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EDITORIAL

Dr. Derek S. Thomson

After a short delay, I am delighted to bring you another retrospective issue of Value World. In this issue, we present selected papers which have been identified by the Value World editorial board as key contributions to the recent development of our discipline. In the last issue of Value World we presented historical papers from the roots of our discipline, authored forty years ago. At that time, we were excited by the principles of our new knowledge and were just beginning to realise the opportunities for its application through new methods. In the papers presented in this edition of Value World - authored some twenty years later - we had become more sophisticated in our understanding we were beginning to appreciate the nuances of its application. This raises the questions: Where are we now as a discipline? How would we characterise the state of our knowledge and its application? What are doing to ensure that it is not stagnating?

In his 1992 paper, Charles Bytheway shares the heuristic uses in function analysis workshops to both facilitate the definition of a problem among a group of stakeholders and to help himself understand that problem from the perspective of each stakeholder. He describes how he has been intuitively placing himself in the role of each stakeholder to help understand the problem from their perspective. In today’s context, Charles’ paper raises several key questions, including: What other heuristics are currently being applied to value studies? How can we characterise them and share them among our community? How would their characterisation help move our understanding and the practice of our discipline onwards?

In her 1995 paper, Julia Dale reminds us that stakeholders view the same problem differently. She highlights the need to remain mindful of each stakeholder’s differing view and highlights that, because of these differing views, each stakeholder has a different understanding of value. Julia’s paper is an important reminder of the need to understand everyone to understand value and she reminds us of that every stakeholder – not just the client – has a voice when defining value. She emphasises that reliance on systematic methods alone will not necessarily yield an appropriate result. Today, we must ask ourselves if we routinely address these “soft” issues and, if so, how? How does today’s facilitator negotiate stakeholder relationships to ensure that the most appropriate perspectives on value are addressed? Do we routinely take a broad approach and explore the problem environment and its stakeholders before applying analytical methods? What project experiences and methods can we share with our peers to help each other address the social complexity of multi-stakeholder projects? All these issues raised by Julia remain timely and pertinent today.

In her 1992 paper, Rosemary Fraser provides a key insight into the nature of the groups we are responsible for facilitating. She shares with us two competing theories of group function and helps us to understand that group performance varies according to the type of task they are set. By opening the door to this knowledge, Rosemary signalled a key influence on the development of our field. In concluding with a call for research into the influence of group structure on the deployment of VS studies, Rosemary commented “very little evidence has been documented regarding the interaction of group process variables and group outcomes in VM.” We must now must ask ourselves what we have done, as a discipline, in response to this observation? How can we move forward by routinely sharing our practices and insights into group function so that we can build a community of knowledge in which we understand more than our formal, structured processes?

In his 1995 paper, William Lenzer draws linkages between the Miles’ function based definition of value and Edelman’s suggestion that we each have a biological “imprint” of value that ensures we perceive activities that benefit ourselves as being worthwhile. In doing so, he highlights the importance of semantics and significant contribution that verb-noun functional definitions in helping groups to reach a common understanding. William concludes his paper with a call for experimental clarification of this linkage and associated investigation into cognition.

In the overview above I have asked many questions but have presented no answers. Just like each of you I have my own opinions and experiences to draw on for answers, but they are no more relevant than anyone else’s. However, what I can do is offer Value World as a forum in which you can share opinions and debate both our theory and practice. We must consider how, in a retrospective issue of Value World compiled twenty years from now, we would want our concerns today to be characterised. If things are not as we would hope, we must each contribute to the debate that is required to change them.

I therefore call for each of you to consider Value World as an opportunity to share your point of view with the community. If each of you were to submit one contribution (or a response to a previous contribution) each year, we would enjoy a healthy, interesting and useful dialogue.

At Value World we welcome many different kinds of paper. You might wish discuss or explore an aspect of theory or practice, you might wish to analyse your experiences or workshop data to draw generic insights, you might wish to review or comment upon the work or publication of someone else, or you might want to present a case study of your own work. The submission process is by blind reviewing and – due to the diligence of the Editorial Board members – is free from bias. We always provide positive feedback to authors and do whatever we can to help them ensure their submissions meet the Journal’s quality standards. Although we have a maximum paper length (5,000 words), there is no minimum length. For instructions, please visit the Journal’s website at http://www.value-eng.org/catalog_valueworld.php or contact me directly at d.s.thomson@lboro.ac.uk
FAST: An Intuitive Thinking Technique

Charles W. Bytheway, CVS

Originally published in 1992

Abstract
This paper tells how intuitive thinking was responsible for the development of the FAST Diagramming Technique.

Accepting the Challenge
It has been 27 years since I presented my first paper on FAST Diagramming in Boston. I will try to shed some additional light on this subject today. The initial seeds for FAST Diagramming were planted in 1960 while attending the first university offered course on Value Engineering (VE) at UCLA. During the course Ed Heller made a presentation on Function Analysis. His explanation of the verb-noun method of expressing functions developed by Larry Miles made a presentation on Function Analysis. His explanation of the verb-noun method of expressing functions developed by Larry Miles was fascinating. It sparked within me a seemingly unlimited amount of creativity and understanding.

During the next three or four years this new method of identifying functions using a verb and a noun became part of my life. I soon discovered I could isolate the basic function by asking this question. "If I didn’t have to perform the function I’ve selected would I still have to perform any of the other functions listed?" If the answer was no, then I knew I had identified the basic function. This method of analysis soon caused me to ask other questions about each of the other functions, such as "Why must this function be performed?" and "How is this function actually performed or to be performed?"

One day when an instructor working with another team failed to have the same degree of success as I enjoyed, I was invited to assist him. Within a few minutes we had lots of ideas, one of which appeared to be patentable. A day or two later, my boss, C. S. Gray, said to me “Whatever you’re doing, it works for you, but it won’t work for anyone else because no one else knows what you are doing different.” Then he said, “Why don’t you try putting down on paper what you do and how you think?” Frankly, I thought myself to perform. I evaluated what each team member said to determine if any new insight was provided by their responses. Frequently I would answer the question myself because my in-depth evaluation sparked an innovative answer. I would continue the question interrogation until I had obtained additional insight into the subject under investigation.

The Secret
What I’m going to tell you now is what I was doing for years without knowing it. I discovered it purely by accident with the help of a nice young lady. In 1972 Dick Park invited me to participate in the SAVE North Central Regional Conference at Troy, Michigan, which was sponsored by the Detroit Metropolitan Chapter. It was basically a conference on FAST Diagramming. Several of the attendees requested a demonstration of how I applied my own technique, and I consented. We discussed the high jacking problem which was of major concern to everyone who flew on the airlines in those days.

I interrogated the participants with my “Thought Provoking Questions.” As different people responded, I recorded their verb-noun answers. I evaluated whether their responses provided new insight into the problem as I had been doing for years. After several attempts to obtain a creative response either from me or from the audience, I intuitively went back to a function I had investigated earlier. Once again I was showered with responses. One of those responses excited my understanding so I told the group a particular answer was the answer I was after.

Suddenly a young lady, Donna Rogers, spoke up and said, “How come you like that answer now when five minutes ago you didn’t like it?” I replied, “I’m now president of the airlines; before I was a passenger on the hijacked plane.” At that very moment I realized I had been switching roles to stimulate understanding and creativity within myself without even knowing it. It appears, every time I couldn’t increase my understanding of the subject at hand when analyzing a given function, I intuitively switched roles. I think I was doing what Charles Kettering did when he discovered a new hydro-carbon. He pretended, according to his writings, that he was a molecule of gasoline being forced through an intake valve or being compressed by a piston.

I don’t think it makes any difference whether the role switching is done intuitively or is planned as Mr. Kettering suggested. I do, however, think that FAST Diagramming is much more productive if different roles are played by each team member as they unitely analyze functions.

Now I want to impress upon you that this interrogation for a non-obvious answer required considerable thinking on my part and often left me exhausted because of the in-depth thinking I forced myself to perform. I evaluated what each team member said to determine if any new insight was provided by their responses. Frequently I would answer the question myself because my in-depth evaluation sparked an innovative answer. I would continue the question interrogation until I had obtained additional insight into the subject under investigation.

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When team members don’t know the roles being played by other members, the more likely there will exist a disagreement on the answers to the Thought Provoking Questions. This type of disagree-
ment forces the participants to discuss their answers in greater detail. As they do so, each person in the group adapts what is said to the role he or she is playing. This is the ideal situation for expanding understanding and stimulating creativity. It allows the team to explore all facets of a problem in just a few minutes which, otherwise, might take hours to accomplish.

