

The “P’s” & “Q’s” of Assessing Program & Project ‘Outcome’ Effectiveness ¹

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Introduction

My letter to the Editor last month highlighted my concern that the Project Management Institute’s 7th Edition of their **PMBOK®** broadens the Project Management Team’s scope of responsibilities to encompass *effective delivery of Outcomes*. Although still only a “Guide” rather than an absolute edict, regardless of where you stand on the issue, **there is still a need by executives, managers and project management practitioners at all levels for increased awareness and understanding of tools & techniques to assess Outcome effectiveness.**

To that end, the following **two ‘Best Practice’ techniques** in the professional Evaluator’s toolkit are available:

- 1) **Pearson’s Correlation Analysis** to assess the possible extent of ‘Cause & Effect’ between project deliverables and their Outcomes, and
- 2) **Yule’s ‘Q’** to determine the ‘Necessity & Sufficiency’ of those deliverables – *i.e. your program & project Inputs and Outputs* -- to attain Outcomes.

ON THE ISSUE OF RESPONSIBILITY for OUTCOMES

Whenever government and business executives envision improving situations within their areas of responsibility, they clarify the felt need in accordance with their Vision; specifying the Outcomes desired, then mustering resources to initiate programs & projects to deliver the requisite wherewithal – *i.e. infrastructure, goods and/or services* – to achieve their objectives.

The **importance** of relating project deliverables to organizational strategic objectives was recognized by the international development community² in the late 1960’s and they subsequently

¹ How to cite this article: Smith, K. F. (2022). The “P’s” & “Q’s” of Assessing Program & Project ‘Outcome’ Effectiveness, *PM World Journal*, Vol. XI, Issue III, March.

² *i.e.* USAID, the World Bank Group, Asian Development Bank, etc.,

adopted or adapted the **Logical Framework** technique³ to address the issue. [My April 2021 PMWJ article⁴ describes the concerns and issues precipitating the Logframe’s origin, as well as its evolution, scope and respective managerial-level constraints.]

Until the 7th Edition of its PMBOK in 2021, however, the Project Management Institute (PMI) was largely oblivious to the ‘Output-to-Outcome’ issue; or treated it with benign neglect. So, PMI’s recent recognition that “*Projects do not simply produce outputs, but more importantly, enable those outputs to drive outcomes that ultimately deliver value to the organization and its stakeholders*”⁵ is a welcome addition to the program / project management community at large.

Nevertheless, **I contend PMI’s new stance of holding Project Managers and their teams responsible for also attaining those Outcomes⁶ is excessive, incongruous, misdirected and untenable.** My aforementioned PMWJ article outlined the basis for this disparity and the impracticability of the new PMI position, but the point is worth reemphasizing with a few ‘For Instances’ from different sectors:

- **Agriculture: Individual farmers manage, plant, nurture, harvest and market their crops – not the project team!** *The project management team* providing field demonstrations, credit, inputs and extension services to farm communities and individual farmers **cannot be held responsible** for attaining the increased crop productivity, production and farm incomes upon which the project farm plans & budgets were premised.
- **Agriculture Infrastructure: The project management team** that successfully constructs and turns over an irrigation system to a farmer or farm-cooperative association **cannot be held responsible** for attaining the increased crop production that was anticipated to be produced therefrom. **Utilization, and maintenance of the system is no longer within the output delivery project management team’s control.**
- **Infrastructure:** Similarly, **neither can the project management team** that constructs a highway or a bridge connecting two -- or more -- population centers **be held responsible**

³ Developed by Leon Rosenberg & Larry Posner of Practical Concepts, Inc. (PCI), for the US Agency for International Development (USAID).

