



"Eliminating Chaos Through Process"

MCL & Associates, Inc.

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USING *REXCEL*:

A MODEST PROPOSAL FOR CHANGING ORGANIZATIONAL CULTURE

A WHITE PAPER

PREPARED BY:

MARK LEFCOWITZ, CMBB, PMP, CLM

**MCL & ASSOCIATES, INC.
FREDERICKSBURG, VA 22405**

<http://www.mcl-associates.com/>

For more information:

Public and Media Relations
MCL & Associates, Inc.
(540) 374-1551
info@mcl-associates.com

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WHITE PAPER

USING *RExcel*:

**A MODEST PROPOSAL FOR BRINGING STATISTICAL TOOLS
TO THE FUNCTIONAL LEVEL**

By Mark Lefcowitz, CMBB, PMP, CLM
Chief Executive Officer
MCL & Associates, Inc.
Fredericksburg, VA 22405
Phone: (540) 374-1551
Fax: (540) 374-5578
<http://www.mcl-associates.com>

“Skill to do comes of doing.”

- Ralph Waldo Emerson

“The number one benefit of information technology is that it empowers people to do what they want to do. It lets people be creative. It lets people be productive. It lets people learn things they didn't think they could learn before, and so in a sense it is all about potential.”

- Steve Ballmer

“L'enfer est plein de bonnes volontés ou désirs” (“Hell is full of good intentions or wishes”)

- Saint Bernard of Clairvaux

“... [T]he essence of science: ask an impertinent question, and you are on your way to the pertinent answer.”

- Jacob Bronowski

1. INTRODUCTION

Most of us spend a large proportion of our adult life recovering from the disappointments and pains of our youth. We discover that life to one extent or another is replete with constraints – imposed upon us by both circumstances and forces far beyond our immediate control, as well as other limitations of our own making. The truth is that few of us attain that for which we once ardently hoped to achieve as adults.

It is a measure of our maturity and life skills how we choose to deal with this harsh reality and the setbacks and calamities that befall each of us. In our individual journey from childhood, through adolescence, and finally to adulthood, we come to understand that childhood modes of behavior rarely have a harmonious outcome in the tougher, more demanding world of adults. Therefore, we must all choose – or fail to choose – what we shall try to do next, and who next we shall try to become.

Animals struggle to survive. Only humankind struggles to leave something of worth behind.

What is true for individuals is also true for organized groups. Despite an increasingly complex business environment – including but not limited to globalization and geographic disbursement of staff, the increased dependence of technology for information and communication, shifting strategic alliances, fluctuating budgets, and



higher expectations for performance and efficiency – the basic way we organize to achieve large-scale goals has scarcely changed over the centuries of time.

Long before Frederick Winslow Taylor published his seminal work (Taylor, 1911) on the principles of scientific management, humankind has concerned itself with a single problem, which – for our species – is crucial, “How can ‘big things’ get done?” The various answers to this deceptively simple question have fueled our collective history before there was the means to record it in written form. Virtually every human culture that we know of has asked and answered this question. While the precise definition given to the concept of “big things” has changed from culture-to-culture and from circumstance-to-circumstance, it has always resulted in some group action that reflected the collective wisdom of that culture. It has resulted in a tapestry of folkways, mores and laws that all too often have produced great brutality and human suffering – certainly as a consequence, if not literally as a means – to the objective that harnessed the imagination and energies for those who inhabited that particular time and place.

In the very first paragraphs of his treatise, Taylor (pp. 8 – 9) lays-out his vision for the science of management unambiguously [sic]:

“The principal object of management should be to secure the maximum prosperity for the employer, coupled with the maximum prosperity for each employé.

The words “maximum prosperity” are used in their broad sense, to mean not only large dividends for the company or owner, but the development of every branch of the business to its highest state of excellence, so that the prosperity may be permanent.

In the same way maximum prosperity for each employé means not only higher wages than are usually received by men of his class, but, of more importance still, it also means the development of each man to his state of maximum efficiency, so that he may be able to do, generally speaking, the highest grade of work for which his natural abilities fit him, and it further means giving him, when possible, this class of work to do.