Several years ago I tried to write a book on FAST Diagramming. I never completed the book because I realized my method was completely different from everyone else’s method. Not only that, I’ve never been able to teach anyone how to do it the way I do it. Perhaps my explanation today will help a few of you to try it my way, as Frank Sinatra would put it.

I use the process for developing the diagram as a creativity tool rather than a tool to organize functions. Oh, the diagram organizes functions alright, but the only reason I organize more functions is to stimulate more creativity and understanding. The diagram is just the outgrowth of this activity. Let me illustrate what I mean.

**My Creative Approach**

Whenever I lead a team in developing a FAST Diagram, I look for functions which stimulate my creativity; therefore I mentally screen the functions recorded as team members respond to the Thought-Provoking Questions. As soon as a function stimulates my creativity, I immediately stop the function analysis effort and ask the team members to brainstorm different ways of performing that particular function.

Whenever a person describes how to perform a function that has been identified by a verb and a noun, I believe, he or she intuitively picks a role to play without realizing it, just as I had been doing for years. The role they pick is based on a wide variety of factors. Their experience, education, interpretation of the meaning of the verb-noun, position, responsibility, past experience, plus many other factors all affect the role a person ends up playing.

Some people become irritated when I ask them these simple function oriented questions, especially if they are skilled in the field we are discussing. Their usual response to me is, “Just tell us what answer you want.” This is a natural response because I repeat the question over and over again until their response stimulates my thinking. I frequently say to them, “It’s not what I’m looking for, but what you should be looking for.” If they are not forcing themselves to perform in-depth thinking, then they fail to transform themselves into that “molecule of gasoline” as Kettering would put it, there is no mental motivation to intuitively switch into a different role.

Years ago while I was conducting a seminar at Sperry Phoenix, a gyroscope engineer, who was assigned to work with our team, got frustrated and asked to be taken off the project. I think frustration occurred because I told him we were going to develop some new concepts in gyro design. To which he responded, “Do you know that there are only about a hundred people in the world that really understand gyros? And you think we’re going to develop something new?” I responded by saying “That’s right!”

The next day I was asked if I would accept a replacement on the team. I said, “No! We got this fellow half oriented already, and he doesn’t even know it.” As our team met that day he complained and said he was forced to go along with our silly game. Within a half hour this engineer was up at the board modifying someone else’s concept. He became so enthused about this new concept within just a few days that he came in on his own time and made drawings of it. Five new gyro concepts were developed in just a few weeks using this approach. Sperry wouldn’t allow me to publish a paper on our results because they considered the concepts to be proprietary.

If you can get the team members to respond with any answer that comes to their minds, their intuitive roles will eventually become activated. Once these roles have been activated, the opportunity for creativity is at its highest level. If I, during the function analysis investigation, become creatively stimulated by a particular function, then I must be the one who tells how else we can perform that function. If someone else is creatively motivated then they should tell how to perform it.

You see when I describe how to perform a function in the role I am playing, other members of the team adapt what I say to the role they are playing. They think they know what I am saying, but if they are playing a different role than I am, then what I say doesn’t quite fit. As they try to comprehend my concept, they adapt my description to the role they intuitively selected.

This means they have an entirely new concept which is different than the one I just described to them. They, in turn, should be asked to explain how they think I proposed to do it. I and the other team members now adapt what this other member says to fit the roles we are still playing. The result may be the development of several new ideas or concepts. At the very least, a broader understanding of the subject will be acquired.

If a member of the team fails to respond with any suggestions or with his own description of how he would perform the function, then that individual should be asked to explain one of the concepts presented by someone else. This way you are able to capitalize on every member’s intuitive role and creative abilities. Invariably, he will modify or add to the concept presented by someone else because of the role he is playing. Hitch-hiking or modifying other people’s expressions to fit the various roles of team members can, within minutes, yield several new concepts or ideas.

Once creativity has been spent on the function under consideration and all ideas and concepts have been recorded, then I ask the team leader ask one or more of the Thought Provoking Questions of one of the other functions listed. Each time a spark of creativity raises it head, we run with it. In each instance a dialogue and sometimes an extensive discussion occurs. After all functions have been analyzed and new ideas and concepts have been recorded, then the team works together as they analyze, modify, develop and select those ideas and concepts which are practical and suitable for implementation.

As soon as these tasks have been completed, I ask the team members to agree on the functions that should be used on the FAST Diagram. At this point we have most of our solutions and some semblance of a diagram. We have not attempted to get agreement on what the diagram should look like. When the How-Why Logic is checked with the adjoining functions and the semantics of verb-noun expressions are agreed upon, other spurts of creativity generally occur.

As agreement on the semantics of functions is achieved, team
member yield up their intuitive roles to the role of the project. At this point, everyone on the team should understand completely the scope of the project. What is proposed; what each function on the diagram means with respect to the project role. How each function is to be accomplished, and why it is necessary for all functions to be performed in the manner specified.

By looking at a completed diagram, you should realize that “You will never find a function which doesn’t have a higher level function, and the only reason a lower level function exists is because its higher level function caused it to come into being.” This is a quote from my 1965 paper. Once a higher level function goes out of ‘scope’, we discontinue our analysis of it.

This next quote from the same article is just as important and is equally applicable to non-hardware type functions. “We discovered that the basic functions of lower level parts and assemblies came into existence whenever the method selected to perform some higher level function was agreed upon.”

You might want to ponder these two statements because both of them play an important role in the success of any VE project.

I trust this brief explanation of how this technique was developed and how I use the procedure to stimulate creativity may open new doors for you.

I have listed seven articles as references. If you desire reprints of them, then make your requests known to SAVE and, perhaps, they will publish them in future issues of Value World.

Bibliography
Third Party Value

Julia E. S. Dale, BA, BArch, MA, Reg Arch
Originally published in 1995

Abstract
This paper examines the need for the Value Specialist to fully understand the meaning of “Value” in the broadest context. Through case study analysis the aim is to show that it is no longer sufficient to limit the determination of Value to the two traditional parties, namely the Client and the Customer.

Introduction
Whilst it is appreciated that there are subtle differences between Value Analysis (VA), Value Engineering (VE) and Value Management (VM), by implication alone they are all concerned with “value.” This is the unequivocal common denominator. It follows that any Value Specialist or consultant who practices VA/VE/VM must be an authority in the specific field of Value above all else. Yet consultants offering other management skills such as TQM, BPR, Quality Circles etc. would argue that whilst for example, Quality may be the main parameter of an exercise, their methods will also produce better Value. So what extra ingredient does the Value Specialist add to merit such an authoritative title? because, if the ‘value’ provided is not greater than that achieved by the other methods, then either our nomenclature is incorrect, or, worst still, in years to come, we may be blamed for the consequences.

Traditionally in VA, we have two parties: - The CLIENT - the instigator of the project/product, without whom it probably would not exist. This includes a wide variety of people e.g. shareholders/owners/manufacturers etc., and - The CUSTOMER - the purchasers/users of the item, an equally wide range of people. The success of VA in the Japanese motor industry shows that it is the CUSTOMER who determines the VALUE of the product - and consequently the manufacturer (Client) produces the goods which the Customer wants. So we can describe the functions as:- Satisfy customer; increase sales; increase profits; satisfy shareholders - and BOTH parties are happy!!

So what is meant by THIRD PARTY VALUE? Well, this is insurance jargon. It relates to a Third Party i.e. an previously unknown element, and like an Insurance Policy, you usually only realise how necessary/essential/or how good it is, when it’s too late to do anything!! For example - you are driving your car one day, minding your own business, when your car encounters another car/ or a tree/ lamppost or even a person, otherwise described in insurance terms as the “Third Party.” This Third Party had no previous involvement in your life or in the purchase of your car. YET the “impact” (excuse the pun) which this unrelated Third Party can subsequently have on your life, can be dramatic. As such, it is the CONSEQUENCE of an encounter with a previously unknown element which constitutes the need for the insurance policy in the first place.

Hence, Third Party Value relates to the consequence which previously unknown or unidentified elements or persons might have on the two previously known parties at any given instant. In relation to VE the hypothesis is straightforward: “What happens if an item, product or process has NO benefit or Value to EITHER the Client or the Customer?” Does it have ANY Value? Is its existence due to HABIT? Is it, in fact, Necessary? OR, is there perhaps a THIRD PARTY who benefits, and if so, what consideration is given to their Values? The needs of society as a whole and the values of “others” (the Third Party) who are not directly related to the project or process under study should be an integral factor in a more holistic approach in the VE procedure of the future.

