, you are simply asserting that the total cost function for a given facility type behaves in a predictable, justifiable way; the underlying components of total cost are unimportant to the solver.

3. Engineering Approach

Suitable historical facility operating costs may not be obtainable from your accounting records. Even if they are available, you may be unwilling to use them as the basis for your analysis for several reasons, including

a. base period that contains abnormal events such as strikes or national disasters;
b. reporting discrepancies that are so severe they cannot be reconciled, and
c. missing information from one or more facilities

In such instances, you may conclude that standard costs should be used instead of accounting data. If your firm has recently built, or plans soon to build a new manufacturing or distribution center facility, it is virtually certain that the planning phase involved detailed estimates of facility operating costs. Assuming that the facility size specified in the analysis represents those you wish to evaluate, you can incorporate these values in your IEO model. Alternatively, you can commission special studies to develop such estimates. Following is the recommended step-by-step procedure:

Step Action

1 Obtain engineering cost estimates for each facility type to be evaluated.

2 Identify and temporarily remove regional influences built into the estimates (for example, labor and utility rate differentials). You may wish to use the Regional Cost Indices to facilitate this effort. You should perform this step even though you will almost immediately reintroduce such factors in Step 4. Remember that most engineering studies are confined to few sites. If you wish to use this data to evaluate a larger number of candidates, then the base cost estimates must be region neutral.

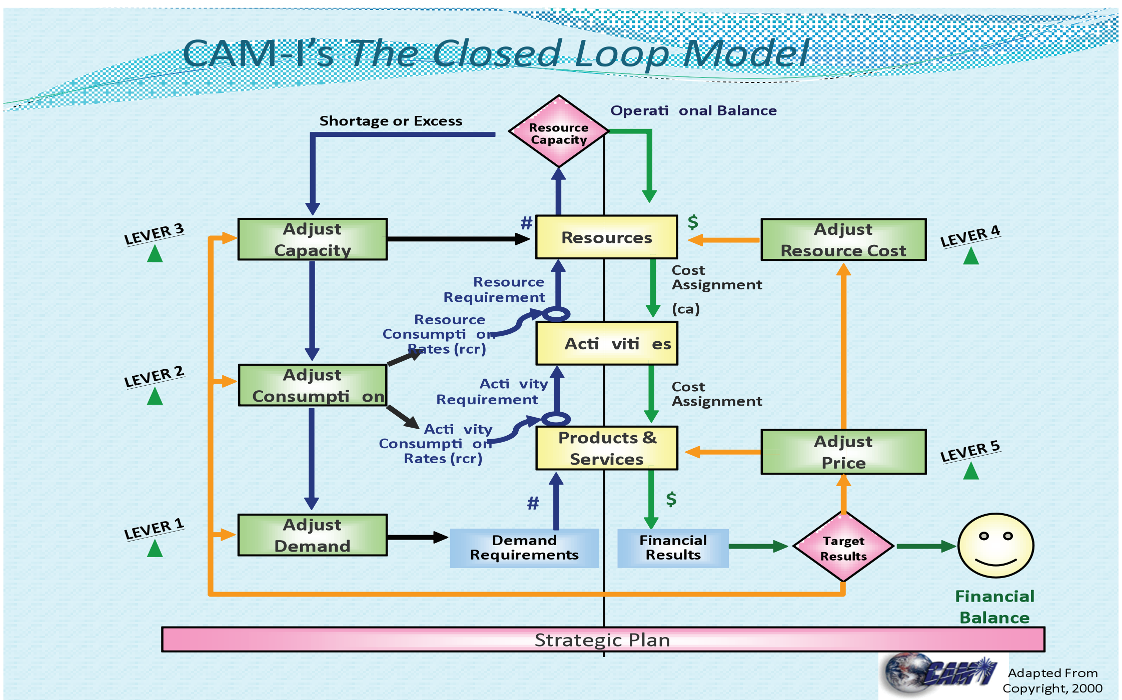
3 Ensure that your standard costs are divided into fixed and variable components. Obtain the assistance of the engineering design group responsible for the estimates, if required, to perform the required segregation.

Appendix V: New Way for Developing DDP Cost Function Slopes with Activity-based Costing Data

In looking for data from which to construct the DDP proof of concept model, as a very pleasant surprise to the authors, they discovered the two analytic techniques of interest (activity-based costing and supply chain network design) have exactly the same costing data architecture. This is, in a nutshell, why DDP models can be easily created from ABC data.

Reviewing, activity consumption rate (acr = activity/product) and resource consumption rate (rcr = resource/activity) and the associated cost factor (cf = $/resource) when multiplied are, in fact, precisely the slope of the variable cost functions required in a DDPm. Thus slope = activity/unit of product x resource/activity x $/resource = $/unit of product = slope of cost function curve.

Below is a graphic describing the use of the three ABC factors in *The Closed Loop* planning process flow. Reiterating, activity-based planning flows products/customers through activities to resources; activity based-costing processes flow in the opposite direction.



Obviously, as illustrated above, the three essential factors of *The Closed Loop* are exactly those developed by traditional activity-based costing techniques: the activity consumption rate (acr), the resource consumption rate (rcr) and cost assignments (ca). They are also sometimes referred to as cost factors (cf).

In *The Closed Loop* this is illustrated in Chapter 8 with an example; that of an out- bound call center. All the costs in the example are fixed except those of the reps making the calls and the telecom costs/call.

Using data from the call center example in *The Closed Loop*, below is an illustration of the arithmetic identity of the slope of the cost function curve required in a DDPml and the multiplication of the three factors developed in the activity-based costing analysis: acr x rcr x cf= DDP model cost function slope.

