

# THE STATISTICAL CONSULTANT

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Section on Statistical Consulting  
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## **Book Reviews: GOAL/QPC's Memory Jogger Guides (Memory Jogger II, The Team Handbook Memory Jogger, and The Project Management Memory Jogger)**

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GOAL/QPC ([www.goalqpc.com](http://www.goalqpc.com)) has published a series of pocket guides known as Memory Joggers designed to help organizations continuously improve their business practices. For the statistical consultant three of these books, Memory Jogger II (MJII), Team Handbook Memory Jogger (THMJ), and Project Management Memory Jogger (PMMJ) provide easy-to-read tips and serve as handy quick references.

The MJII includes 23 tools essential for continuous quality improvement and for effective planning. Included among these tools are seven basic quality control tools (Pareto charts, checksheets, control charts, histograms, scatter diagrams, cause and effect/fishbone diagrams, and flowcharts); seven management and planning tools (activity network diagrams, affinity diagrams, matrix diagrams, tree diagrams, interrelationship diagrams, prioritization matrices, and process

decision program charts); and team effectiveness techniques (brainstorming, radar charts, team guidelines, force field analysis, nominal group techniques, and problem solving/process improvement storyboards).

While the above tools are useful for continuous improvement and effective planning, the MJII is generally lacking in statistical tools beyond basic SQC control charting and process capability tools. Some of the statistical tools that are included might seem too elementary for the statistical consulting audience. On the other hand, this book includes good, simple-to-follow examples of advanced statistical techniques like Saaty's analytical hierarchy process with prioritization matrices, and critical path methods.

Targeted more specifically to team interactions, the THMJ contains guidelines to enable team members to have "good team experiences." Its major topics (and key subtopics)

include:

- Preparing to be an effective team member (personal skills checklist, responsibilities, listening for understanding, giving and accepting useful feedback).
- Getting a good start (start-up checklist, keys to getting a good start, agreeing on a team purpose, ground rules and logistics; identifying stakeholders, limits, and expectations; defining team roles).
- Knowing when and how to end (closure checklist, knowing when the purpose is achieved, maintaining the gains, completing documentation, evaluating the team's work, sharing results, and recognition and celebrating).
- Problems within the team (checklist of common problems with detailed descriptions of the symptoms, why it is important to deal with the problems, and tips and ways to deal with them).

The THMJ has a number of valuable features: (1) tips for dealing with overbearing experts and those with power; (2) ways to handle conflict and disagreement from the people who make up teams; (3) a clear organization of the importance of the topics, examples, and what readers can do; (4) checklists useful for consultants. Again, these are presented in a compact, pocket-sized reference. A weakness is that THMJ does not offer enough tips for using statistical thinking — ways of capitalizing statistical data to measure and understand processes.

Less focused on teams and more on the projects that they deal with, the PMMJ steps through the process of moving projects from conception to completion. Its main chapters (and subtopics include):

- Creating successful projects (definition of what a successful project is, planning the journey, roadmaps, and timelines).

- How to create a project charter (defining project scope, boundaries for deliveries, determining deadlines and constraints).
- How to work together as a team (developing groundrules, meeting guidelines, “parking lot” and issues lists).
- How to create a project plan (developing a list of required reviews, approvals, risks, schedule and budget determinations).
- Doing the project (monitoring progress, resolving problems and managing change, project review meetings).
- How to close out the project (feedback and lessons learned).

The PMMJ follows the steps of basic project management. A weakness is that it does not give the readers enough ways for dealing with problems that hinder a project's progress other than just documenting activities or forming “issues parking lots” for further discussion by project teams. This is not to say documentation is not important, but readers need to find ways of moving beyond the stumbling blocks that hold a project back. Perhaps cross-references to other MJs or relevant literature would help.

The basic layout of each Memory Jogger topic has a neat order of presentation covering issues such as: “Why is (this topic) important?” “What can you do?” or “Why do it?” “How do I do it?” The PMMJ provides steps to follow in carrying out the topic with a form or filled-in example.

It is worth commenting on the examples that appear in THMJ, for example, to illustrate further the approach and limits of the Memory Joggers.