Fundamental Principles
Before attempting to analyse this hypothesis using various scenarios, some basic principles need to be established to set the parameters of this investigation. Value, being the common denominator, has been defined in many ways. For instance, Heller [1] uses mathematical formulae to express the relationship of Value, Function, Cost, and Worth, as follows:

\[
VALUE = \frac{FUNCTION}{WORTH} \text{ at a minimum Cost}
\]

or

\[
F = \frac{V}{W(C_{\text{min})}}
\]

VALUE = Function / Worth at a minimum Cost

In contrast, Morton [2] defines Value, from the client’s perspective, as the relationship between Quality and Price, and the term VALUE as the relationship between Cost (or price to the client) and Reliability/Performance of a product.

Yet another method is Value by category. Whilst the semantics vary slightly, most authors refer to these as: USE Value; COST Value; EXCHANGE Value; and ESTEEM Value. These four kinds of value are considered, for the most part, quantifiable values since they can be related to a measurable means of worth, because in a VE exercise what constitutes “better” value is a quantifiable and objective calculation.

The standard Value Study Job Plan is well established and, given the two known parties, is straightforward to follow. Usually, the Client determines the scope of the project in consultation with the Value Specialist. The Value Team then gather all the information and establish the basic and secondary functions which identify the high cost areas that do not contribute towards performing the task, and consequently are revised or eliminated. In other words, if it does not contribute towards the accomplishment of the Basic Function, it is not necessary, so why does it exist?

Subsequently, alternative ideas for satisfying these functions are created. Then these ideas are evaluated - normally the quantifiable measurement or degree of Value for each item is assessed on a weighted scale during the evaluation phase, (after which the se-
lected items are finally developed into a workable and satisfactory solution). However these items represent the alternative solutions to performing the previously defined functions and this ASSUMES that all the original Functions (from which the new alternatives are created) have been correctly defined! In the context of a two party scenario - all the functions can readily be defined - because the two constant elements (the Client and Customer) are KNOWN. The problem arises if the product/process under consideration has an impact on a “third party” who has not been identified and who may even be outside the normal scope of the project.

From the brief descriptions above, it can be seen that: the Value of an item is variable in itself; and the Value of an item is variable in respect of the person valuing it. Value, must be perceived in various dimensions, and to understand this it is necessary to focus on two elements - function and value, and the relationship between them.

Discussions which take place during function analysis and the FAST process are also helpful for highlighting the difference between needs, wants and habits (Figure 1). However, it is the subsequent decisions based on the above processes (especially if carried out in isolation of other factors) which can produce potential areas of conflict, as will be illustrated later. It should be noted that “HABIT” is a word to be used with caution!! It is a word which is often used in the negative sense, rather than the positive. This is backed up by countless examples where something is done a particular way because “it has ALWAYS been done that way” thereby implying that it is a “bad” habit which should change. Yet there is a fine line between HABIT and TRADITION.

- We put expensive slate roofs on houses in Yorkshire - is that out of habit - or is it a tradition?
- Are Christmas cards - a habit or a tradition?
- Is the Monarchy - a habit or a tradition?

The following scenarios may suggest that there are values beyond the accepted norms that anyone seeking would be wise to consider, namely the value to the Third Party.

**Scenario 1 - Construction Project**

On the remote Western Isles of the Outer Hebrides, HM Coastguards built a new Marine Rescue Sub-Centre (MRSC) at Stornoway to replace the old facility. The cost of the new facility was approximately £800,000. The area which the station serves stretches from the mid-Atlantic (where it meets the Canadian coastguard limit) to the western shores of Scotland. The Regional centre is based in Greenock. During a short VM awareness seminar for my students, the sketch plans and specification of an existing building were used as an example to illustrate the various techniques and methodology in a typical VE Study of a building project. The emphasis was on the construction elements and the planning.

<table>
<thead>
<tr>
<th>VERB</th>
<th>NOUN</th>
<th>TYPE</th>
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<tr>
<td>save</td>
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<td>house</td>
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<td>iLink</td>
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**Figure 2: Function analysis and facility as a whole**

**Conventional Approach**

To “set the scene” a Function analysis of the facility as a whole was carried out, as shown above. Not being familiar with the rescue procedures involved, it seemed an appropriate exercise to construct a FAST diagram (Figure 3) to establish how the primary higher order function, “save lives,” was achieved.

The exercises that followed during the awareness seminar con-
centrated on the building. The following analysis was NOT part of the discussion.

The probability of a ship or yacht getting into difficulty and requiring rescue services in the Harbour at Stornoway, in front of the Station is very unlikely (though it can happen). Most vessels requiring rescue services are out at sea, maybe hundreds of miles from the coast. When this happens, distress signals/location etc. are all conveyed by radar / telecommunications to the mainland, NOT by an officer viewing with binoculars from a window at the station. Rescue helicopters and search planes are sent from the RAF air-base on the mainland, not launched from the Station. In fact, the station does not even have a lifeboat. In the event of a major disaster, a press centre is set up on the island to provide up to date information. This means that dozens of journalists/police etc. have, to fly to the island - to receive information - that is being conveyed to the centre on computers and radio. As a Taxpayer, I must therefore ask the question: WHY did they NEED to build a station on the island in the first place?

To “Save Lives” and “Rescue People” it is necessary to provide space to house both people and equipment in the same accommodation. However, the location of this accommodation is questionable. Is it possible to perform these functions for this zone without building a station in Stornoway? Given the sophisticated computerised technology employed in such operations today, these functions could be carried out from the Regional Centre in Greenock, or from Birmingham!! So the answer is YES. Put another way - Is building a station on the island necessary to “Save Lives” and “Rescue People?” The answer is NO. “Building Station” cannot therefore be a Basic Function.

Turning to the Cost:Worth ratio, we know that the Cost of building a station was £800,000, but since each function can be carried out elsewhere does this imply that the Worth is £0? Building on any island is very expensive in terms of capital costs, and both maintenance of the building and equipment is high in this location. So what is the “Value” of the building?

How does this stand up to the accepted criteria previously stated?

- If the Worth is £0 and the function is zero, then using Heller’s mathematical formulae \( V = \frac{F}{W} \) and \( V = \frac{F}{C} \) then the Value is zero.
- If Value is the relationship between Cost and Reliability/Performance, yet again we have a high cost item whose function can be reliably performed elsewhere, so this implies there is little value.
- If we turn next to the four kinds of Value:- since it is not “needed” an extremely high Cost Value relative to building on the mainland; the Exchange Value is worthless, and in terms of Esteem Value aesthetics are not regarded as a major consideration, so overall, we again have a low value score.

Finally, we have stated that it is the Client or the customer who determines Value. How then does the building fare with this criterion? If the Client can be provided with the necessary function to the same standard at a reduced cost elsewhere, then it has little value. If the customer is the end user, namely the person being rescued, the answer is the same, since it has been established that the operation can be implemented from any base.

Hence, in terms of the standard criteria for both cost had been a prime motivator, then this project would have died at the outset. Indeed, the Client was well aware of the alternative options of relocating to the mainland, so why build on the island? HABIT is the first word that jumps to mind “because there has always been a station there.” Historical precedence (Tradition?) over-riding technological advances, or what one wants, versus what one needs. Or is it?

**Alternative Approach**

It is the job of a Specialist in Value to look beyond the normal parameters; to ask, Why?; to question, What is the Purpose of?; and to seek, What else? Would such a dilemma have arisen had a school or medical centre been used as a case study? Is this a “one off” case blown out of all proportion? and does it relate to other projects? Does it have any significance whatsoever to the rest of us on terra firma?

To answer this, we first have to ask the question: “is the station of value to ANYONE?” The answer to which is YES, it is of value to the people who live on the island. Viewed from this perspective the functions can be defined as shown in Figure 4 below:

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<thead>
<tr>
<th>REASSURES INHABITANTS</th>
<th>SIGNIFIES IMPORTANCE</th>
<th>RECOGNISES EXISTENCE</th>
<th>REDUCES ISOLATION</th>
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<tr>
<td>that they are part of our whole community</td>
<td>- of their contribution to society, however remote</td>
<td>- that they are not forgotten</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 4: “Third Party” functions and values**

Yet these functions do not appear on the original list in Figure 2, because they do not relate to either the client or the customer but to a third party who is not directly involved in the project (i.e. the Islanders). Also both the function and the value are psychological. To understand this, I had to think back to time I lived for three years on an island of 21 square miles in area. Unless one has been born and raised in such an environment, for 80% of the time it may be paradise found, but for the other 20% it can be an isolated and confusing existence which requires a specific state of mind to cope. The expression “rock happy” will be familiar to anyone who has experienced living on an archipelago. It signifies the need to return to the mainland to be reassured, that one exists!

