**DDSM Technical Considerations**

DDSM integrates two modeling techniques that have, as separate applications, enjoyed significant commercial success for decades.  One is operations-focused (i.e., supply chain network design) and the second is sales/marketing-focused (i.e., marketing-mix modeling).  Supply chain network design assumes a fixed forecast and designs the most profitable supply chain required to make and fulfill the forecast.  [See INSIGHT for more details.](http://www.insight-mss.com/index.php/solutions/network-design) Note: INSIGHT is the firm that created DDSM

Conversely, marketing-mix modeling assumes a fixed supply chain and designs the most profitable forecast.  [See IRI for more details](http://operationalincomestatement.com/roi/wp-content/uploads/2015/05/2009-IRI-marketing-mix-modeling.pdf).  By integrating the latter into the former, DDSM makes it possible for the very first time to design, simultaneously, the most profitable forecast **and** the optimally feasible supply chain required to make and fulfill it.

Three additional factors associate with DDSM’s technologies.  As described above, one is its use of prescriptive techniques (as opposed to scenario analysis techniques) to solve for the maximally profitable forecast.  Prescriptive techniques answer the question: “What is best possible outcome?”  Scenario analysis or what if analysis answers the question: “What will happen if we do X?”  Given even a relatively small number of possible solutions, prescriptive techniques are necessarily superior to scenario analysis.

The second is required by the first.  Specifically, since an DDSM answers the “best possible outcome” question (in the DDSM’s case, the most profitable forecast), then the **all variable costs** must be represented in the model as variables so the model can calculate and select the best outcome from all possible outcomes.

In the case of the supply chain, these representations are called cost functions where activity is the independent variable (x axis) and cost is the dependent variable (y axis). (Note: Cost functions are described in Horngren, Datar and Foster, Cost Accounting, a Managerial Emphasis as “descriptions of how a cost changes with changes in the level of an activity or volume relating to that cost.”)

In the case of sales and marketing costs, the relationship is the opposite.  Cost is the independent variable and activity is the dependent variable. See Figure 1, below.



The third is also required by the first.  Specifically, since what is being optimized (the objective function) is profit, the model must include not only the supply chain costs (i.e., **COGS**) and sales/marketing costs (**S** of SG&A).but also **G&A costs** must be included in the model.

The result, with Finance’s leadership and featuring Sales/Marketing’s analytics (i.e., response functions) as the driving force, is an entirely new form of the income statement; one that assures important cross-functional enterprise performance management (EPM) benefits for the entire enterprise. This is because sales and marketing’s expenditures (the **S** of SG&A) makes the entire income statement demand-driven since **S** is the **cause** that drives **COGS + G&A** costs. This is a reality that will elevate the importance of sales and marketing’s role in the annual planning process significantly. See Figure 1, above.

**A cost/flow baseline** for the DDSM serves two purposes: to establish model validity and to provide a basis for comparing the results of a given optimization scenario with the current system.  The baseline DDSM attempts to replicate the logistics flows and costs for a given historical base time period. The analysis team then compares model results with known historical values and assesses model accuracy. The underlying rationale is simple: if we can reasonably replicate history, then our willingness to accept recommendations about the future increases. However, failure to replicate known historical values calls into question the results of forward-looking scenarios.

The procedure the DDSM uses to establish model validity is to construct a historical cost/flow baseline, which is then compared with corresponding known values. Objective is within 2% of accounting data. The broad outline of this process is described below:

**Action Steps**

**1** Establish historical customer demand levels.

**2** Establish historical flows for each transportation link, by commodity.

**3** Establish historical flows for each facility location, by commodity.

**4** Multiply each transportation link flow by the corresponding unit transportation

cost.

**5** Multiply each facility location flow by the corresponding unit cost

(procurement, manufacturing, DC locations).

**6** Establish the fixed cost for all corresponding facilities with positive flow

(plants, production lines, DC locations).

**7** Add the results from Steps 4 through 6.

**8** Compare volumes and costs with known historical values and assess overall

model validity.

**Note: Steps 1 through 7 are executed by the cost/flow baseline model in DDSM.  The analysts must perform Step 8 outside of DDSM.**

The DDSM cost/flow baseline module multiplies facility and transportation historical flows by

corresponding variable costs and adds in fixed costs. Reports are then prepared to summarize the process. Therefore, running a cost/flow baseline does not alter any element of the SAILS database. On the other hand, virtually every element of the DDSM database influences the cost/flow baseline. This is the first time that "all the pieces come together" to describe the complete logistics network under study. Only those elements of the database that are related to **proposed** entities (new products, facilities, and so on) are irrelevant, because a baseline is a look back into history, not a projection of things to come.