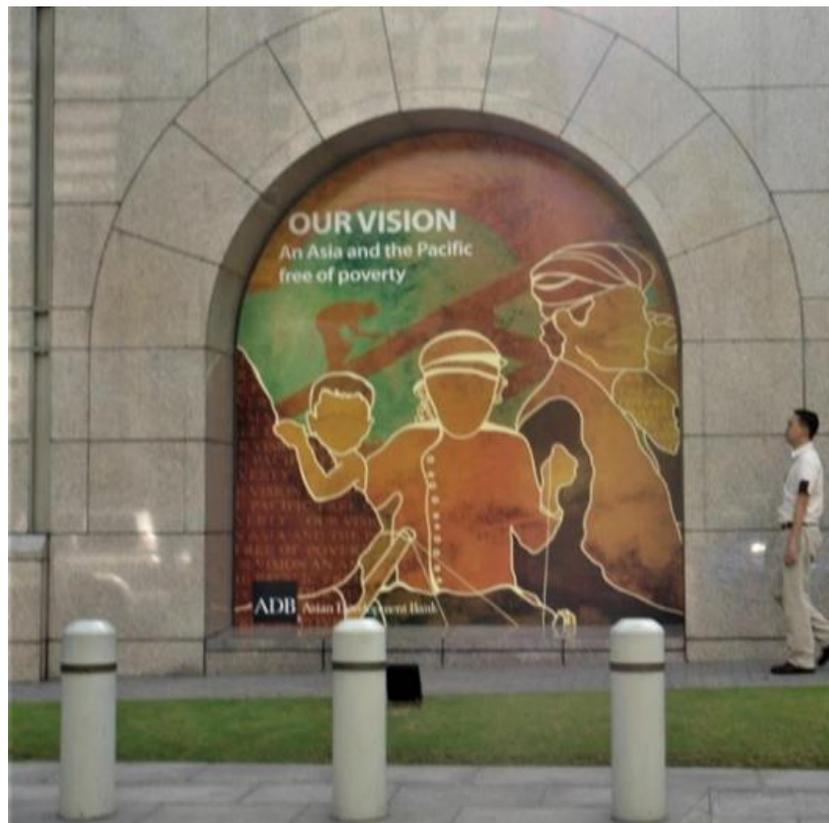
⁴ Smith, K. F. (2021). Managing Project & Strategic Objectives with Logframe Analysis and the Logical Framework, *PM World Journal*, Vol. X, Issue IV, April.

⁵ The Standard for Project Management and A Guide to the Project Management Body of Knowledge. (PMBOK GUIDE 7th Edition. Preface, Summary of Changes. p. xi.

⁶ i.e. “**Project Manager. The person assigned by the performing organization to lead the project team that is responsible for achieving the project objectives**” [*Emphasis mine.*] -- Ibid. p. 16.

for the multitude of anticipated economic benefits which could accrue to the residents by facilitating the movement of people, their possessions, and products from one point to another -- and upon which the project was originally justified by extensive cost/benefit studies. **Any benefits achieved by residents are a function of their activities and initiatives, given the infrastructure; not derived from the infrastructure, per se.**

- **Education:** *The project management team* that provides teaching facilities, materials and other resources – including upgraded faculties – **cannot be held accountable** for the subsequent use (or misuse) thereof; **or responsible** for the ultimately desired heightened levels of knowledge, literacy and skilled Outcomes. **Benefits from the acquired attributes is again a function of their utilization by recipients.**
- **Health: Maintenance of one’s health status is an individual responsibility.** *The project management team* that provides health facilities, equipment, medication and medical supplies; and even training for a community relinquishes its responsibility when those contractual items are delivered to the next levels of management slated to provide preventive and/or curative services. Even this level **cannot be held responsible** for the community’s health status, no matter how hard they strive – witness the current virulent covid pandemic, despite government struggles to abate the crisis by vaccinations, facemasks, lockdowns and mandates.
- **Joint Venture Projects:** Getting participants to divvy up and contribute their talents as well as some resources, and work together as a management team on a multi-donor health project is relatively easy; but **quantifying any individual input-to-outcome responsibility as a catalyst is impossible**, and even attempting to do so would be an evaluation travesty! **While everybody could take credit for contributing to the Outcome, it would be ludicrous to claim any percentage share of the changed health status. The same rationale would apply to joint venture projects in other sectors.**
- **Economic Development in General: The Asian Development Bank (ADB) VISION** of “*an Asia & the Pacific free of poverty*” is a worthy one, inscribed on the walls of its Headquarters in Metro Manila.



To that end, for many years the Bank has had, and continues to have, a vast and ever-changing portfolio of diverse programs and projects. However, apart from ADB, there are a myriad of other dynamic actors and factors involved in the region’s environment. Thus, throughout the Asia and the Pacific communities the Bank serves, *there is no way the current poverty status vis a vis the Bank’s Vision can be attributed to specific individual Bank projects; their management teams held responsible for the current status*, or their marginal contributions measured by multivariate analysis.

In all the foregoing situations, **OUTCOMES are not immediately manifest**. Usually, after project Outputs have been delivered a period of adjustment occurs before their impact is absorbed and a new ‘steady state’ is attained. Thus, **timing** when to conduct evaluations is also very important; which *tends to absolve project management teams of responsibility as well as preclude them from participation*; because after delivery, those involved soon move on to other projects.

With these few representative illustrations – each with which I have had working level experience over the years -- I rest my case. **In short, the responsibility for Outcome attainment is beyond the scope of project management teams, and lies with the targeted beneficiaries; while the responsibility for conducting post-project effectiveness assessments rests with the executives who had the Vision and sponsored the program and project interventions.**

That is not to say project management teams should not be concerned with Outcome attainment; far from it. Only that *any* assessments as to the post-project state -- and the extent to which program policies and projects may have contributed to it -- **are the responsibility of the intervening organization’s sponsors, executives and their professional evaluators.**

However, even though not their direct responsibility, nothing precludes Project Managers and their teams from **planning for Outcome assessment**, and developing familiarity with relevant tools and techniques. Indeed, if anything, it reinforces that need. As I pointed out in another PMWJ article⁷

Evaluation is neither the function nor responsibility of project managers. Nevertheless, whatever is learned from the evaluation, **the project manager will ultimately be held accountable for subsequent shortfalls by the target clients -- if not the sponsors!** Therefore, it is in the project manager’s direct interest to include sufficient resources during planning to achieve their project’s objectives beyond its immediate ‘deliverables;’ as well as provide for subsequent evaluations. Thus, even though not directly involved in evaluation, Project Managers should be familiar with the unique processes, tools and techniques of evaluators.

