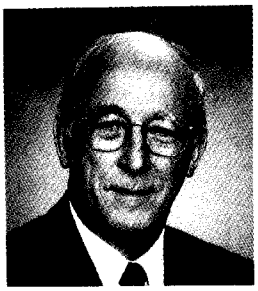
VALUE ANALYSIS AND SYSTEMS
VA/VE: iS IT APPLICABLE TO SYSTEMS? IS IT REINGINEERING:



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ABSTRACT

I wish to demonstrate that VA/VE can be applied successfully to systems development and optimization. Case studies are used to support this assertion. Also, I have developed over many years of practice a nine step VA job plan. The job plan description is a major topic in this paper.

With the evolution of VA/VE from product analysis to construction VE, working on concrete applications, down to earth professionals like us engineers, financial persons, technicians, cost accountants, we have found so much fulfillment in those applications of VE that we may not have been very quick to look at other not so concrete applications of VA/VE. One striking sign of this is the emergence of "Reengineering" completely outside of the VA/VE circles of SAVE as well as of other VA associations.

Was it really something new? Was Reengineering a kind of VA? Attendants at the 1995 SAVE Annual Conference workshop on the subject, among them many of the best minds of the association, came to the same conclusion with a striking unanimity: Reengineering is in our realm.

Indeed, analyzing functions is so basic to human activity that we often do it many times in a day before taking very simple decisions of life. However, when it comes to rationalizing, VA comes so naturally, that one can listen to respected authorities in subjects like strategic planning or systems engineering talking for hours about most of the favorite VA/VE subjects without ever hearing the simple two "VA" or "VE"! Why is that? Are simple value concepts not applicable to systems? Or is it that VA methodology must be modified substantially to suit systems analysis?

I would like to demonstrate here, that one can follow exactly the basic five step work plan or an expansion of it, like the one we have developed over years of applications, and succeed beautifully to develop and implement optimized manual as well as automated systems.

SYSTEMS (WHAT ARE THEY REALLY ?)

VA/VE has moved more naturally to industrial process analysis since industrial processes are the ways and means of making a hand-on product. We have learned well to analyze and optimize products. Applying the same technique and putting the emphasis on the tools to produce the "thing" rather than the "thing" itself yields almost a new tool to work with.

The "system" concept is fundamental to understand our world. Indeed, is it not true that many products are, in fact, assemblies of various parts of different nature or "arrangements of things working together". Are they not kinds of "organizations" i.e. arrangements of organs much like in the human body. Is an industrial process not a kind of system: in other words, an organization, "an arrangement of things working together" towards a precise goal: the product?

Now, if this product is intangible like "information", do we not still have an arrangement of means working together to reach a common goal : that of receiving raw information, treating it, transforming it, and making it more usable for a person : the customer?

Products, industrial processes, information systems, management processes, are they not all systems of some kind?

If we accept this view, then we can develop a common approach to a large variety of VA. All man made systems must serve a purpose: that of fulfilling a user need. Fulfilling a user need, having a function, rendering a service is the positive part of having "value". Of course, the other part is the negative aspect of value i.e. the price to be paid to fulfill this need (every good thing has a price).

The most widely spread non-material product of man made systems is information that in fact is the most valuable product of human minds. In some instances, it can become priceless. On the other hand, if uncontrolled, it proliferates becomes redundant and useless. Therefore, we organize it into systems, we organize ourselves and our tools to produce it. Unfortunately this is all too often done by trial and error, by many individuals often over years of evolution in some older firms. The result is that these information handlings are often complex and less than efficient.

Until very recently, organizations used to manage information entirely using manual tools like pencils, pens and paper. Of course the advent of computers changed that and large parts of our present systems are now treated on computers. But, an amazingly important part of our information is still handled manually and requires the intervention of a human hand. Also, to reach the user, there must be a human interface of some kind at least at the output side. The input also comes from a person even if remotely. Therefore, one can say that all systems are composed of three parts:

Input side:	manual systems
Treatment :	manual or computer aided
Output side :	manual systems to end user

This is the basis for establishing the scope of a potential analysis: should we analyze all the operation, or only the manual parts, or only the computer based parts? Where does the system start, where does it finish? This, the scope of the analysis that will be covered by the systems' diagrams.

However, the user can never be ignored and must be clearly identified not forgetting that in large systems, intermediate users are found at all stages of information treatment. Intermediate users also act as producers of input to the next system until a large web of small systems is created into an often a very large overall system. That is why one can always say that a product (tangible or intangible) if useful, is part of a larger system that in turn must fulfill some need. If not, it will be discarded.

The traditional way of analyzing systems was to immediately look at the architecture and the components in an effort to understand the mechanism. This way one became very proficient at developing means of doing "things", even the most difficult. The challenge was so great that we became obsessed by the tools and without cease we found huge sums of money towards this objective. Such examples are the evolution of computer languages from COBOL, Fortran to C++, high level languages, complex shell, LANs, and now INTERNET. Expert systems are developing at an increased pace and telecommunications now add a new dimension to an already overactive field. However, the computer persons seldom have concentrated really on the goal of all this activity: truly the needs of the end users.

