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An OLAP Application for Group Support Systems Empirical Research

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Abstract

OLAP technology is extending the analytical capabilities of business managers and researchers by allowing them to manipulate their data models across many dimensions. A Group Support Systems (GSS) OLAP model is presented which permits the GSS researcher to organize the data into 20 or more dimensions. The OLAP model permits "drilling" down to the author level with nested cross-tab analysis.

Introduction

Sprague [9] suggested that there is a natural advancement of information technology that led from EDP to MIS to the current DSS thrust. In 1980 DSS picked up where MIS left off; today OLAP picks up where DSS left off. The journey continues from DP to EDP to IS/IT to information delivery (ID). OLAP technology is designed to aid the business analyst work with unstructured problems by providing summarized, historical, and subject oriented information in a fast friendly manor [6]. Thomsen's [7] detailed comparison of OLAP, spreadsheets, and SQL databases suggests that OLAP is faster, more effective and more importantly more manageable for the user (also see [3] where an OLAP model is compared to a database model).

The objective of this paper is to present a fully implemented OLAP model for the analysis of GSS experimental research data.

OLAP

OLAP is a class of business software that gives the users access to analytical content such as a time dimension, product analysis, and trend information across other business dimensions. OLAP technology permits users to easily interact (create, analyze, understand, etc.) with business data. This benefit has proven to be very useful for the analytic evaluation of accounting data [8], budgeting, financial data, and even GSS data [3].

OLAP enables the analysts to "slice" and "dice" large amounts of data very quickly. In comparison doing this type of analysis within a spreadsheet or relational database is more time consuming and requires many joins, queries and cross-tab analyses [2].

Business managers think multidimensionally. The questions they ask are: when, who, what, where, and the result. In an OLAP model these questions equate to: time, region or country or person, channel or customer, and the measures [1]. In the GSS model the questions relate to who (independent variables), what (dependent variables) and results. Thus, the OLAP model presents a natural way to

view business information. The analyst is free to manipulate the data in novel ways, in order to derive additional business value [6].

GSS Assessment

Fjermestad and Hiltz [2] presented an assessment of GSS empirical research consisting of 1582 tests of hypotheses from 200 experiments. Their analysis highlighted that drilling deeper into the data yielded very interesting results and that different dimensions have a moderating effect. Experiments with seven to 10 groups per treatment condition working on idea generation tasks and using GSS technology improved from an overall positive effect (GSS > FtF) of 16.6% to 29.0%.

Method

The 20 multidimensional data model is shown in Figure 1. Figure 2 shows a detailed structure for the dependent variable dimension. Note that the lowest level shown in Figure 2 is at the author level (see [2] for the author reference). Further drilling to the experiment level is possible simply by clicking on the + next to 39 or 82.



Figure 1 GSS Dimensions

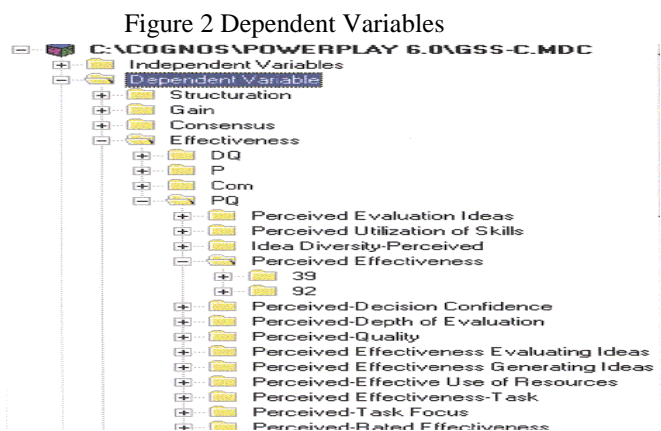


Figure 2 Dependent Variables

Analysis

With the data organized in a multidimensional format it becomes very easy to analyze. Figure 3 shows the total counts for all of the dependent variable categories across the results. The Percent Positive column is the ratio of GSS >FtF counts to the total count less no main effects and interaction columns. By double clicking on the Effectiveness label we are able to drill deeper into the data and get Figure 4. Figure 4 shows the counts and Percent positive ratio for the four effectiveness sub-categories (decision quality, productivity, communication, and perceived quality). The Percent Positive ratio for productivity is 32.22%. This is almost twice as high as the 16.6% baseline ratio for all dependent measures. Drilling even further reveals Figure 5. The Percent Positive ratio for "Number Alternatives" and "Number ideas" is 44.4% and 53.85%, respectively. These results suggest the GSS technology is far superior to FtF when soliciting alternative or ideas from groups.

Figure 6 shows a nested cross-tab (Task dimension with Effectiveness sub-categories cross results counts. The task dimensions represent McGrath's [5] task circumplex. Task types 4- decision making, 3- intellectual and 2- idea generation, are shown.

Conclusion

The objective of this paper was to present a fully implemented GSS-OLAP model which can be used to assess the GSS empirical research data. The results shown here will aid the GSS researcher in designing new systems and experiments.