However, hitherto, since PMI never paid any attention to Output-Outcome linkages, they likewise ignored the need to address related evaluation aspects in their successive PMBOK guides. But now, it behooves organization Executives and their managers -- particularly PMPs and other PMI-*adherents* -- to incorporate Outcome evaluation into their project planning; as well as to acquire the tools, techniques and skills to evaluate post-project situations at some level within their organization. This article is directed to increasing awareness, and honing capabilities to that end.

EVALUATING FOR ‘OUTPUT-TO-OUTCOME’ CAUSE & EFFECT

By their very essence, each and every community situational environment is unique. Project-sponsoring organizational executives and their program planners therefore draw upon their collective experiences and respective areas of expertise – as well as think ‘out-of-the-box’ -- to design tailormade project interventions to address the need, as well as estimate the extent to which improvements can be wrought.

When conducting an evaluation, it is important therefore to:

- First, **compare the post-project delivery status of key indicators with pre-project baseline data; and note any changes.** This can be done by simple “*Before-After*” analysis.

⁷ Smith, K. F. (2018). Evaluation: The Project Management Cycle’s Sixth Dimension; *PM World Journal*, Vol. VII, Issue X – October.

- Second, rather than jumping to conclusions based on planning assumptions, expectations, or prior experiences elsewhere, **determine the extent to which any differences noted were due to factors other than the project’s deliverables.** The remaining obverse can then be attributed to the project deliverables. This process entails sophisticated “**With-Without**” **correlation analysis** – a technique usually lacking in the project implementation team’s skillset, or toolkit, which will be expounded on subsequent pages.
- **Ideally, do both “Before-After” and “With-Without” correlation analysis** – referred to as ‘**BAWWO.**’ Unfortunately -- for want of *a priori* baseline data, planning for a control group, limited resources, or timing constraints -- that is not always feasible.

2. MORE ON CORRELATION ANALYSIS

Correlation Analysis is the search to ascertain predicted assumptions, or otherwise discover the extent of dependent ‘Cause & Effect’ proportional relationships between two or more variables – in our context between particular Project deliverables and selected Outcome states. The strength of the relationship is expressed as a ‘**coefficient**’ – i.e. a constant number in a range between +1 and minus 1 with acceptable levels usually at or above +0.75 ((or below -0.75) – which also indicates whether the relationship is positive or inverse; that is they both change in the same direction, or one decreases as the other increases at some fixed rate.

Pearson’s⁸ correlation is the classic technique to assess the **relative strength of linear relationships** between data sets of two variables; even if one variable is a *non-linear* function of the other. As usual with statistics, the formula is quite intimidating:

$$r = \frac{\Sigma(X-\bar{X})(Y-\bar{Y})}{\sqrt{\Sigma(X-\bar{X})^2} \sqrt{\Sigma(Y-\bar{Y})^2}}$$