A major hydro electric company's computer department has developed a systematic approach to what they call "Feasibility Study" and they apply it before designing and developing all computer systems. Their sequence of actions is named as follows:

1. FUNCTIONS ANALYSIS
2. EXAMINATION OF PRESENT SITUATION
3. TECHNOLOGY SELECTION
4. PROPOSED SCENARIO
5. EXPECTED BENEFITS
6. COSTING
7. RECOMMENDATIONS

This enumeration speaks for itself. This organization does start by making the right step, that of first doing a function analysis. This is therefore essentially a VA because function analysis is the essence of VA, no matter how you do it. Therefore, not only is VA applicable to systems development, it is already applied as part of standard practice by this big organization, even though they have not been able to identify it as VA.

FUNCTION ANALYSIS

Admitting that function analysis is the proper way to start a systems analysis, why then not do all the work using this methodology? The basic five step

work plan 1. Planning 2. Information 3. Creativity 4. Evaluation 5. Implementation has been in use for many years and has been varied in many ways. By adding what we viewed as an indispensable step at the beginning (Market identification and review), another one towards the end (Implementation of solutions), and by defining precisely the steps made to examine the systems components respond to the needed functions, over the years, we have developed our 9 step workplan for all process analysis. It is expressed as follows:

Step 1 Preparation of the analysis

In this first part of the analysis, the client's characteristics and all available key information is gathered. Such information as his financial statements, organization chart, applicable standards, available cost plans, previous study reports are sought for a start. Team members are selected and a tentative schedule is established.

Step 2 The product and its market

First, a definition is made of what is considered as the main product of the system and which to guide the team members through the system's modules. For systems, this product is always under the form of a piece of information. For example, in an insurance company, it could be the insurance policy. Then the users of this product, considered as the clients of the system, are identified, numbered and qualified. Information such as the number of usages per unit time are found and evaluated. If the system's market is identified clearly and of the sufficient size, the team carries on with the system's analysis.

Step 3 Function analysis

In this part of the analysis, all the functions of the system are identified and represented on a FAST diagram. Each constraint is also identified and represented on a FAST diagram, if required. Then each is analyzed individually and qualified to decide if it is necessary. Two words are used.

Step 4 Main system's product analysis as an output of the process

The end is then examined from the point of view of its raw input material (still under the form of information), the output of the system and the transformations brought to the input by the system's action.

Step 5 Detailed analysis of the process

The system currently in use is then broken into its parts by process mapping techniques; manual and automated parts are identified and examined in detail, costed and related to the accepted functions and constraints. Any part that is not required to fulfill a needed function or to satisfy a constraint is considered as suspect. A clear cost reduction objective is derived from this analysis.

Step 6 Creativity

The above steps are not only good analysis discipline, they are also very stimulating for new ideas. All those are carefully recorded for later use. So at this stage we already have a sizable number of ideas. A formal brainstorming session is now made to assure that all possibilities have been fully exploited. All ideas are analyzed and selected in the usual manner and possible improvements are defined.

Step 7 Analysis of proposed solutions

Proposed solutions are very clearly expressed and with the known techniques of financial analysis they are ranked, validated and evaluated for implementation in the short, medium or long term.

Step 8 Implementation of improvements

Definite recommendations are prepared and the final report is written in a draft form, reviewed with the workteam to assure unanimity. Proposed improvements may already have been partially implemented at this stage. An implementation program of all recommendations is designed.

Step 9 Final evaluation

A review is made of the objectives first agreed on at the beginning of the analysis. The value of the proposed system is evaluated as compared to the initial one and the report is finalized.

Earlier studies were performed inhouse without Market survey (Step 2). It was later found in other commercial applications that this factor is all too often completely overlooked. Indeed, if the intended

user/client of the information produced by the system is not identified clearly, the analysis is superfluous as the need of the system's output product cannot be proved. Not until the last decade did we add this essential step to our standard work plan. The implementation follow-up step was also added later because we saw too many analysis recommendations shelved or half implemented. The inclusion of this additional step solved the problem.

CASES: THE FINE PAPER DISTRIBUTOR

At the beginning of this project, all the operations of the company were done with manual systems that had evolved over the previous 40 years of a very successful operation. Financial statements were prepared by hand and the balance sheet was still written with ink and pen. This was in 1974 ... When the project was finally completed three years later, all the operation had been computerized and handling some 7000 different products on a day to day basis. To implement this major change, the methodology of VA was followed as time conditions permitted, department by department.

Function analysis with a full bodied work group was conducted several times in the first months. The team included the General Manager, the Sales Manager, the Lead inside Orders Taker, the Purchasing Manager, the Inventory Control Manager and the Warehouse Manager. Subgroups were formed as needed in each department to analyze specifics of each operation, create more innovative approaches and develop solutions.