Acknowledgements

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Figure 3
FtF vs. GSS Assessment Results: Counts for All Experiments on Outcome Factors

| | Total Count | GSS > FtF | GSS = FtF | FtF > GSS | No Main Effects | Interaction | Percent Positive |
|--------------------|-------------|-----------|-----------|-----------|-----------------|-------------|------------------|
| Structuration | 66 | 17 | 6 | 3 | 0 | 13 | 24.00 |
| Gain | 142 | 62 | 14 | 14 | 12 | 40 | 18.00 |
| Consensus | 67 | 30 | 3 | 6 | 3 | 26 | 7.00 |
| Effectiveness | 612 | 239 | 72 | 44 | 10 | 169 | 21.00 |
| Satisfaction | 300 | 133 | 18 | 28 | 39 | 87 | 10.00 |
| Loss | 71 | 26 | 8 | 18 | 0 | 17 | 28.00 |
| Process Variables | 146 | 61 | 18 | 17 | 18 | 33 | 18.75 |
| Usability | 62 | 26 | 1 | 3 | 4 | 9 | 3.45 |
| Process Issues | 44 | 16 | 4 | 8 | 0 | 7 | 14.00 |
| Role Outcomes | 22 | 6 | 2 | 4 | 4 | 7 | 18.18 |
| Efficiency | 97 | 32 | 10 | 28 | 18 | 21 | 17.24 |
| Summary Variables | 9 | 4 | 0 | 2 | 0 | 6 | 0.00 |
| Dependent Variable | 1602 | 628 | 158 | 165 | 193 | 438 | 16.64 |

PowerPlay - [gss-a2.ppt of GSS-C (Explor)]

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Independent Variables Effectiveness Subject Type Design GSS Level Priority Anonymous Leader

Figure 4
FF vs. GSS Assessment Results: Counts for All Experiments on Outcome Factors
Effectiveness Sub-categories

| | Total Count | GSS = FIF | GSS > FIF | FIF > GSS | No Main Effects | Interaction | Percent Positive |
|------------------------|-------------|------------|-----------|-----------|-----------------|-------------|------------------|
| Decision Quality (DQ) | 218 | 91 | 30 | 15 | 27 | 55 | 22.06 |
| Productivity (P) | 187 | 53 | 20 | 8 | 17 | 68 | 32.22 |
| Communication (Com) | 182 | 53 | 11 | 16 | 26 | 56 | 13.75 |
| Perceived Quality (PQ) | 70 | 33 | 3 | 5 | 5 | 24 | 7.32 |
| Effectiveness | 617 | 230 | 73 | 44 | 75 | 195 | 21.04 |

PowerPlay - [gss-a2.ppt of GSS-C (Explor)]

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Independent Variables P Subject Type Design GSS Level Priority Anonymous Leader Primary Task Type

Figure 5
FF vs. GSS Assessment Results: Counts for All Experiments on Outcome Factors
Effectiveness Sub-categories - Productivity

| | Total Count | GSS = FIF | GSS > FIF | FIF > GSS | No Main Effects | Interaction | Percent Positive |
|---------------------------------|-------------|-----------|-----------|-----------|-----------------|-------------|------------------|
| Number Ideas | 49 | 12 | 14 | 0 | 9 | 15 | 63.86 |
| Number Unique Ideas | 36 | 12 | 3 | 1 | 2 | 18 | 18.75 |
| Number Alternatives | 28 | 10 | 8 | 0 | 5 | 5 | 44.44 |
| Depth of Evaluation | 8 | 2 | 1 | 0 | 0 | 4 | 25.00 |
| Number Unique Ideas-Information | 6 | 2 | 2 | 1 | 0 | 1 | 40.00 |
| Productivity | 5 | 1 | 0 | 4 | 0 | 0 | 0.00 |
| Number Alternatives-Solutions | 2 | 2 | 0 | 0 | 0 | 1 | 0.00 |
| Assumption Validity | 3 | 1 | 0 | 0 | 0 | 2 | 0.00 |
| Unique (Highest Rank) | 2 | 1 | 0 | 0 | 0 | 1 | 0.00 |
| Productivity Opportunity | 2 | 1 | 0 | 0 | 0 | 1 | 0.00 |
| Number Ideas Quality (Total) | 2 | 1 | 0 | 0 | 0 | 1 | 0.00 |
| Number Ideas High (Good) | 2 | 0 | 0 | 0 | 0 | 2 | .0 |
| Productivity (P) | 187 | 53 | 20 | 8 | 17 | 68 | 32.22 |

PowerPlay - [gss-a2.ppt of GSS-C (Explor)]

File Edit View Insert Explore Format Tools Window Help

Independent Variables Effectiveness Subject Type Design GSS Level Priority Anonymous Leader Primary Task Type

Figure 6
FF vs. GSS Assessment Results: Counts for All Experiments on Outcome Factors
Number Corrected Task Type by Effectiveness Sub-categories

| | Total Count | GSS = FIF | GSS > FIF | FIF > GSS | No Main Effects | Interaction | Percent Positive |
|------------------------|-------------|-----------|-----------|-----------|-----------------|-------------|------------------|
| 4 Productivity (P) | 38 | 12 | 8 | 2 | 7 | 9 | 38.38 |
| Perceived Quality (PQ) | 33 | 16 | 3 | 2 | 1 | 11 | 14.29 |
| Decision Quality (DQ) | 60 | 28 | 17 | 6 | 10 | 19 | 33.33 |
| Communication (Com) | 63 | 16 | 6 | 7 | 21 | 11 | 26.81 |
| Effectiveness | 214 | 72 | 28 | 17 | 39 | 50 | 28.00 |
| 3 Productivity (P) | 29 | 11 | 3 | 8 | 0 | 10 | 14.79 |
| Perceived Quality (PQ) | 2 | 0 | 0 | 1 | 0 | 1 | 0.00 |
| Decision Quality (DQ) | 50 | 28 | 3 | 8 | 3 | 10 | 9.11 |
| Communication (Com) | 33 | 6 | 3 | 6 | 0 | 11 | 16.67 |
| Effectiveness | 104 | 46 | 6 | 18 | 3 | 32 | 11.99 |
| 2 Productivity (P) | 88 | 30 | 17 | 1 | 10 | 41 | 35.42 |
| Perceived Quality (PQ) | 28 | 16 | 6 | 1 | 1 | 11 | 0.00 |
| Decision Quality (DQ) | 67 | 28 | 7 | 1 | 9 | 22 | 19.44 |