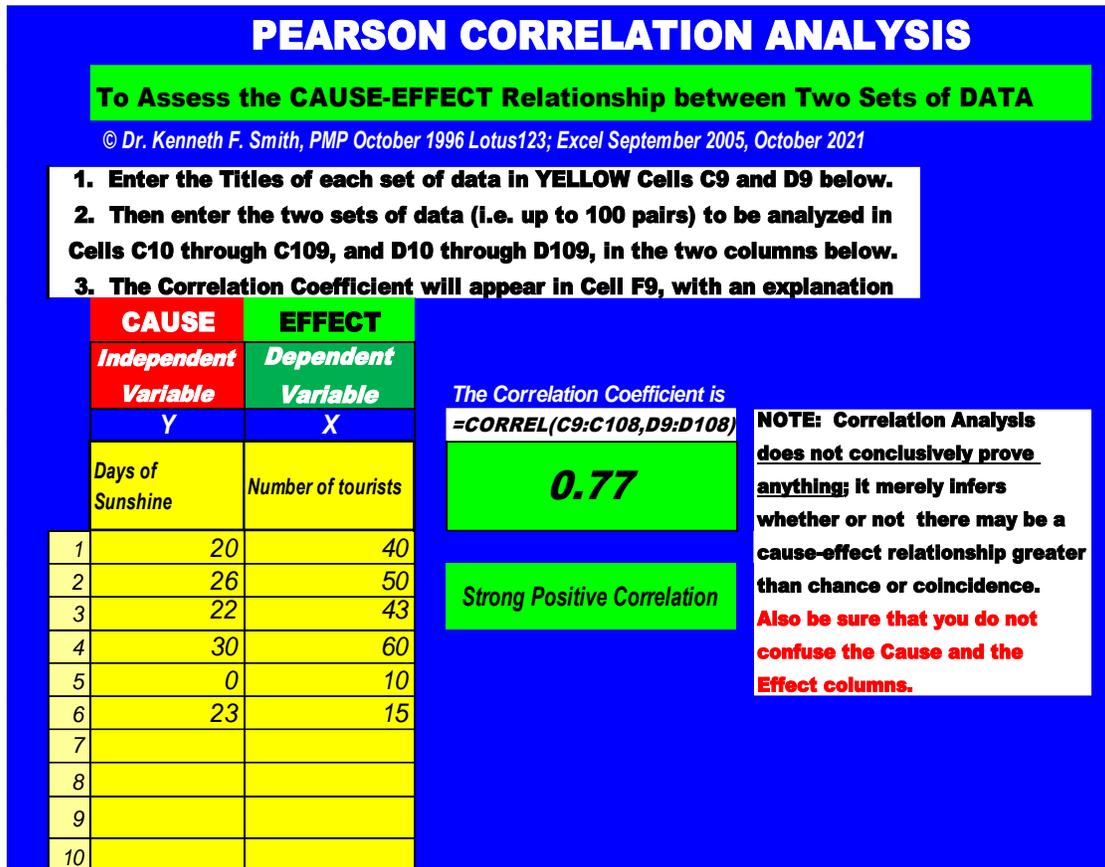
Where, \bar{X} = mean of X variable

\bar{Y} = mean of Y variable

However, I developed a template to facilitate its application:

⁸ Karl Pearson (1857-1936) was an English mathematician, and the ‘father’ of mathematical statistics.

Figure 1



Where the strength and direction of the association between two variables is assumed to be *non-linear*, Spearman’s⁹ rank order correlation is a preferred approach. Actually, Spearman’s formula is simpler to apply manually than Pearson’s analysis as the ‘dirty data details’ are not analyzed – only the relative rank order. However, the ‘Cause’ data must first be arranged in rank order to compare whether when one variable increases, the other follows suit by increasing or decreasing at some rate.

Spearman’s formula is less complex than Pearson’s:

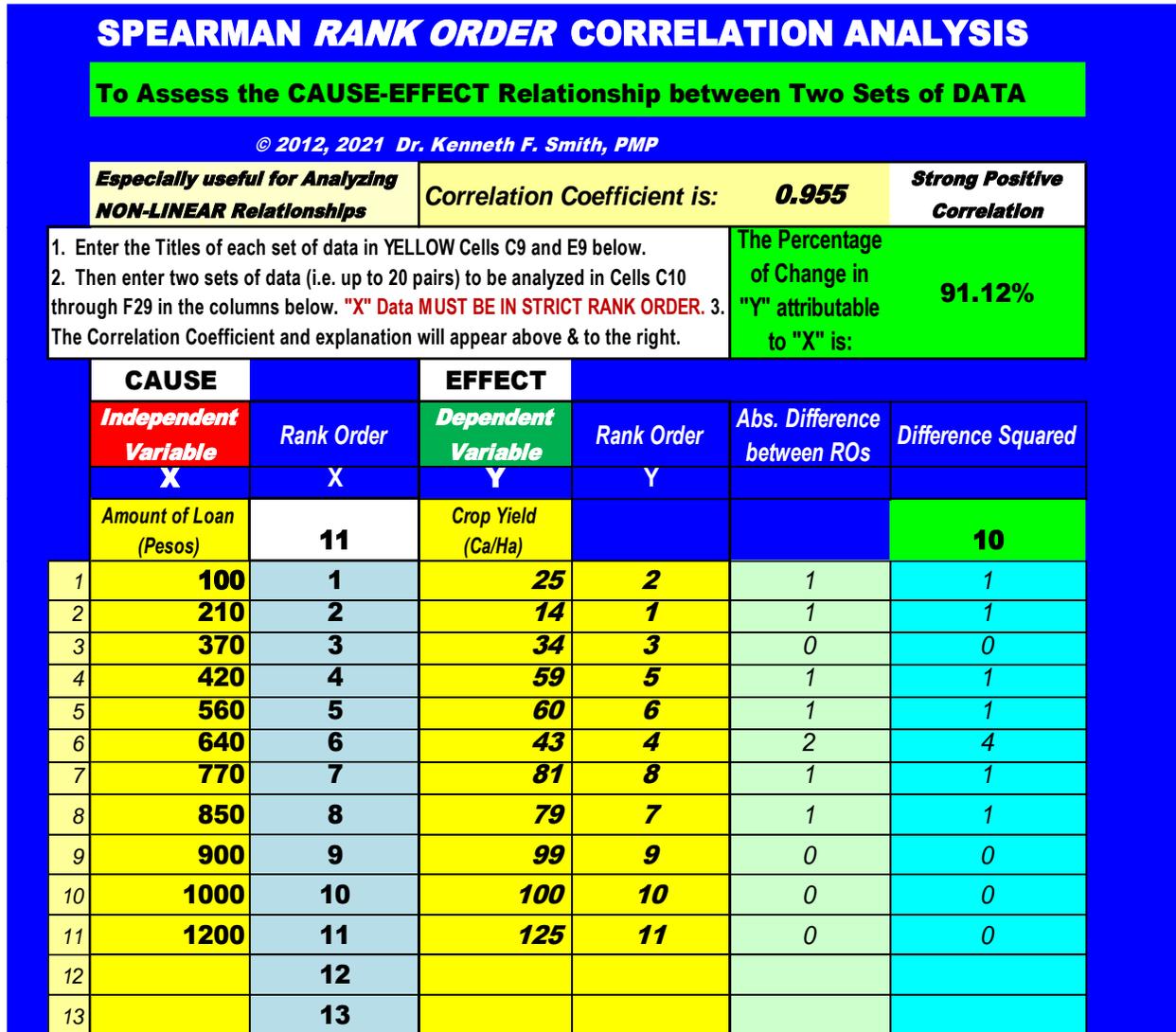
$$r_R = 1 - \frac{6\sum_i d_i^2}{n(n^2-1)}$$

