

COMPUTER-AIDED INNOVATION (CAI) SOFTWARE APPLIED TO VALUE MANAGEMENT

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ABSTRACT

TechOptimizer™ is a leading CAI software package designed specifically by and for inventors and innovators. This paper and presentation will show how CAI can make significant contributions to Value efforts. The Invention Machine correlates with a typical Value Management Job Plan. It is designed for individual use by engineers and scientists, and as an effective interactive team tool. Running in Windows 95 or NT, it is easy to integrate with other applications and local networks. Unique and powerful Function Analysis and reporting tools are included. CAI is doing for the innovation process what CAD has done for the design process.

INTRODUCTION

The presentation of this paper will best be made by using computer images on a large screen. This will provide a live demonstration of the Invention Machine CAI software, and its ease of integration with user specific requirements and applications.

Value Management (VM) will be used as a term implying the use of a typical Value Job (or Work) Plan, including Value Engineering, Analysis, Control, and of etc.

The objective of this paper is to demonstrate how the Invention Machine software and knowledge bases do the following.

- a. significantly increases value
- b. provide an unparalleled knowledge base
- c. produce competitive concepts in less time
- d. effective as an individual or interactive group effort

The format will be to highlight those things that are similar to VM, and to elaborate on the value of those that are different.

The TechOptimizer™ correlates directly with a typical VM Job Plan.

This parallel compatibility will be shown in the order of a typical VE Job Plan.

COMPUTER AIDED INNOVATION (CAI)

The TechOptimizer™ CAI methodology is partially based on the Theory of Inventive Problem Solving (TIPS or Russian acronym TRIZ), developed 50 years ago in the former USSR.

New and refined methodology as well as user friendly software provides the opportunity to integrate this with Value Engineering and all other function based processes.

CAI was designed by engineers and scientists to significantly improve individual effectiveness. The CAI software is also a very effective interactive team tool.

VALUE ENGINEERING (VE)

VE has also been refined since its inception 50 years ago in the United States. Value Engineering (VE) will be used as a term implying the use of a typical Value Job Plan (or Work Plan) regardless of when or where it is used (VA, VM, VC, etc.).

Value is the ratio of the sum of the benefits divided by resources; most commonly, Value = Function / Cost. The value elements are gathered by identifying and quantifying benefits derived from an effort (in terms of functions), as well as the resources required for achieving those functions (time, money, facilities, people, equipment, etc.).

A typical VE Job Plan provides tools and methodologies for identifying, quantifying, maximizing, monitoring and controlling value.

1. Information Gathering, Sharing & Agreement
2. Function Analysis (sometimes included in 1)
3. Creation & Discovery of new possibilities
4. Evaluation & Development
5. Recommendation & Implementation
6. Continuous Improvement (repeat 1 through 5)

The most dramatic advancements are achieved when the VE Job Plan is followed by a cross function group, with a well-defined scope and objective, in a concentrated period of time.

The VE Job Plan can be applied to product, process, procedural, policy, and organizational issues.

THE CORRELATION BETWEEN CAI AND VE

1. INFORMATION GATHERING, SHARING & AGREEMENT

This phase of the VE Job Plan typically creates the following output for each specific project.

- Title
- Description
- Scope
- Objective and Goals
- Expectations, Wants, Needs
- Reason
- Logistics (how, when, where, who. etc.)
- List of required information, its availability and who has it.

The TechOptimizer™ CAI software “Project Data” section provides for most of the above VE output.

Objective and expectation output is enhanced. Each objective or expectation is listed as a specific parameter with its current quantity, desired quantity and relative ranking with respect to other objectives and expectations.

Limitations are added to the output and are identified with the same detail as the objectives.

Scope output is greatly enhanced. By integrating function with components and interfaces, a total systems approach clearly identifies the scope of a project.

The TechOptimizer™ CAI software does not contribute to some of the Logistics or List of information. This can be handled by an underlying generic program of the user’s choice (Excel, 1-2-3, etc.).

2. FUNCTION ANALYSIS

This phase of the VE Job Plan typically creates a clear definition of functions and their relationship with each other. This significantly enhances the understanding and focus of the project for team members, attributers and project benefactors.

The TechOptimizer™ CAI software “Function Model” section provides many advantages over most VE Function Models and can totally replace them.

Verb-noun descriptions are used. The function diagram is programmed to be very manageable and user friendly. It is much easier to learn and use than most current VE function models.

Functions are ranked based on their proximity to a basic function, their cost, associated potential problems and whether their function is useful or harmful. The dynamics and parameters of a function can also be identified, quantified and recorded.

Harmful, unnecessary and lower ranked functions are recommended for trimming.

3. CREATION & DISCOVERY OF NEW POSSIBILITIES

This phase (along with the Function phase) of the VE Job Plan is the greatest benefactors of the TechOptimizer™ CAI software.

- The core TechOptimizer Module includes the trimming option during the function phase, which is a significant contributor to generating new alternatives. The trimming option recommends eliminating or combining components or transferring functions to other components.
- The Effects Module provides over 2000 engineering and scientific effects with illustrations and descriptions. These can be selected based on desired function requirements.
- The Principles Module is used to solve engineering contradictions and conflicts, and is based on the evaluation of over 2.5 million

patents. Like Effects, illustrations and descriptions are provided.

- The Prediction Module can clearly define future directions of scientific innovation, allowing users to stay ahead of competition, and advance their own plans and visions.
- The Feature Transfer Module provides a powerful mechanism for combining specific features of alternative solutions into one single, innovative solution.

The effect of this section of the TechOptimizer™ CAI software is the same as having a virtual cross functional team, expanding available knowledge and experience by several orders of magnitude.

Ideas from traditional sources can be recorded along with those recommend by the TechOptimizer™ CAI software.

4. EVALUATION & DEVELOPMENT

The TechOptimizer™ CAI software integrates some very sophisticated evaluation and development tools in the 5 modules shown above. The results of which are presented to the user for a decision to accept, reject or alter the TechOptimizer™ CAI software recommendations.

An underlying generic program of the user's choice can handle specific VE or organizational evaluation tools, such as Value calculations, records and comparisons.

5. RECOMMENDATION & MPLEMENTATION

The TechOptimizer™ CAI software's report generator is in Rich Text Format (RTF). This format allows for integration into other applications and therefore provides easy communication with others.

Value elements and calculations should be monitored during the implementation period.

6. CONTINUOUS IMPROVEMENT (REPEAT 1 THROUGH 5)

The VE Job Plan and TechOptimizer™ CAI software can be used during all life cycle stages of a product, process, procedure or organization (from concept through development, implementation, continuous use and termination).

CONCLUSION

The combination of CAI software and methodology provided by TechOptimizer™ and Value Engineering methodology can contribute to accelerated commercial and technical advancements.

The TechOptimizer™ CAI software and methodology provides the method to accelerate technological advancement by shortening the discovery and evaluation process.

The VE methodology provides the method to accelerate commercial advancement. This is accomplished by focusing on, and quantifying, the best overall value impact for all parties affected by the results (regardless of the number or complexity or alternatives). This, in turn, allows for confident decisions. The same information used for making the initial decisions can be used for monitoring during implementation and continuos operations.

REFERENCES

1. Harris, R., Zaal, G., & Ikovento, S., "Accelerated Technical & Commercial Advancement Using Computer-Aided Innovation (CAI) and Value Engineering (VE)", *SAE 1998 International Conference*, paper #981180.

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