“Examples of measures” and “Examples of using data to check progress” (pp. 105-106) illustrate the use of statistical measures. The example uses a dot plot histogram that compares differences of a basketball player's number of foul shots made (after three attempts).

The claim was that more foul shots were made after training than before. From just the data presented, one could represent the same data with a box-whisker plot and accompanying F-test. This would show that training not only improved foul shots made, but also how variability was reduced. (Example of “Using Data,” pp. 87-91).

Another example (p. 90) illustrates the use of data to pinpoint problems with product or process. The data are displayed as a run chart (plot of moisture content by 25 time points). The time points 19-25 show a linearly increasing trend. The caption suggests that the team look for “something special happening” in the process. Careful examination of the plotted points for times 5-15 suggested a cyclical pattern: regularly recurring peak points followed by two or three low points. Such patterns would also lead an analyst to further investigation, but nothing was said about them in the interpretation provided. In addition, the scatter plot on page 91 could have been enhanced with multiple box plots to show differences in variation between each of the missed classes.

While these Memory Joggers are useful, to me they suggest the need to produce a pocket guide for consulting statisticians, say the Consulting Statistician’s MJ (CSMJ) or Statistics MJ (SMJ). The CSMJ should cross-reference useful techniques from other MJs. The chapters of such a book could borrow from the best sections of MJII, THMJ, PMMJ, and Boen and Zahn (1982), and embrace a philosophy of “statistical thinking.” That is, a philosophy of learning and action, based on three fundamental principles: All work occurs in a system of interconnected processes, variation exists in all processes, and understanding and reducing variation are keys to success (Quality Press, 1996). Statistical thinking emphasizes ways of integrating disciplines in managing and improving operations — statistical methods focus on statistical technical tools for analyzing data. In addition, statistical thinking forces consultants to expand beyond the tra-

ditional roles of “police officer/priest,” “fire-fighter,” “technician,” “healer,” and “teacher” and adopt roles of “colleague” and “collaborator.” See Clayton (1998).

Here’s how this reviewer sees the five chapters of the CSMJ/SMJ.

Chapter One: Client-Statistical Consultant relationship. The Client’s problem/question; client’s jargon and science; a scenario example of the client/consulting statistician’s dialog; a layout of the questions, issues, and road-map/game-plan to meet the client’s needs (whether to answer the client’s question(s), solve the client’s problem(s), improve the client’s process(es), product(s), or performance). Clarify the role of statistical thinking throughout the Client-Statistician relationship distinct from statistical methods.

Chapter Two: Study approaches to the client’s questions or problems posed; list various approaches, their pros and cons; include in this chapter a “methods” matrix. The rows would list various statistical tools (e.g., t-test, ANOVA, ANCOVA, regression, EDA, etc.) while the columns could include brief descriptions of what the tools are used for; the assumptions data must follow for each statistical tool to be used; ways of detecting whether assumptions are met by the data; and alternative actions to take if assumptions are violated.

Chapter Three: Ways the Client and Statistical Consultant can work better together; show the use of a deployment flowchart of responsibilities; develop ground rules for meetings and discussion, expected outcomes, etc.; construction of risk priority matrices (similar to reliability assessments of occurrence, detectability, and severity in failure mode and effect analyses).

Chapter Four: Ways to check progress between the client and consultant; closure checklist; evaluations and documentation; maintain progress; sharing of results; recognition and celebration.

Chapter Five: Close-out; lessons learned; what worked, what did not work, what could have been done better. The changing roles

of the statistical consultant, strategies for remaining valued today and in the future.

Appendix containing, in more detail than Chapter 2, a description of various statistical methods used in consulting practice (T-Tests, F-tests, ANOVA, Regression, etc.); the assumptions data must follow when using the methods (normal distribution, homogeneous variance, independence, etc.); ways of assessing the validity of the assumptions; alternative approaches to take if assumptions are violated; incorporating Bayesian prior probability estimation to provide posterior uncertainties arising from strategic planning, managerial and operational development; lists of other resources available for help, e.g., ASA and the GASP web site (West et al., 1998).

What do readers of this review think about such a book? The issues of statistical consulting have been discussed by various other statistical groups. Hahn and Hoerl (1998), Snee (1998) and discussants stressed the importance of changing from the traditional role of “remote consultants” to one that is more proactive, where the statistician can “be valuable and influential in the future environment” (p. 212).