where *n* is the number of data points of the two variables and *d_i* is the difference in the ranks of the *ith* element of each random variable considered.

⁹ Charles Spearman (1863-1945) was a British psychologist who developed formal factor analysis.

but I developed another template anyhow, to crunch the numbers and provide an assessment:

Figure 2



[NOTE: Be sure not to confuse the Cause and Effect columns; *vis*: ‘Higher rice productivity *does not* induce higher levels of irrigation!']

It is also important to note that correlation analysis does not conclusively prove anything. Correlation merely infers whether or not there *may be* a cause-effect relationship greater than chance or coincidence. A ‘cheesy’ example by Kathiann Kowalski¹⁰ illustrates this:

Eating more mozzarella cheese shouldn’t make engineering schools hand out more diplomas. Yet between 2000 and 2009, the more mozzarella that Americans downed, the more doctorates in civil engineering that U.S. universities awarded. Over a 10-year period, as levels of one went up, so did the other. The two showed a strong positive correlation. Yet almost certainly this happened by coincidence. One did *not* cause the other.

Perceived relationships may be spurious and other factors are actually responsible for the apparent effect. As Kathiann cautions in the same article: “*Another complication: Many events or trends can have multiple causes. And sometimes two variables might both be due to a third factor.*” **It is therefore important to search for other *plausible* explanations of apparent correlations before settling on the ones that match the program policy and project outputs.**

2. NECESSITY & SUFFICIENCY

Having determined that a cause-effect relationship exists between some project intervention Outputs and the program Outcomes, **the final task is to assess the extent to whatever was delivered was *necessary and/or sufficient*; -- i.e. did the project do enough to achieve the desired objective, or are more Outputs still needed?** For examining and evaluating this aspect, **Yule’s “Q”¹¹ is the capstone of the correlation approach.**

“**Necessity & Sufficiency**” determination is made from a comparative “Cross-Tab” statistical analysis of *Successes and Failures* in a “*With - Without*” situational matrix:

	Successes *	Failures *
	(In terms of the project outcome objective)	
With the Project	A	B
Without the Project	C	D
	<i>[i.e. the Control]</i>	

* *Quantitatively, these can be expressed in terms of either direct numbers or percentages*

A “Q” Score is calculated from the values in the matrix, *as follows*:

$$Q = \frac{(A \times D) - (B \times C)}{(A \times D) + (B \times C)}$$

¹⁰ Kathiann Kowalski, *Science News for Students*, July 24, 2015. Freelance Writer [Twitter@KMKowalski](https://twitter.com/KMKowalski)

¹¹ George Udny Yule (1871-1951) – a student of Pearson -- was another British statistician who authored “*Introduction to the Theory of Statistics*,” thereby capturing and furthering Pearson’s pioneering work.

Project Output deliverables are then assessed as being one of the following four states:

- 1. Necessary & Sufficient**
- 2. Necessary, but Not Sufficient**
- 3. Desirable, but Not Necessary, or**
- 4. Undesirable &/or Not Necessary**

Similar to Pearson’s coefficient, Yule’s “Q” score can range from +1 to -1 where:

- +1 = Complete positive association
- +0.75 or better = Strong positive association
- Range +0.74 to -0.74 = Weak or No association
- 0.75 or worse = Strong negative (inverse) association
- 1 = Complete negative (inverse) association

Criteria for each category are as follows:

1. Necessary & Sufficient

- The Q Score = +1.00
- “With” & “Without” are Mutually Exclusive -- **i.e. *the project is always successful, and without the project there is always failure*** [NOTE: Very Rare!]