It would seem to be self-evident that maximum prosperity for the employer, coupled with maximum prosperity for the employé, ought to be the two leading objects of management, that even to state this fact should be unnecessary. And yet there is no question that, throughout the industrial world, a large part of the organization of employers, as well as employés, is for war rather than for peace, and that perhaps the majority on either side do not believe it is possible to arrange their mutual relations that their interests become identical.

The majority of these men believe that the fundamental interests of employés and employers are necessarily antagonistic. Scientific management, on the contrary, has for its very foundation the firm conviction that the true interests of the two are one and the same; that prosperity for the employer cannot exist through a long term of years unless it is accompanied by prosperity for the employé and vice versa; and that it is possible to give the workman what he wants – high wages – and the employer what he wants – a low labor cost – for his manufactures.”

How we choose to solve “big things” defines our collective understanding and our collective assumptions about the world around us. It delineates the scope of the tools and the technologies we use, it constrains the problems we choose to address, and – ultimately – it defines who we are both as individuals and members of the greater group of which we are members.

Sociologists and Anthropologists tell us that there is a strong connection between the elements of culture, tools, and myth. Both tools and myths define and mirror the physical and psychological context of our cultural circumstance. The tools we use (technology) define what we do, how we do it, and what we need to do next to make the tools that we do use to be of even greater utility. Myths explain and justify why we use the tools that we do, and who within our society has access to them. These elements are mutually interlocked. Each element defines and redefines the others, from one generation to the next, and from one subsequent condition of human circumstance to another.

This paper assumes that the key to how we solve problems – both big and small – is determined by the tools we create, how we individually and collectively perceive their use, and to whom or what groups within our society we



authorize their use. The word “*tool*” not only includes the physical instruments of manual and mechanical work, but additionally, it also includes access to the knowledge that makes use of these tools possible.

For any new tool to gain general acceptance and broad use, four prerequisites are required:

1. It must solve a new problem, or provide a better solution to an old problem;
2. Its utility over other alternative tools or solutions must be readily apparent;
3. Its operation must be either similar to other tools or relatively easy to master; and
4. Its cost must be reasonable in relationship to the cost of the unresolved problem.

Moreover, this paper assumes that cultural change is an absolute necessity if organizations are to be successful in their attempts to become more efficient and more effective. Our failure to link tools and myths in the workplace has placed our society in grave danger, and has mired our efforts to transform our businesses and social institutions from becoming more efficient and more effective.

What, then, are our own current business myths and tools, and at what intersections do they define and redefine the other? To discuss this we must first discuss the human social condition, its underpinnings, and the myths it produces.

2. HOW WE GET THINGS DONE; HIERARCHIES

The nuts-and-bolts of human social activity and action are based upon two basic social structures: kinship networks and non-kinship networks.

Kinship networks are systems of social relationships and obligations based upon ties of blood or marriage (e.g., the existence or claim of a consanguineal or an affinal relationship). Non-kinship networks are systems of social relationships, obligations, and responsibilities based upon ties and associations other than blood or marriage (i.e., professional and work associations, fraternal organizations, geographic or political associations, religious groups, socioeconomic class distinctions, etc.)

These networks are not mutually exclusive. To the contrary, we are all members of variety of kinship and non-kinship associations and groups. Often members of non-kinship networks use kinship idioms (i.e., brother, sister, family, etc.) to reinforce non-kinship bonds, as evidenced by the Ndendeuli of southern Tanzania (Gulliver, 1971) or the common practice of invoking the idiom of kinship in those instances where it is obvious that no actual lineal relationship exists (i.e., labor unions, religious groups, street gangs, businesses, etc.). Moreover, to one degree or another, both network types rely on the establishment and maintenance of hierarchical relationships.