The first department that was tackled was inside sales. Workshops conducted with sales manager, key salespeople, dispatcher and inventory manager indicated that orders had to be taken very quickly over 3 short periods of time during the day and that stocks had to be clearly and quickly identified. A new item numbering system had to be developed to this end. Also, it had to be the basis for the automation of the whole system.

Coding was found much more complex than it can be thought at first glance. To optimize this, creativity session were held many times and using this technique, a final solution was found and implemented. It consisted in a series of letters and figures permitting initiated salesmen and order takers to remember them easily and moreover that could be easily handled by on-line computer system. This became the basis for all the interrelated systems of the company.

The computerized system needed to satisfy (only) the required functions was charted with an analyst-programmer in enough detail so that she could code all the required software as per our request. The first one prepared was the inside order entry with the objective of later operating in a real time mode. The order picking document was combined with the invoice, eliminating half a dozen copies that were previously handled by hand. At the onset, only the inventory in stock quantities were deducted. The programs were first tested and validated again with the workgroup. After all the final corrections met all the requests of the work group, the first module of the system was started and ran successfully for two months.

During this period, the inventory stock locations were put in order, all stock items were coded and registered, obsolete stocks were sold at a discount and dead stocks were disposed of under the direction of the inventory manager and of the purchasing manager. This allowed to finalize a more than 90 % accurate inventory file.

Concurrently, minimums, maximums reorder point and reorder formula were defined by the purchasing manager's staff and entered on file by an exceptionally fast data entry clerk (25,000 - 30,000 characters per hour with absolutely no error!). Soon, stock purchase orders were prepared automatically.

In both modules, the data processing was devised again using workteam and the VA approach. Training and implementation was controlled during the implementation by the participants in the VA workteam. The result was immediate: much faster and better customer service, and reduced inventory. As a consequence, the firm's profitability, which was already very good, improved again.

The same methodology and the same pattern was followed to install a fully automated accounting system to replace the manual system. At the beginning, the system was a semi-batch system which permitted to clean all the entries and close the books without corrections in the first five working days of the month. This objective was fully attained on the third month-end. Considering the thousands of fast transactions carried each month, sales, returns, cancellations, exchanges etc, this was considered an exceptional achievement in the trade.

The last system module tackled was the order preparing and routes dispatching which were completed later by the client.

Was it reengineering of this corporation? Most probably, and using VA full time for many months. Was it successful? It was considered a model by the local industry and competitors made offers to buy the system. Undoubtedly, the information system's value i.e. service rendered/price paid was increased manifolds to the greatest satisfaction of the company's owners.

REAL ESTATE INVENTORY SYSTEM

A more very recent case of system VA concerns the analysis of Hydro-Quebec's real estate inventory system. This 17-year old computer based system was partially automated to control $5.6 Billion of real estate covering all its distribution network.

The previous system was fed by information coming from a dozen of interrelated automated and manual systems. Same data were often captured several times. It had to respond to requests coming from all over the hundreds of different departments of the company, all over the country in addition to requests from outside government services, notaries, attorneys at law, surveyors and many other groups. Continuously, it has to provide justifications for claims of ownership. It was a very important system for the company.

A new law was passed by the provincial government last year to recode all pieces of land according to a new numbering system. In its present form the real estate inventory system is already considered obsolete and certainly cannot cope with this new pressure. A very short of time is given to respond. There is an acute need to keep a record of correspondence between the old and the new numbers at least for several months.

VA was performed following systematically the above mentioned steps with a workgroup composed of the following persons:

- one computer software specialist
- one real estate management section chief - western div.
- one chartered appraiser - eastern division
- one real estate analyst - western division
- one real estate surveyor - eastern division
- one real estate manager - western division

Two inside specialists were also asked to participate at two workshops for specialized computer systems analysis.

The study was completed in two separate phases over a period of 5 months. It resulted in a wealth of precious informations contained hundreds of pages of workshop reports. In addition, pages of reference information were gathered during the workshops and bound for later use by the client. The final report was endorsed unanimously by all the team members at the final meeting. All recommendations were accepted by top management immediately and are now being implemented. As a result, a new computer system will be fully developed to respond to the government register of land reform and a three year program for revamping a web of related systems.

Millions of dollars will be saved, the need to comply with the law will be fulfilled and the system will be immensely more convivial.

These are two examples, at very different periods clearly demonstrating that VA/VE can be used successfully on systems.

ISO 9000 AND VA

This article should not be complete without a word about VA/VE and its application to ISO 9000 registration movement worldwide. This is another case of the need for VA/VE specialists to be present and actively bring our discipline to the organizations who are preparing to face the registrar requirements. The strong movement for compliance to international norms calls for major review of many organizations' functions in order to set quality standards that must be met. We believe that VA can be used very comfortably to prepare organizations for ISO 9000 standards compliance if it is conceived as simple information processing process, a system. This is a field to be further explored.