Perhaps it is the essence of the Coastguards’ work which makes them understand the needs of others beyond their direct contact and which influences their perception of Value. If this approach is applied to other projects then it may indeed be of significance to everyone.

**Scenario 2 - Manufacturing**

In the UK there is strong opposition to the EU’s Social Charter. Small and medium-sized manufacturers consider that if the Charter is adopted their manufacturing costs will increase dramatically, and that, in the present unstable economic market, their ability to
exist will be put in jeopardy. Some have already stated that they would be prepared to close down their UK factories, “puck up” all their equipment and relocate to the Far East or eastern Europe, where wages are lower and restrictions, such as Health and Safety (let alone social charters), are virtually non-existent. Similarly, many very well-known large manufacturers in the USA have already closed their factories in the States and relocated not only in the Far East but JUST over the border in Mexico where the cost of production is much less.

In Value terms, what does this mean first with respect to our two party scenario? Well, the Customer is happy, as the same goods can be purchased at a slightly lower price; and the Client is happy because overheads reduce, profits will increase and more goods are sold. And who is the Third Party? They are the American citizens who used to work in the factories before they lost their jobs when the factories closed and relocated. They could be future Customers, but since they are unemployed they probably cannot afford to buy the goods which they once made, so their perception of Value is non-existent. The other Third Party are the Mexicans who now have a new job at a minimal wage and who now have a new job at a minimal wage and who still have to exist in squatter shanty towns. They may conceivably rank this as slightly better Value. So long as both of these Third Parties remain in the minority, they will go unnoticed, but the long-term consequences for their societies may not be so desirable.

**Scenario 3 - Banking**

The total number of persons employed in the banking, insurance and finance sector in recent years reached a peak in 1990 of around 2.7 million. By the middle of 1993 this had fallen to 2.57 million, a reduction of 124,000. Figures published in January 1994 show that in the last four years employment cuts in the following major banks amounted to:

- Nat-West = 15,000
- Lloyds = 12,400
- Barclays = 13,000
- Midland = 5,600

These job losses underline the speed at which banking and its public image have changed over recent years. Not long ago the local bank manager was regarded in much the same way as the family solicitor, a trusted confidant, a friend and professional advisor. The situation is very different today as thousands of bank jobs are disappearing, as smaller and more remote branches are closing and as electronic devices such as cash dispensers replace staff.

The demise of the neighbourly bank can be traced to the need to recover huge losses on unwise loans in the late 1980’s to failed property developers and to Third World countries. Boards of directors ordered their organisations to be harder on those who ran up unauthorised overdrafts, and to concentrate more on profits and less on acting as “unofficial social workers.” The effect has been striking, for instance, Barclays lost £242 million before tax in 1992, but forecasters believed it made profits of £800 million during 1993. Many analysts believe the banks have gone on using the huge losses of the ’80’s as an excuse to raise charges, squeeze the last drop of profit from their customers and to reduce staff. Whereas, in the past, staff were usually only sacked in a “loss year,” now a 6% growth appears to be the cut off point. In fact, the number of current accounts has almost doubled since 1982 (25.5 million to 55.7 million), and turnover has increased proportionately.

Small businesses, in particular, have complained bitterly that the once-amicable manager no longer has the time for a chat, and is likely to present them with high bills if asked for his professional advice. His priority now is to make quick profits for his bank rather than to help the community. The trend towards performance-related pay has also fuelled this process, as staff are pressurised to sell services such as investment schemes, pensions and insurance to boost the corporate coffers. Apart from staff, the banks are also reducing the number of branches. Some 2,200 branches have closed in the last five years leaving around 12,000 in total. However, Barclays and Nat West are closing branches at the rate of 100 a year, and other banks are following suit. So with growth on one hand and cuts on the other, what is the function of the banks? A corporate bank described their purpose in function terms as shown below.

<table>
<thead>
<tr>
<th>VERB</th>
<th>NOUN</th>
<th>TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>raise</td>
<td>money</td>
<td>Basic</td>
</tr>
<tr>
<td>lend</td>
<td>money</td>
<td>Basic</td>
</tr>
<tr>
<td>satisfy</td>
<td>shareholders</td>
<td>Basic</td>
</tr>
<tr>
<td>attract</td>
<td>customers</td>
<td>B/S</td>
</tr>
<tr>
<td>house</td>
<td>money</td>
<td>B/S</td>
</tr>
<tr>
<td>invest</td>
<td>money</td>
<td>Secondary</td>
</tr>
<tr>
<td>provide</td>
<td>service</td>
<td>Secondary</td>
</tr>
</tbody>
</table>

**Figure 5: Function analysis of banking as a whole**

These functions place the emphasis mainly on growth activities. So why the cuts in staffing? The answer is simply to “save money.” Yet again computerised technology has made this possible, with one cash dispenser said to be the equivalent to 30 staff. And why the reduction in branches? The answer is to “save rent,” “save rates,” “save salaries” and “save uniforms.” New technology allows more work to be done at regional centres, and there has been a dramatic increase in home banking. However, this raises the question, how do you attract customers if the physical presence of a bank in the High Street does not exist? The response to this is not so simple.

It appears that those in the older age group 30’s and upwards like face to face contact in terms of banking. There are many who still prefer to receive their salary in cash and then take it to the bank to lodge in person. Both of these factors are based on Habit. The growth area in fully computerised banking, such as First Direct, appeals to the under 30 year olds, the younger generation, who do not have the need for human contact in such matters. It therefore follows that the trend of both staff and branch reductions will continue as future generations rely more on technology rather than people to suffice their needs. Eventually the local bank will possibly not even exist, since in terms of function, it is not needed as these functions can be provided by alternative means at a reduced cost. So in terms of Value, using the standard criteria, the results will be similar to the previous example - the Client and the shareholders may get “better value” in cost terms, but the community as a whole will not.
However, the staff consider the banks provide a form of social service. The flow of shopkeepers, businessmen, pensioners, housewives, students etc. provides a social interaction which gives a structural core to a community. There is a physical building in which a wide variety of people negotiate transactions, discuss problems and debate or dispute deals. So it is about the ability to COMMUNICATE. My students prefer the cash dispensers and computerised system “because we don’t have to speak to anyone” - which I find very disturbing. I cannot help wondering how they are ever going to cope with major disputes on a building site, if they find difficulty in negotiating an overdraft with the bank manager. I just hope they never become politicians!!!

**Pandora’s Box**

Adopting the conventional approach, we could therefore eliminate the physical presence of banks and building societies from the High street since their functions can be carried out by alternative technology. Surely the same is true for shops. Buying goods through catalogues is already well established, and more recently the television system of phone-in purchasing is expected to be a growth sector. Both systems save money on expensive shop premises and staff wages. Both satisfy the Client (who sells goods and makes profits) and the Client (who buys goods). We could all sit at home and purchase what we want by means of telephone and computers - BUT - where would the social intercourse necessary for a stable society to exist take place? Leisure facilities? Perhaps, but with more people becoming redundant to “save money,” such enjoyment would more likely be the domain of the people who are still employed and therefore able to afford this facility, since they will also have to finance it in the first instance!

At a recent conference entitled “Achieving Efficiency Savings in the Public Sector” six speakers used the word “Efficiency” in the title of their paper, and four of these added “and Value for Money.” If we define ‘Efficiency’ as “doing the job right,” then they all made a genuine and sincere attempt to do the job of saving money for their own Authority or specific public sector. However, as professionals, we are virtually legally bound to be efficient - to do the job right, for failing to do so would be negligent - doing the job incorrectly. As Value Specialists providing ‘Value’ is not just about being efficient, but is about being ‘Effective’ - which is defined as “doing the right job.” And it is here that the dilemma occurs yet again, because what may be desirable for one particular public or corporate body may not be desirable for the community as a whole.

**Conclusion**

If the expression “he who pays the piper calls the tune” holds true, then it is the Client’s needs that determine the criteria for value. This may be satisfactory if the subject under analysis is a widget or the detail of a building component. Needs override the wants and habits which previously existed. Value is defined in terms of use, cost, efficiency etc. This is a traditional linear approach tested and proved successfully over time.

However, in some instances a broad holistic approach may well be more appropriate. The important point to note in the above examples is the fact that basic functions which have previously been done by people out of HABIT, can now be performed by alternative means at either a reduced cost or at a cost to someone else. As such, these people are not needed - in functional terms they are an “unnecessary cost” and unnecessary costs are usually eliminated. But what is the Value of a society where millions are unemployed because there is no need to employ them? How many of you would DARE define the Basic/Higher Order Function as “Eliminate People”? When applying VM, it may be prudent to consider that people and a community or society as a whole should not be regarded in the same way as widgets. Indeed if, as this conference suggests, “VE is the Way to a Healthier Economy,” the key question to ask is simply, “Healthier to whom?”