The proposed CSMJ would be a desirable end-product. For the present time, the three MJs provide sufficient guides that give statisticians essential non-statistical skills; they provide a set of essential core competencies nec-

essary to be a valued, effective contributor in any organization.

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## Statistical Consulting in Developing Countries

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This article serves to highlight some of the concerns as well as the challenges that inde-

pendent consulting statisticians face in developing countries. I relay some of my experiences

working in Trinidad and Tobago and to a lesser extent in the English-speaking Caribbean. I provide some of my views regarding the necessary tools for effective consulting and comment on prospects for the future.

## The Profession

Let me first begin by giving a brief sense of the attitude towards statistics in developing nations. In my view statistics is basically conceived as a number crunching exercise and statisticians are perceived as number junkies. It seems to me that perceptions of Statistics are very limited in the Caribbean, and that statistics is being relegated to sample surveys and opinion polls (and oh how these are loved during the general elections!).

Unfortunately, it seems that business researchers, whether they are in Market Research, Psychology, Agriculture or Customer Service have not seen statisticians as an integral part of the research process, but rather as persons to call in when their data need to be analyzed. Statisticians are called in many instances to make sense out of nonsense, but too often the information that can be extracted from surveys is minimal. Thus, many reports present little more than bar and pie charts. When a more sophisticated technique such as factor analysis is used, the assumptions are often violated and erroneous conclusions are drawn. But, what is even more disturbing is the trend of poor methodological practices. Telephone polls are often used with faulty questions. Recently, one of our television stations posed the question: “Do you think there should be a referendum on the death penalty?” — a question which really does not give an indication on the actual number who will favor or not favor the death penalty. It is no wonder that, in a recent report by the Inter-American Development Bank, the Bank noted that surveys done in the Caribbean were not being properly and fully analyzed.

## The Tools

What recommendations do I have for the a person interested in pursuing a career as a consultant in the Caribbean? One of the prerequisites of the statistical consulting profession is a good degree in statistics. My definition of a “good degree” is a post graduate degree. The University of the West Indies (St. Augustine Campus) offers a Masters degree in Statistics. While the degree is good, it should only be used as a stepping stone to your goals. Finances permitting, one can consider pursuing a Ph. D. outside the Caribbean at one of the more prestigious universities; Commonwealth and OAS fellowships are available in support of this. The course of studies one undertakes should be as practical as possible and exposure to statistical software is essential. The courses I strongly recommend for consultants who wish to work in the Caribbean are:

- Total Quality Management
- Sampling Theory and Techniques
- Linear Statistical Models
- Statistical Consulting
- Forecasting Techniques and Econometrics
- Statistical Theory
- Practical courses on demographics, population studies or market research depending on your area(s) of interest.
- Statistical Computing
- Operations Research
- Design and Analysis of Experiments
- Quantitative Methods and
- Multivariate Techniques

To be effective, the consultant needs to be continuously informed of the latest trends and developments in his area(s). Libraries in developing countries often contain outdated books

and journals. Budget cutbacks also prevent these institutes from accessing some of the latest books and journals. Therefore, it is well worth joining some newsgroups like “Allstat” and “timeseries” to keep in contact with upcoming seminars and courses. The Internet is often a good source of free information including journals and papers. Online books can also be helpful. I have downloaded a lot of questionnaires and methodological reports that are beneficial to my areas of interest. Joining a few reputable international statistical organizations such as the American Statistical Association and the Royal Statistical Society is also an important way to be informed of new methodologies.

Software is also a key concern for statistics professionals in the developing countries. In my view, the software that is mandatory for statistical consulting includes SPSS, Statistica, Minitab for Windows, Stata, S-Plus, Epi-Info and ML-Win for those involved in multi-level analysis. In listing these packages I have left out SAS. The cost of SAS is usually out of reach of the average consultant. One point to note here is that software developers in the US and UK have not really asked for input or even tested their products in developing nations to see their effectiveness locally. I would suggest that software developers consider statisticians in developing countries as “beta testers” of their software. This might even help them in getting a larger market share in the long run.