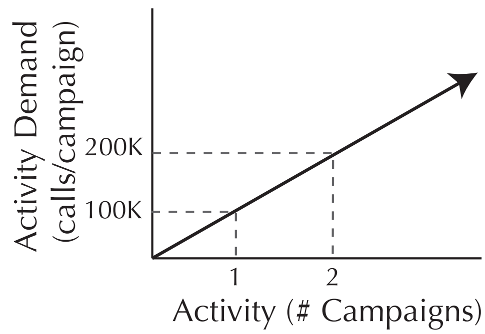
Mapping Call Center Consumption Rates to Cost Functions:

LABOR

Cost Object = Campaign
Activity = Create Campaign

1. Activity Consumption Rate (ACR)

ACR = 100K calls/campaign

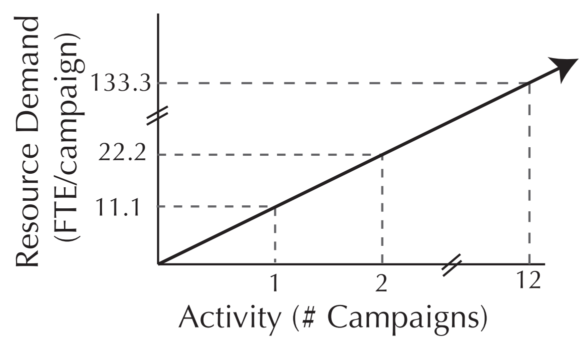


2. Resource Consumption Rate (RCR)

RCR = 10 min./call

Assume: FTE = 1500 hrs.

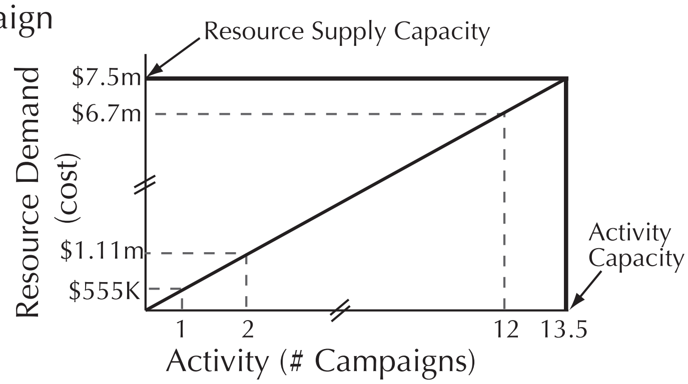
FTE/Campaign = 10 calls/campaign
x 10 min./call
x 1 hr./60 min.
x 1FTE/1500 hours
= 11.1 FTE/campaign



3. Assume: FTE = $50K

Campaign cost = $50K/FTE
x 11.1 FTE/campaign
= $555K/campaign

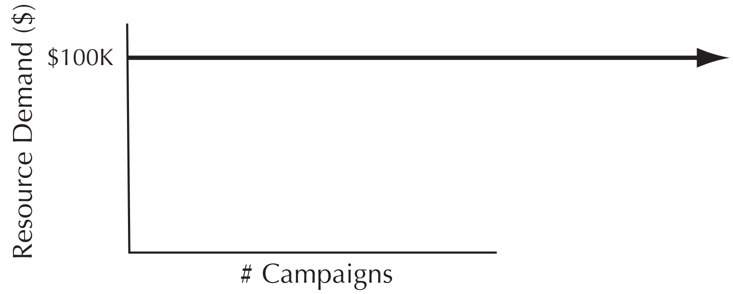
COST FUNCTION (LABOR)



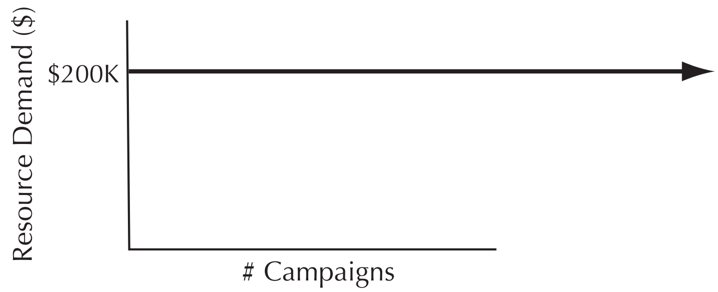
Mapping Call Center Consumption Rates to Cost Functions:

OTHER

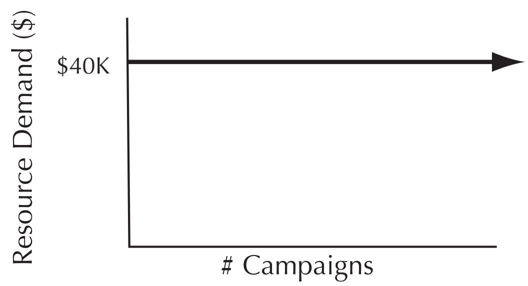
General Manager



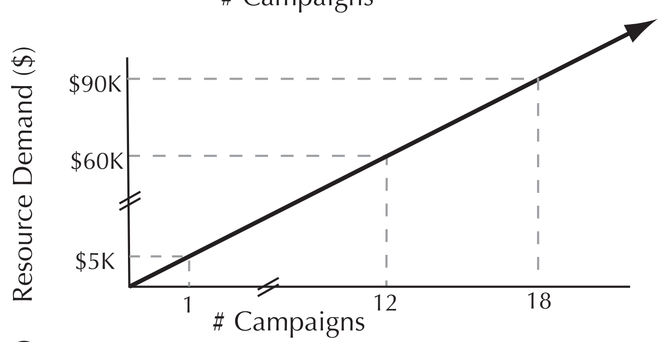
Facility Lease



Sundry



Telecom



Supervisors