What I have tried to show is that whilst it is not difficult to produce results, it is the long term CONSEQUENCE of the results, especially the Value to the Third Party, which should be considered. After all, VALUE is your responsibility.

**References**


Winning the Competitive Edge Through Cooperative Group Interaction – It Depends on the Task

Rosemary Fraser, PhD
Originally published in 1992

Abstract
Our conventional wisdom contains several adages that deal with the relative capabilities of groups and individuals. Sayings such as “Too many cooks spoil the broth” and “Two heads are better than one” reflect the diversity of opinion that characterizes present positions. Across time, one of the most frequently asked questions is “Which is better at performing tasks – groups or individuals?” This paper reviews theory and research relevant to one specific element of this question, task structure. Additional elements of group structure and reward systems are related to the task structure content.

Introduction
In value management (VM), heterogeneous groups are employed to implement the job plan. This clearly demonstrates the belief that a group can perform information, speculation, analysis and evaluation functions more effectively than individuals operating independently. This paper is the first in a series of papers which will examine the theories and research relevant to various features exhibited in small group activities to provide greater understanding of those features and to identify implications for improvement of the group operations part of value management programs. The element discussed in this paper, task structure, is central to group behavior. Later papers will focus on other elements such as group interdependencies, communication, organization and reward systems.

Perspectives on Group Performance
The question of relative value of group versus individual performance was one of the first issues examined by early social psychologists. From the 1920’s through the present, two major perspectives have been apparent in both theory and practice. The first perspective, “wholism”, had a major influence on early research. The basic assumption of wholism is that the whole is greater than the sum of its parts. Further, early social scientists presumed that the positive effects of assembly were accelerated as group size increased (Figure 1).

Studies conducted by Gordon[1] and Shaw[2] are typical of early holistic research. Using judgement and problem-solving tasks, both researchers found groups to be more effective than individuals. Unfortunately, those studies were seriously flawed. The judgement task outcome was actually a function of compensating random errors, while the problem-solving outcome was a best-member result rather than a group interaction effect. Studies in the 1950’s, more carefully examined the relative outcomes of interacting groups versus non-interacting aggregates. Such research identified the number of times an interacting group would perform better than expected for the number of individuals. Results were disappointing for those holding holistic biases.

In a number of studies the group’s performance was significantly below that of individuals and aggregates, leading many theorists and practitioners to adopt a new position called “reductionism” (Figure 2).

This perspective holds that the whole group, at best, is equal to the sum of its parts. However, the equality of outcome holds only when interaction is optimum. Since optimum interaction does not occur in most cases, especially as group size increases, the group performance would be significantly less than the sum of the individual efforts. Reductionists view actual group productivity as a function of optimum (or theoretical) productivity minus losses due to faulty group interaction processes.

Clarifying the Basic Question
More recent investigators have found the question “Which is better at performing tasks – groups or individuals?” too vague to be researchable. Terms such as “better” and “tasks” had to be more clearly specified. First, what does the term “better” mean? Better in terms of what? Both individual and group activities result in a number of output variables, including accuracy, solution quality, speed, satisfaction and overall productivity. Any one or combination of these variables can provide reference points for identifying “better” performance. To clarify the second term, “tasks”, several taxonomies have been developed. The classification scheme used in this paper was developed by Ivan Steiner[3], who identified four major types of tasks.

In “additive” tasks, the outcome is simply a total of individuals’ products. For example, I might hire three secretaries to type copies of a paper. If one person typed four copies, the second typed six copies and the third typed five; then as a whole, the group typed fifteen copies. Performance on such additive tasks can be measured in terms of overall productivity and speed.

In “conjunctive” tasks, the outcome is also considered as the members combined output. But in these tasks, each person must...
different numbers of people was measured to determine the perfor-
tive was provided by an early study performed by Ringleman (as 
that involve a single decision.

tasks can involve multiple judgement, decision-making and/or prob-
ment of the least competent member.

Performance on the third taxonomic type, “disjunctive” tasks, 
requires that group members choose the best answer from a set of 
possible options. In this type of task, the least competent member 
of the group need not affect overall performance. It is theoretically 
possible for the group to succeed as long as even one member can 
perform the task well.

Hackman[4] further divided disjunctive tasks into three subsets. 
“Judgement” tasks have answers that are objectively correct. How-
ever, the validity of the group response cannot be determined by 
group members and must be verified by external sources. Group 
activities such as “Lost on the Moon” or the “Occupational Rank-
ing” task require that an established “right” answer (from NASA in 
the former case or the National Occupational Ranking Center in 
the latter) be consulted to evaluate the correctness of the group 
judgement. Group performance on judgement-type projects is 
generally evaluated in terms of speed and accuracy.

Disjunctive “problem solving” tasks also require “best” answers 
to be identified. In this case, however, the group members can rec-
ognize the appropriateness of their response.

The “Ages” puzzle[5] is a good example of this type of problem in 
which once the necessary insight has occurred, the group mem-
ers can clearly identify that their answer is correct. The third sub-
category of disjunctive tasks, “decision making activities”, have 
no convergent “right” answers. No verifiable standards exist to 
determine whether a given policy or plan recommended is the most 
appropriate. Group action is judged by the methods used and the 
extent to which they were used well. “Accuracy” cannot be equated 
with successful implementation of the decision reached since ex-
ternal conditions or other mitigating factors might affect imple-
mentation so that even the best available decision might have less 
than favorable results.

“Complementary” tasks, the last major taxonomic type, are gen-
ernally similar to disjunctive tasks. However, complementary tasks 
can be broken down into component parts or stages. Thus, such 
tasks can involve multiple judgement, decision-making and/or prob-
lem solving activities. Each activity or phase can be operated on by 
various members of the whole group, depending on specific expertise 
required. This is significantly different from disjunctive tasks that 
involves a single decision.

Research on Group Performance 
by Task Type

Additive Tasks -- Strong support for the reductionist perspective 
was provided by an early study performed by Ringleman (as 
reported in Kravitz & Martin[6]). The amount of force exerted by 
different numbers of people was measured to determine the perfor-
manence per worker. Results clearly demonstrated a drop in produc-
tivity per person as the group size increased. Numerous studies 
conducted since this “Ringleman effect” was identified, most in-
volving additive tasks, have replicated the original findings.

Further, studies conducted by Ingham, Graves & Peckham[7] 
isolated the source of the decline as a function of motivation rather 
than demands for coordination. In a rather ingenious study, Ingham 
et al. replicated the Ringleman rope-pull study. Although all partici-
pants were operating as individuals, half of the subjects were 
made to think they were working as members of groups. Data were 
interpreted as support for a “social loafing” tendency, since exert-
ion levels dropped when persons thought they were working in a 
group compared with the same individuals’ exertion when operat-
ing as individuals. Social loafing seems most apparent in additive 
tasks in which specific contributions cannot be determined. Re-
duction in social loafing has been associated with perceived task 
importance and/or challenge, individual accountability and respon-
sibility for specific tasks.

Conjunctive Tasks -- The Reductionist perspective is also sup-
ported by studies of group performance on conjunctive tasks. In a 
study conducted by Frank & Anderson[8] groups of different sizes 
performed idea generation tasks (i.e. each person was to list three 
reasons for and three against legalizing gambling). The task was 
made conjunctive by specifying that the group as a whole could 
not move on to the next task until each member finished the present 
one. As expected, group size was inversely correlated with effi-
ciency (speed) of the output. Such evidence suggests that when 
working with additive or conjunctive tasks, it is wise to keep group 
issues as small as possible and minimize incompetence among mem-
ers through selection, retraining or replacement. At this point in 
our review, advocates of the holistic perspective have little basis 
for optimism. The evidence strongly supports the position that the 
effects of assembly are not positive with regard to performance — 
at least in the cases of additive or conjunctive tasks. However, the 
nature of VM activities is not apt to be additive or conjunctive. To 
obtain the benefits of the heterogeneous teams selected to perform 
a VM study, the task should be organized in disjunctive or com-
plementary ways.