2. Necessary, but Not Sufficient

- The Q Score = +1.00
 - Successes Only occur With the Project
- But some failures are also experienced With the project [NOTE: Rare!]*

3. Desirable, but Not Necessary, or

- The Q Score = is greater than +0.75
 - Most successes occur With the Project
- But some Successes also occur without it, and Some failures are also experienced with the project*

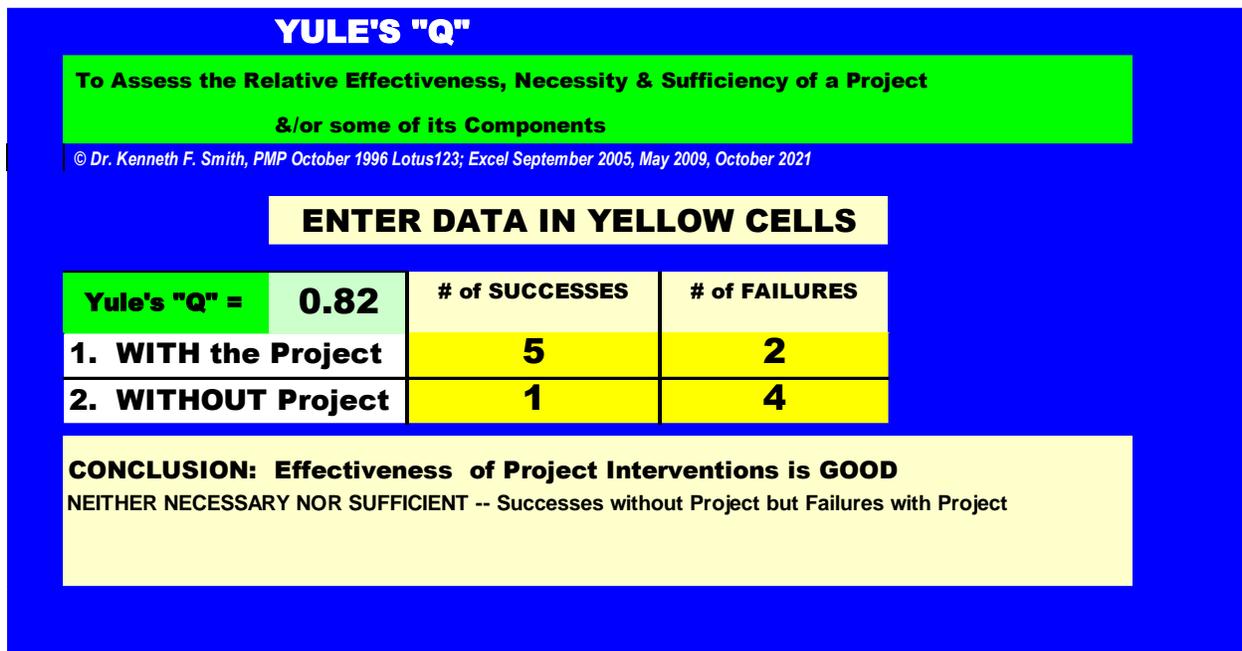
4. Undesirable &/or Not Necessary

- The Q Score = is Less than +0.75
- Successes occur Without the Project

Although some Successes occur, Many failures are also experienced With the project

I developed another template to calculate Yule’s “Q” and provide the Relative Effectiveness, Necessity and Sufficiency assessment:

Figure 3



NOTE: Successes and Failures can be expressed in terms of direct numbers or percentages

Pearson’s Correlation and Yule’s Q analysis are thus invaluable tools for probing the potential impact of projects delivering Outputs, and validating program policies.

The major constraints precluding utilization of ‘P & Q’ analysis are:

1. Availability of good data, and
2. Access to that data.

EVEN MORE VALUABLE than obtaining high correlation coefficients corroborating earlier planning assumptions **however, ARE FINDINGS OF ‘LITTLE OR NO CORRELATION’ IN RELATIONSHIPS WHERE CAUSE-EFFECT WAS EXPECTED. That is a clear signal the policy assumptions -- on which the relationship was premised -- were incorrect; the intended cause-effect of project outputs is inutile, and those efforts should be discontinued, and a search for other correlations should be conducted.**

For example, on one classic program with which I was involved, agriculture experts posited the reason small-holder rice farmers had low productivity rates was because:

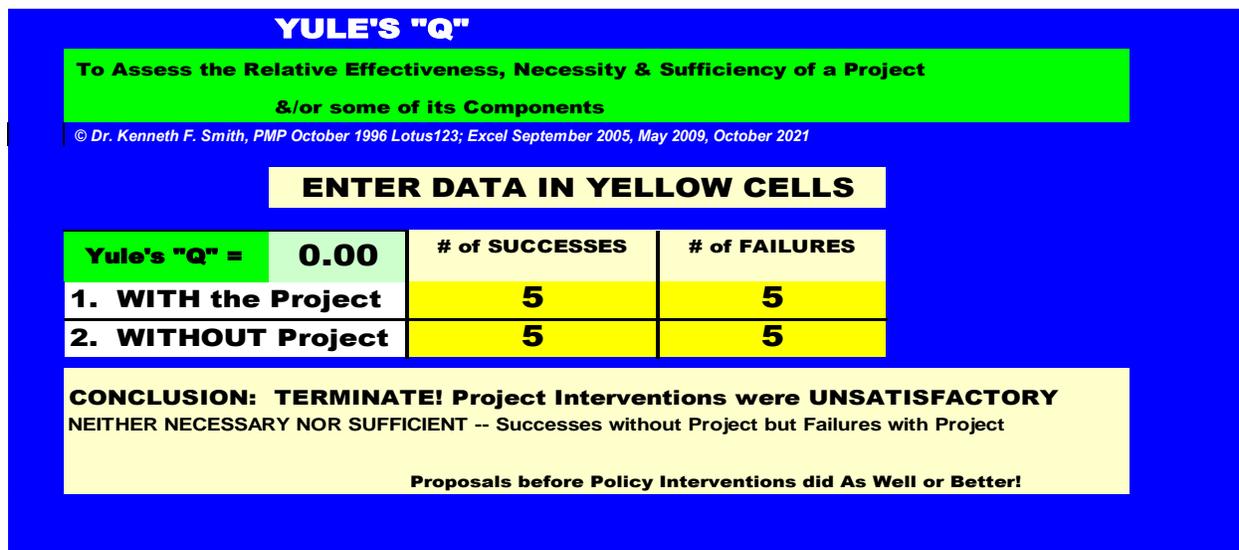
- 1) Farmers didn’t understand the requirements and methodology for growing the new high-yielding variety (HYV) rices, and
- 2) They couldn’t afford the requisite inputs.

A project to provide extension services and credit to targeted farmers was then launched.

Major improvements in the targeted farmers harvests were reported by the end of the season. However, even *despite a significant overall increase in productivity*, post-harvest **Pearson correlation analysis** revealed a lack of significant correlation between either extension intensity, credit amounts, or both by farmer recipients, and their increased productivity levels.

Furthermore, **Yule’s Q analysis** indicated there was *no statistically-significant difference* between productivity rates of farmers receiving extension &/or credit, **and non-recipients.** Thus, **despite the Ag. Experts presumptions, the project Outputs were apparently not the cause, and were therefore unnecessary for attainment of the Outcome.** Something – or things -- other than the project’s deliverables were therefore the cause.

Figure 4



Regardless of the nature of the program -- whether it be agriculture, education, health, infrastructure, or whatever -- the same P & Q tools & techniques can be applied to determine the extent of correlation of their project Outputs with their intended program Outcomes, and the necessity &/or sufficiency in meeting the desired objective, or the need for alternative approaches.

The current COVID pandemic and debate over the efficacy, necessity and sufficiency of vaccines, face masks, lockdowns, mandates and measures to address them engendering conflicts on the North American continent¹² **exemplify the crucial need for objective P & Q analysis. But it will only occur if – and/or when – more good data is available and accessible, and authorities have the political will to address the issues, accept the findings and take appropriate follow-through actions; as well as agreements – on both sides of the issues -- to abide by them.**

Unfortunately, in my experience as an evaluator (as well as peripheral observation), for the most part organizational executives, program managers -- and particularly technical ‘expert’ project managers – in both the public and private sectors are very defensive! When confronted with unintentional outcomes and undesirable consequences, or objective statistical probability science that challenges their expert judgements and/or past policy decisions,¹³ they are reluctant to admit or accept that they erred, and try to change course.

Instead, **the ‘political’ science approach predominates** – digging deeper in entrenched positions; reinforcing prior efforts to attain desired outcomes, while avoiding seeking answers to questions that might contradict prior assumptions.¹⁴

¹² For example: **1) The parking protest by Canadian truckers** confronting their truculent President Trudeau over mandatory vaccination, vaccine passports and masking issues; as well as **2) parental pushback** throughout the US, levying lawsuits against belligerent local school-board dictates over mask mandates for students.