## Future Prospects

At the end of the day, how will independent statistical consultants survive in developing

countries? One of the most obvious ways is to continue working along with the other professionals such as economists, being secondary rather than primary consultants.

Secondly, statisticians need to educate the powers that be of the value of statistics and the advantages of using a statistician as a research officer rather than an MBA graduate. It is really time that certain standards be set such as provided by the “Certified Statistician” or even the “Chartered Statistician.” I believe that respect for the profession will be greater if a greater number of statisticians possess these qualifications.

Thirdly, statisticians in the developing countries need to network with other statisticians and (to a lesser extent) non-statisticians in the developed countries so that they can vie for more lucrative international contracts given by the Inter-American Development Bank and other international institutions.

Fourthly, statisticians need to diversify and develop expertise in other non-traditional statistical areas such as finance, market research and psychometrics.

In concluding I will say that statisticians in developing countries need to take the responsibility of moving their profession from being a back-up or support profession to one of being a stand-alone profession.

I would like to correspond with anyone who would like to be involved in a pool of consultants from both the developing and developed countries.

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## Notes from the Editor

- It is time for me to move on. I have been editing *The Statistical Consultant* for four years now, and once this issue hits the streets, I will be hanging up my blue pen-

cil (as it were) and leaving the editorship of the newsletter.

I make this announcement with mixed emotions. I have had a great deal of

fun working on the newsletter and I have been thrilled by the volume of responses and suggestions that readers have mailed in. At the same time, the process of putting the newsletter together has been a time-consuming one and there are many other things that must be done.

I am happy to announce, therefore, that we have a new editor, Chris Gullion. I hope that you will be as supportive of her as you have been of me. Chris has a number of exciting ideas for the newsletter, and I know that, in turning it over to her, I leave it in excellent hands. Don't forget that book reviews, articles, suggestions of articles, letters, and ideas are all welcome. These can be mailed to Chris via e-mail at: [Christina.Gullion@Columbia.net](mailto:Christina.Gullion@Columbia.net)

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- I have a number of people to thank for their help and support during my tenure as editor. I start by expressing my deep appreciation to all of the authors who have contributed material. Two of these deserve special mention: Richard Browne, who contributed *many* fine articles, and Roy Tamura, who not only contributed an article himself, but then rustled up a number of additional articles by other authors. Other members of the Executive Committee of the Section on Statistical Consulting also provided support in many ways. I would like to especially thank Sandra Stinnett, Marcia Gumpertz, Keith Muller, George McCabe, Janice Derr, and Ron Wasserstein for their encouragement and support. And finally, I owe a huge debt of gratitude to my secretary, Candy Smith,

for help with layout and proofreading.

- I have used this column to invite you to submit articles and comments about issues of interest and concern to statistical consultants. I would like to leave you with one final thought in that regard.

It has often been suggested, somewhat defensively at times, that statistical consulting is just as worthy an academic pursuit as the more traditional academic roles involving teaching and research. Indeed, collaborative research is what the consulting role ideally leads to. Moreover, I maintain that consulting also involves a great deal of teaching — the difference is that on any given day we don't know what the curriculum might be until we meet with our client/collaborator.

I would like to suggest that we as statistical consultants have an additional role and responsibility that we all too often neglect (myself included). I believe that we should be spending more effort not just *doing* consulting, but also being scholars *about* consulting. Keith Muller has suggested to me that, just as *The American Statistician* has a "Teacher's Corner," so too should there be a "Consultant's Corner." I agree. We should not only be practicing as consultants, but we should be writing, researching, and teaching about consulting.

Certainly some of our colleagues have been doing just that, and I applaud their efforts. But I think we can and should do more. I am certain that there is a sea of excellent ideas out there concerning consulting tips, tricks, ideas, philosophies, theories, and exercises. We can all benefit from pooling our collective wisdom and experiences. Whether you are in an academic setting or in industry or government, I invite you to share your thoughts and ideas, whether it be at a session at the JSM, or in this newsletter, or in one of the many statistics journals.

(It's one of my New Year's resolutions to do so, and I hope it will be one of yours, too.)

- Although new business for the newsletter should be sent to Chris, comments on the current and past editions can be sent to me at: [clayton@stat.wisc.edu](mailto:clayton@stat.wisc.edu)

or by US mail at:

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- So long!

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