Disjunctive Tasks -- As described earlier, both judgement and 
problem solving types of disjunctive tasks have objectively correct 
answers. Researchers test two assumptions when examining group 
performance on these disjunctive tasks. First, given at least one 
competent member, the group should be able to reach a correct 
solution. Second, it is assumed that interaction needs are limited to 
simply communicating the solution once determined. Presumably, 
the correct answer will be recognized by the other group members 
or they will be persuaded by the competent participant. Johnson & 
Torcivia[9] tested those assumptions by presenting a problem to 
be solved to individual participants. After solving, the participants 
were to report the extent to which they were certain their answers 
were correct. The participants were assigned to one of six condi-
tions: 1. individuals who got the right answer (R), 2. individuals 
who got the wrong answer (W), 3. dyads of correct respondents 
(RR), 4. dyads of members who got the same wrong answer or 5. 
different wrong answers (WW), and 6. dyads of one right/one wrong

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in the previous solution (RW). The task was then performed again with the following results (in percentage correct):

| RR - 100% | RW - 72% | WW (same answer) - 10% |
| R - 96%  | W - 9%   | WW (diff. answer) - 8% |

The participants who had previously been right continued to be right, while those who had previously reached incorrect conclusion were still unsuccessful. In the case of two wrong dyads, two heads were not significantly better than one. Even in the dyads in which the participants had earlier reached different wrong answers (possibly giving them some dissonance that might generate discussions leading to the correct answer), incompetent problem solvers could not help one another reach better solutions. However, given at least one competent member, the outcomes indicated positive assembly effects. In the RW dyads, the competent member generally had greater influence on the outcome than the less competent member, even though truth did not always win out.

Thus, for those with holistic biases, the question remains “given at least one competent member, why was the interaction in RW dyads insufficient to provide for correct solutions in a greater percentage of cases?” In the Johnson & Tercivia[10] RW groups were generally the member who reported greater certainty. Sometimes this was the more competent member, but not in all cases. In a related study, Zaleska[11] uncovered additional information regarding the relationship between competence and persuasiveness. In that experiment, samples of college students and vocational high school students attempted to solve a verbal problem and then rated their confidence in their responses. Next, all the participants were placed in groups containing at least one member who had previously been correct. After a period of discussion, the participants made a second attempt to solve the problem, rated their own confidence and then rated the confidence that they thought others had. The college sample improved in 17% of the cases, while the percentage of vocational students who were correct fell 4%. In the college sample, although the most competent members did not necessarily rank themselves as most confident, they were the most talkative. Other group members judged them to have the greatest assurance. In the vocational sample, the most talkative members also had the greatest influence on others. Unfortunately, in the sample the most talkative member was not generally the most competent. As the authors of the study concluded, if competence wins, holistic outcomes occur.

Compensatory Tasks -- Holistic approaches have been supported further by results of studies that involve compensatory tasks. In a representative study, Laughlin and Johnson[12] gave participants two tests in which 148 items had to be categorized as synonyms, antonyms or analogies. Competence of each participant was determined by results on the first test and subjects were classified as high (H), or low (L). For the second test, participants either worked alone or in dyads combining various ability levels. Results on the second test were:

| HH - 126.3 | MM - 84.2 | LL - 54.4 |
| HM - 114.1 | M - 76.5  | L - 48.1 |
| H - 95.2  | ML - 74.4 | HL - 92.9 |

Much of this data provide support for the holistic perspective. Subjects who worked with H or M ability did better than if they worked alone. Positive assembly effects are demonstrated especially well in the HM dyads that performed even better than H individuals alone. The key factor in the improved performance of the groups was clearly competence. Again, the implication may be drawn that if competency wins out, group performance is superior.

Group Structure and VM Activity

A number of implications for VM group activities can be derived from this review of task structure research. First, it is clear that group task is a major determinant of the group output. The task builds into the group a common sense of what constitutes appropriate ways to respond to the problem. It is to a group’s advantage to turn lower level tasks into complementary tasks. As the group engages various phases of the job plan, this would provide for most effective use of the different abilities of group members. The likelihood of best outcomes is significantly improved by allowing different member’s competencies to emerge as appropriate. While some members are more skillful at generating ideas, others are best at evaluating proposals.

However, it is important to recognize that these different competencies will be effectively manifest only if the group is organized properly. VM groups should be staffed with competent individuals with a range of experience, backgrounds, points of view and talents. We know that individual differences are the primary source of the power and potential advantages of group activity. Complementary tasks allow these group aspects to be optimized, while lower-order tasks depress or eliminate the potential of positive effects of assembly.

The Need for VM-Activity Based Research

Research regarding competence and influence (cf. Zaleska[13]) suggest that VM group leaders should be aware of the possible misuse of “open group communication.” While the subjects of group interaction and structure will be discussed more fully in later papers in this series, a few highlights are appropriate here. In 1979, Kabanoff and O’Brien[14] examined two forms of cooperative group structures – collaborative and coordinated – in comparison with competitive (individualistic) structures. The researchers found that “Coordination resulted in products that were longer, more issue involved, adequate, creative and of higher quality” (p.173). Although the particular task involved was a discussion type rather than problem solving or decision making, this result might shed some light on ways to reduce inappropriate influence by less capable members. Extensive reviews of the cooperative-competitive group structure literature have resulted in contradictory conclusions. It is clear that Deutsch’s[15] initial prediction that cooperative structures yield greater group productivity than competitive structures did not account for confounds as reward systems, member ability, organization or task type. Pettigrew[16], a major proponent of competitive designs, commented that “in a competitive society such as ours, the satisfaction of the differentiating reward and the feeling of competitive success more than compensate for the interpersonal loss.” Despite extensive research aimed at elucidating the effects of reward structures on group productivity, there is little evidence supporting Pettigrew’s contention. Research re-

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lated to the reward structure has obvious implications for development of performance appraisal techniques in organizations that provide members with both individualistic and group goals.

Very little empirical evidence has been documented regarding the interaction of group process variables and group outcomes in VM. Practice has been based largely on conventional wisdom, modeling, or implications from research focusing on groups operating under experimental conditions. Some naturalistic research related to group problem solving is available, but little or none that employs groups operating with the structures, reinforcers, leadership, tasks, etc. that characterize our field. While research reviews commonly end with a "need for further research" clause, such an appeal is especially appropriate here. The external validity of common group research is questionable given the specifics of VM activity. We have the need to develop a knowledge base founded on naturalistic study of VM teams. We have personnel with necessary behavioral science skill. We have sufficient numbers of VM teams operating in different environments, on different tasks to examine the relative impact of differences in conditions. Continuing interest in increasing the professionalism of VM requires that we match our resources with the information needs and begin serious, systematic study of the people part of our work.

References


[10] Ibid.


This paper was originally presented at the 1992 SAVE Conference. At the time of presentation, Rosemary Fraser, Ph.D. was a professor in the Department of Educational Psychology, Miami University, Oxford, OH. She has a Bachelor's (Mathematics), Master's (Social Psychology) and Doctoral (Behavioral Science) degrees from the University of Michigan where she also completed post-doctoral study in administration. She is a frequent speaker for professional and civic groups and has an extensive publication and consulting records with industrial organizations dealing largely with issues of motivation, communication and group dynamics. Rosemary is a member of the American Psychological Assn., the American Educational Research Assn., the Southwest Ohio Chapter of SAVE and is a member of the Board of Directors of the Miles Value Foundation. She was awarded SAVE's "Best Technical Paper" in 1974 and 1987.
The "Theory of Neuronal Group Selection" (TNGS) Establishes a Basis for the Value Methodology

William F. Lenzer, P.E., CVS, FSAVE
Originally published in 1995

Abstract

The "Theory of Neuronal Group Selection" (TNGS) integrates many aspects of science into a unified, holistic concept of evolution and development of the human brain. Part of this theory is predicated on the evolution of "value centers" within the rudimentary brain structure of all animals. This paper links the establishment of value centers and value criteria in the human brain with the development and practice of the Miles value methodology. It proposes that the Value Method (VM) configured by Miles, provides a catalyst that facilitates communication between individuals by surfacing key criteria (functions) that relate directly to the diverse value criteria of individual perspectives. It also relates the use of function and the Function Analysis System Technique (FAST) technology as part of this critical evolution that makes the VM work. The concepts presented in this paper require a prior knowledge and working understanding of VM and its associated techniques.

Introduction

"Value Engineering (VE) is something we do all of the time." This type of statement, by the uninitiated, has been one of the major roadblocks facing practitioners of the Value Method (VM). Since Miles first arranged his thinking system into an organized approach, overcoming this initial roadblock has perplexed many value professionals. Often, we try to explain what it is by stating what it is not, such as:

- It is not just cost cutting.
- It is not just brainstorming or creativity.
- It is not just taking a third-party objective look.
- It is not just applying good human relations skills.
- It is not just conventional problem solving.
- It is not just team work.
- It is not just engineering analysis of alternatives.