¹³ Some casting doubt on the efficacy of masks, and others on the vaccines; such as the recent Johns Hopkins University study, titled “*A Literature Review and Meta-Analysis of the Effects of Lockdowns on COVID-19 Mortality*” -- **which found lockdowns in Europe and the U.S. reduced COVID-19 deaths by only 0.2 percent and hence was/is unnecessary.** Meanwhile, the Indiana Chamber of Commerce and the Indiana Hospital Association held a news conference December 20, 2021 about the current COVID-19 surge. CEO Scott Davison of OneAmerica insurance group highlighted **that in the U.S. ‘18-64 year-old’ cohort deaths in 2020 inexplicitly increased 40% over pre-pandemic rates**, based on CDC estimates there were 942,431 ‘excess deaths’ -- *typically defined as the difference between observed number of deaths in specific time periods and expected number of deaths in the same time period.* “Just to give you an idea of how bad that is, a three-sigma or a one-in-200-year catastrophe would be 10% increase over pre-pandemic,” he said. “So 40% is just unheard of.” Also, India’s Central Drugs Standard Control Organization said its experts did not support the {Pfizer} vaccine because there are still investigations taking place into **side effects that have been reported** in other countries.

¹⁴ In the agriculture example I cited earlier, for instance, impelled by initial success at the macro level, project proponents basked in public adulation, and, despite the anomalous findings of a lack of correlation between the project’s deliverables and its Outcome, continued delivering the prime components for many more seasons. They even extended the project scope beyond the original target area; although the credit aspect dwindled when many farmers failed to repay their loans, even after refinancing them. Meanwhile political opposition naysayers sniped at all aspects from the sidelines. Official data was questioned, detrimental anecdotes of credit abuse and misuse -- *for resale of fertilizer (purchased at discounted prices) diverted to sugar farmers* -- were cited; and extension services were asserted to be redundant -- *especially*

It seems

“Once you have accepted a theory and used it as a tool in your thinking, it is extraordinarily difficult to notice its flaws. If you come upon an observation that does not seem to fit the model, you assume that there must be a perfectly good explanation that you are somehow missing.”

Thinking Fast and Slow, Daniel Kahneman

In conclusion, with the emphasis PMI’s 7th Edition PMBOK has placed on **holistic teamwork, rather than the project management team’s burden, the responsibility to lead Outcome Evaluation is really on the executive’s shoulders.** Therefore, executives, as well as program and project management practitioners should all start ‘*thinking slower*’ and paying more attention to project planning for Outcome evaluation in the future. **Then, working from a good data base, and “minding their P’s & Q’s” with timely objective interim and post-project analysis, hopefully rationality will prevail.**

after the first season [Farmers’ knowledge is not static!] -- as farmers could avail of ag. technical know-how from government radio broadcasts, as well as from the local ‘grapevine.’ On the other hand, the macro productivity increases were speculated to be primarily due to a concurrent, overlapping, on-farm irrigation expansion project. Although annual after-action analysis revealed the aforementioned Outcome correlation anomalies with planned project inputs, and some internal speculation that availability of HYV rice variety seeds and increased controlled irrigation in subsequent seasons may have confounded comparative control group cohorts, no official comprehensive ‘forensic’ project post-mortem was ever conducted to address the opposition’s assertions -- or internal evaluators misgivings -- to discover the real root cause(s).

About the Author



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Initially a US Civil Service Management Intern, then a management analyst & systems specialist with the US Defense Department, Ken subsequently had a career as a senior foreign service officer -- management & evaluation specialist, project manager, and in-house facilitator/trainer -- with the US Agency for International Development (USAID). Ken assisted host country governments in many countries to plan, monitor and evaluate projects in various technical sectors; working ‘hands-on’ with their officers as well as other USAID personnel, contractors and NGOs. Intermittently, he was also a team leader &/or team member to conduct project, program & and country-level portfolio analyses and evaluations.

Concurrently, Ken had an active dual career as Air Force ready-reservist in Asia (Japan, Korea, Vietnam, Thailand, Indonesia, Philippines) as well as the Washington D.C. area; was Chairman of a Congressional Services Academy Advisory Board (SAAB); and had additional duties as an Air Force Academy Liaison Officer. He retired as a ‘bird’ colonel. After retirement from USAID, Ken was a project management consultant for ADB, the World Bank, UNDP and USAID.

He earned his DPA (Doctor of Public Administration) from the George Mason University (GMU) in Virginia, his MS from Massachusetts Institute of Technology (MIT Systems Analysis Fellow, Center for Advanced Engineering Study), and BA & MA degrees in Government & International Relations from the University of Connecticut (UCONN). A long-time member of the Project Management Institute (PMI) and IPMA-USA, Ken is a Certified Project Management Professional (PMP®) and a member of the PMI®-Honolulu and Philippines Chapters.

Ken’s book -- **Project Management PRAXIS** (available from Amazon) -- includes many innovative project management tools & techniques; and describes a “**Toolkit**” of related templates available directly from him at kenfsmith@aol.com on proof of purchase of PRAXIS.

To view other works by Ken Smith, visit his author showcase in the PM World Library at <https://pmworldlibrary.net/authors/dr-kenneth-smith/>