While the VM is not just any one of these aspects, it encompasses them all, and much more. It spans a wide spectrum of techniques, scientific disciplines, philosophies, ideologies and concepts. It crosses and involves so many traditional areas of learning and knowledge that it has not been able to find a home in the halls of higher education or research. It does not fit engineering, biological science, business, management or the arts. Yet, it encompasses elements of them all.

The power of the VM has been demonstrated through practical application and the results that it produces. From its early beginnings Miles recognized that the VM involved a way of thinking. As Miles said, "This system organizes the essential elements of the problem and the diversified capabilities of the brain into the one plan that promotes the solution of difficult problems[1]." But Miles had only touched the tip of the iceberg.

In the beginning the VM was applied primarily to products, but through almost 50 years of application, has been expanded to many diverse areas. It has been used in many areas of scientific endeavor. In 1979 the traditional VM formula (Value = Function/Cost) was shown through mathematical derivation to reflect a relationship identical to the "Second Law of Thermodynamics" when used to evaluate relative energy functions[2].

Other applications of VM cover all conceivable areas of systems, procedures and processes. It has even been used to help define moral concepts and the evolution of religious beliefs[3].

With the use of the "Function Analysis System Technique" (FAST) a detailed analysis of everything from planning a vacation, to defining an organization, to developing a business plan and understanding a product's function have been effected. The Japanese have recognized the system as a very important process because it helps define "purpose" and orients thinking toward the higher order objectives.

Why does VM work in all of these areas? Perhaps it is a matter of the mind. Perhaps everyone does use it to some extent. Perhaps we can find some answers in the "Theory of Neuronal Group Selection" (TNGS) proposed by Dr. Gerald M. Edelman, Nobel Laureate and first published in 1987[4].

The "TNGS" Proposition

Dr. Edelman's TNGS involves a holistic approach to the matter of the mind that crosses the boundaries of many traditional scientific areas of specialization. It challenges many existing theories on the brain and the workings of the mind, yet it offers a concept that seems to be able to pull many things together and results in some explanations that have previously been unexplainable. The theory is focused on defining how the human brain has developed into a unique organ, through evolution, that uses a process that: "... resembles natural selection to develop during its own lifetime. Essentially Edelman sees the theory as part of his work in developmental biology, in that the outcome of neural Darwinism is decided not so much in the genes as in the developmental process that carries out the instruction of those genes[5]."

The TNGS is an extremely complex proposition that is difficult to fully understand, especially for those individuals who do not have a strong foundation in neuroscience. To present his theory to a wider audience and individuals who are not in the business, Dr. Edelman published his TNGS in the book, Bright Air, Brilliant Fire: On the Matter of the Mind[6].

To fully explain the TNGS would take a significant effort that far exceeds the scope of this discussion. Early in his lay presentation of the TNGS, Dr. Edelman states, "I must warn the reader that I have to explain a series of complex processes that must be grasped..."
to understand brain function. The main ideas to grasp are neuronal group selection, reentry and global mapping[7].

A key premise to the TNGS is that each species of animal evolved a "value system" which helps the brain interface with the body to select patterns of activity which support the conditions necessary to continue life. This "value system" as initially evolved, provided the animal with the behavioral reactions necessary for species survival and satisfying the corresponding physiological needs. Further, the theory "proposes that categorization always occurs in reference to internal criteria of value and that this reference defines its appropriateness[8]."

"The brain stem, together with the limbic (hedonic) system — is a value system[9]." It is connected to all parts of the body and is primarily concerned with appetite, sexual behavior, consummatory behavior and evolved defensive behavior. The "value system" influences and affects all aspects of development and learning. In the human brain, the value system permeates all aspects of conceptualization and categorization. Mapping within the brain is affected and categorization occurs in reference to the value system, value criteria which have evolved from the system and value patterns which have developed based on various stimuli and experiences.

It would seem logical that the basic "value system" tenants, concerning species survival, are the same or very similar in all humans. But then, the evolution and development of each individual brain varies depending on many factors. This results in different value patterns and criteria, that are unique to each person, and results in a "Total Value System" (TVS) which affects learning and behavior.

The TVS of each individual is extremely complex and all encompassing. It is also dynamic and has the potential to change throughout life, through ongoing experimental selection and reentrant mapping. This particular aspect of the TNGS would appear to open many doors to the many mysteries of the human mind and human behavior. If the TVS of an individual can be understood perhaps such questions as "What is motivation?" can be answered.

The potential of the TNGS in bringing together a diverse spectrum of science, ideology, philosophy, physiology and other concepts is awesome. Further research will certainly demonstrate its compatibility with concepts such as Maslow’s Hierarchy of Needs, Dr. Claire Grave’s concept of value systems, Dr. Deming’s quality concepts and the Miles value concept.

**Value in the Miles Context**

When Miles began to develop his concept, he focused on the idea of function and the clear definition of function using a single verb-noun description. His idea was to identify the basic purpose of a device or component of a product in the most basic way possible. He then defined value as a relationship between cost and function, as follows:

Best value then, would be to achieve the function for the lowest cost.

If we consider function as a "value criteria," defining what needs, or is intended, to be done, then the Miles concept should have a relationship to Dr. Edelman’s "value system" and perhaps represents a form of expression which facilitates the investigation and analysis of the entire spectrum of value.

If we consider the basic physiological needs of any animal, it is evident that one value criteria is that it is better to eat than to not eat. The function, using the Miles approach, is then identified as EAT FOOD. For prehistoric man, there were several ways to accomplish this function, and the function required some behavioral action, which can be reflected as a cost.

What options were available to prehistoric man? Let’s consider a few:

- **HUNT**
- **GATHER**
- **STEAL**

The natural reaction to satisfy the function would be to do that which is the easiest (least expensive). If fruits, berries and nuts were readily available, then the selected approach would be to "gather." In making a decision, the mind would have decided that:

If this method of satisfying the function continued to be easy and worked all of the time, then a "value pattern" would be established. However, when the climate changes, fruits, berries and nuts may not be available in a particular geographic area. Thus, other alternatives would have to be pursued (e.g., hunt animal, store nuts, migrate, etc.).

It becomes evident, when considering cost on a basis that goes beyond dollars, and encompasses effort, and various behavioral options, that the Miles Value relationship may provide a means to correlate Dr Edelman’s "value system," "value criteria" and "value patterns" into a format that can be represented in relatively manageable terms. This is not to say that understanding how the mind works in relation to value is simple, but rather that understanding the relationships can improve the ability to investigate and analyze why people do what they do and how they conceptualize.

Because each individual brain develops into a unique organ, its "value criteria" will be different, to various degrees, from that of any other individual. It is this difference in conceptualization and categorization that creates products, companies, systems, processes and other human developments that may contain elements of an individual’s value criteria that may not represent the best value or the consensus value of a group.

The VM is predicated, in part, on the fact that value can only be determined by those who will pay for the function or expend the necessary resources to achieve the function. For instance, to "obtain education" requires an effort and involves a cost. A parent may be willing to spend the money to educate a child because it satisfies their value criteria, but the child must expend the effort. If the child does not perceive that the function (obtain education) is worth the effort (cost) then their value criteria does not coincide with that of the parent and the likelihood of success is diminished.

The function approach of the VM appears to provide a linguistic form of identifying activities, features, considerations, characteristics and objectives that can be related to value systems criteria and patterns of individual minds. Using the verb-noun technique in group sessions facilitates communication and provides a means to attain a consensus understanding as to the nature and purpose of any particular subject under consideration. It often facilitates the
surfacing of an individual’s “value criteria” relative to a specific condition or set of circumstances.

On a VM study of a military communications center, located in the secure area of a central USA military base, a VE team identified the function of a 3 ft. high planter wall that extended around the entire perimeter of the facility as “enhance appearance.” The VE team developed an option that would achieve the function, but reduce the cost by $250,000. When the VE team presented their proposal to the owner in the presence of the designer, the designer interjected that the VE team had incorrectly identified the function. The function, according to the designer was to “inhibit terrorists.”

The owner was startled! The facility was located in a very secure area that did not require further protection from terrorists and no requirement had been presented to the designer to indicate that protection was needed. What happened though, was that the designer, who was aware of a general concern about terrorist acts, took it upon himself to incorporate the “inhibit terrorist” function into the design. His “value criteria” said that this was good, but he failed to discuss it with anyone and with all of his good intentions, built in a $250,000 unnecessary cost to achieve an unnecessary (according to the owner) function.

This is not a unique situation. It happens all the time. When functions are identified in such clear terms, and costs are associated with them, the owner (he who pays the bills) can readily understand what he is paying for and make a clear, sometimes easy, decision on whether that particular function is worth the cost.

What the VM does is arrange costs according to function, thus creating a clear value picture of certain elements of the project, product or process under consideration. This facilitates the evaluation of things based on the “value criteria” of the decision makers.

Further, this aspect of the VM brings to the surface the “value criteria” of those who are charged with carrying out a plan, a design, a management task, or whatever it is they undertake. If clear definition of the effort is provided at the beginning, then it would seem that everyone would understand the goal and stay on track.

It sounds like we’re discussing communications. Perhaps we are. Let’s look a little further.

Cognitive Semantics

Pig! Don’t think about one, but of course, the image has already appeared in your mind. In all likelihood, almost everyone envisioned the same type of animal. But not everyone envisioned the same identical animal. You may have visualized a brown pig, a pink pig, a black pig, a big pig, a little pig, a wild pig or Porky the Pig. On the other hand, you might have also pictured a person ..., a policeman, an ugly person, a fat person or a slobbish person. Since there was no further description your mind brought forth its own unique image. And, even more complexing, the image might be different for an individual based on a specific point in time and circumstantial reference.

After a meeting is over, how many times have you discussed what was said with a few of your associates who were also there, and found that you each heard something a little different? I’ll bet that most of you have experienced the phenomena more than once. What happened? It’s relatively simple. Each person’s brain processed the words that were spoken in a different manner, according to the specific individual’s conceptualization of the words and their combinations.

Languages have evolved from the minds of men. Yet, each individual interprets words and combinations of words differently. Communications is a complex concept. It spans a wide spectrum of human endeavor to impart information, of diverse nature, from one person or a group of persons to other persons. It can include an event, a situation, a concept or a feeling. It is accomplished through words (written or spoken), pictures, sounds, inflections, noises, experiences and gestures. Often the most effective method of communication involves several methods in combination.

Dr. Edelman relates the TNGS to the evolution and development of language. He also demonstrates the integral relationship between the biological functions of the total brain and its value systems to language. He challenges many of the formal views of language in favor of a cognitive model approach based, in part, on concepts suggested by G. Lakoff and related work[10]. According to Edelman, the Lakoff approach to grammar and semantics is consistent with biological and psychological facts encompassed by the TNGS.

The mind first conceptualizes a model. According to Edelman “the mind creates a propositional idealized cognitive model ... uses basic level concepts ... entities, actions, states, and properties. Simple propositions follow the part-whole schema: the proposition is the whole of which the predicate is one part and the arguments (agent, patient, experiences, instrument, location, and so on) are the other[11].” Then, when linguistic components are applied to the conceptual model, it becomes a “symbolic idealized cognitive model” (SICM). The SICM uses the specific language of a particular culture and is made up of central radial categories of words which include verbs and nouns. Non-central categories of words are then adjectives, abstract nouns (e.g., strength), prepositions and other words which are motivated by the central members.

From Language Back to Function

In the earliest development of language, sounds were used to identify objects (nouns). In a particular grouping of prehistoric humanoids, sounds were used to identify common objects such as “tree,” “rock,” “bear,” “female.” By agreement certain sounds became associated with specific physical objects. Next, came the verbs: “go tree”; “get rock”; “bring food.” Then came the adjectives: “go big tree,” “get big rock” ... and that was just the beginning. However, if you also stop a second and think about it, doesn’t that sound similar to how children develop their language skills today? Certainly. Nouns come first, then the verbs, then all the glister.

Today, modern language systems are extremely complex. A simple statement of many years ago like “eat food” has evolved into something much more difficult, like: “I’m hungry for a one-pound, medium-rare, rib-eye steak, baked potato with all the trimmings, and a piece of apple pie.”

While our evolved complex language systems are used as a major component of communication, all of its enhancements (glister) often cloud the issues and the basics get lost. Lost, like a small piece of garlic in a bowl of spaghetti. You sense (taste) the influence, but
Figure 1: FAST diagram of a project premise
may never see the source.

The function definition approach used by the VM, has a cleansing effect on our language and thinking. By forcing clear-cut "verb-noun" statements of purpose, need or action, the subjects of study, discussion or analysis are forced to a basic thinking level. In a team effort, this serves to get everyone on the same track, because the verb-noun function statements force cross-communication and consensus understanding. This represents a convergence of the different mapping systems of each unique brain. Understanding these basics then facilitates the understanding of the value systems that are involved and often a clarification of value criteria. In some cases such activity may even have an altering effect on the higher order value patterns of specific participants.

The "verb-noun" definition approach is consistent with the central radial categories of words which fit into the SICM and the total TNGS concept. The definition of "function" used in the VM, would appear to force the language into a mode that is consistent with the cognitive processes of the brain and bring whatever is being evaluated down to its very basic level.

It then follows, that everyone can look at the problem from its basic aspect (basic function) and then move forward to identify all of the other related functions being performed (secondary, all the time, etc.). Completely unnecessary functions often surface, such as the in the earlier example of "inhibit terrorist."

**From Function to Fast**

Functions arranged in a manner that will answer the questions of How? Why? and When? result in what we typically call a Function Analysis System Technique (FAST) diagram. It appears, that the FAST diagram is a form of SICM which may mirror the mapping effect of the brain. It may, in fact, serve as a reentrant mapping mechanism or catalyst which improves understanding and sets the stage for creative activities and analysis.

Figure 1 represents a form of FAST diagram which was developed from a 30-page document which defined the business plan for a new chemical/polymer processing plant. This diagram allowed the entire document to be condensed to a single page. When it was developed in a VM team study environment, it helped everyone to clearly understand the project and its purpose. It put many things in perspective. When the diagram was presented to the steering committee who had developed the plan, they readily understood it and were amazed to see what they had composed put into such a simple, logical arrangement.

One unique aspect of FAST that has been picked up by the Japanese, is that the higher order functions define the purpose. Since they do not have a word equivalent to our "Why?" they use their best equivalent, which is "for what purpose?" As a result, the functions at the far left of the diagram (i.e., higher order functions) define the purpose.

**Intelligence**

Over time, those of us who have taught Value seminars have observed that some individuals embrace the concepts rapidly and see them as a vehicle through which they can increase their ability to think, analyze products/projects and solve problems. Many have commented that learning the VM of Miles has helped them improve the way they perform their normal jobs. Several have even changed their profession.

Based on observations by Larry Miles, this author and others in the industry, it would appear that the impact of learning the VM increases in some relationship to intelligence. This was first formally proposed in several presentations in Korea[12] and Japan in 1991 and was published in the U.K. in 1992[13]. Figure 2 graphically indicates the suggested relationship.

There is no empirical data to support this proposition, however the observations are not unique to American culture. In 1988 Dr. Takehiko Matsuda of the Sanno College of Japan, proposed that the VM is one important element that can be used to increase organizational intelligence[14]. In 1991, when the concept shown in Figure 2 was presented to representatives of Fuji Photo Film in Japan, Mr. Sadao Kawamura, the top VM specialist in the company, shared an alternative concept which he had evolved, which is represented in Figure 3.

It is interesting to note that until the 1991 American-Japanese interchange, there had been no prior cross-cultural communication...
of these concepts. The independent observations, in two drastically different cultures support the premise that there is some relationship between intelligence and the impact that the VM has on a persons ability to understand, accept and use the concept.

Perhaps, further investigation into the relationships between the TNGS and VM could shed light on this subject. It would require definition of the measurement system for the y-axis of the graphs in Figures 2 and 3, as well as a significant sampling of individuals in a "before" and "after" VM experience. Some early discussions questioned if VM could have the effect of increasing intelligence. Accepted standards, are that you cannot improve an individuals intelligence quotient (IQ). Could this be another area of conventional thinking that could be challenged? Or, are there more things that need to be considered in determining intelligence?

**Conclusions**

There is a definite relationship between key elements of the TNGS of Edelman and the VM of Miles. There is also much room for research and development. It is suggested that VM activities be conducted as part of clinical research concerning the brain and its thinking processes. Since there may well be some aspects of the VM that support the TNGS, perhaps Dr. Edelman’s research can be expanded to include the VM as an application area of the TNGS.

The VM has long sought a home, somewhere in the halls of higher education. Because the TNGS and the VM span so many traditional areas, it would appear that the VM may most appropriately fit under the higher umbrella of neuroscientific research.

Finally, it is evident that everyone really does some form of analysis based on value as an intuitive, or evolved, characteristic, using their individual value system, value criteria and value patterns. What is different about the VM, is its organized approach and specific function techniques that facilitate the understanding and analysis of value. VM professional practitioners should change their attitude and turn the old roadblock into an asset: “Yes, you do use value in your analysis and decision making, but what we offer is an approach to do it more effectively, faster and in a way that enhances communication.”

**References**


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