Conflict theory distinguishes between functional and dysfunctional conflict (Coser, 1956, pp. 72 – 81). Conflict is not always bad. It provides a beneficial functional purpose, and therefore is not necessarily dysfunctional. Conflict theory, too, distinguishes between conflict that is “rational” and conflict that is “irrational” (Coser, pp. 48 – 55). Rational conflict ceases, “if the actor can find equally satisfying ways to achieve his end” (Coser, p. 50). For irrational conflict, however, there are no alternative outcomes, because the actor’s conflict objective cannot be satisfied with its successful attainment. An irrational conflict is always dysfunctional, because it invests resources in an outcome that can never resolve the real need motivating action. However, rational conflict is not always functional:

“Conflict may serve to remove dissociating elements in a relationship and re-establish unity. Insofar as conflict is the resolution of tension between antagonists it has stabilizing functions and becomes an integrating component of the relationship. However, not all conflicts are positively functional for the relationship, but only those which concern goals, values, or interests that do not contradict the basic assumptions upon which the relation is founded.” (Coser, p. 80)

It is not necessary here to go into detail regarding the transformation of social networks into political and commercial organizations. It is sufficient only to mention these associations as the glue that holds human social



intercourse together, to acknowledge the role these social network types have in both our capacity for functional social behavior, as well as our equally strong capacity for dysfunctional social behavior, and to acknowledge that these associations form the basis for all human action. Over time – as the social fabric became more complex, social and political groupings became larger, and the social goals selected required greater consistency and accountability. Official procedures were developed within the structure of the hierarchical group to manage how and what “big things” were to be attended to, and to organize group action. These bureaucracies – organized to achieve specific social, political, and economic goals – would be readily recognizable to the practitioners and scholars of past eras, but with one important difference:

Both in notable and bureaucratic administrations the structure of the state power has influenced culture very strongly. But it has done so relatively slightly in the form and management and control by the state. This holds from justice down to education. The growing demands on culture, in turn, are determined, though to a varying extent, by the growing wealth of the most influential strata in the state. To this extent increasing bureaucratization is a function of the increasing possession of goods used for consumption, and of an increasingly sophisticated technique of fashioning external life – a technique which corresponds to the opportunities provided by such wealth. This reacts upon the standard of living and makes for an increasing subjective indispensability of organized, collective, inter-local, and thus bureaucratic, provision for the most varied wants, which previously were either unknown, or were satisfied locally or by a private economy (Weber, Gerth and Mills, 1991, pp.212 – 213)¹.

Bureaucracy and bureaucrats were supposed to be providers of goods and good things. Yet somehow, we remain dissatisfied. In the 100-years, following Taylor’s work we still seek to attain the original vision for the science of management that he set forth. There seems to be widespread agreement that how we manage our organizations is in real need of improvement and repair. Not a day passes when someone, somewhere, is touting the new flavor-of-the-month that will relieve us from the social, economic, and political changes that continually assault us. Our reliance on larger more complex social and economic organizations, that work even less effectively than their predecessors did in serving our needs, is almost unbearable. The modern pejorative connotation of the words “bureaucracy” and “bureaucrat” continues unabated, and yet relief still eludes us.

The sad fact is that our institutions – their culture and their myths – lag perilously behind the tools and technologies of the Information Age. We continue to accept the cultural myth that only exceptional people with special mathematical and cognitive ability can analyze information correctly. All too often front line Subject Matter Experts (SMEs) are rudely pushed aside because it is assumed that there is no realistic way to bring them into the analysis process on an on-going basis. We tend to forget that statistical data collection methods can only tell us whether the data collection process meets accepted standards to prevent the likelihood of bias, and that statistical methods can only tell us whether it is likely that a correlative relationship exists between two or more sets of data. Only the Subject Matter Expert (SME) – a specialist intimately familiar with the process and the data being studied – can determine whether correlation may also be causality.

The technology of the information age has given every worker having access to a PC the ability to record and track robust local data sets, and to do the necessary calculations to conduct sophisticated first-tier and second-tier statistical analysis, if only we would allow them to use the tools already at their disposal. To ignore their input; to discount what they experience; to actively discourage their individual ability to report and analyze the events and data available to them in the normal course of their day-to-day working responsibilities is short-sighted, wasteful, and inherently dangerous to our institutions and ultimately to our society as a whole.

3. UNSAFE AT ANY CORPORATE SPEED

As noted by Golden, Clayton and Skalak (2006, p. 132).

¹ The word “notable” mentioned by Weber refers to hereditary monarchies and nobility (Weber, p. 300); still the predominate political ruling class of that time; e.g., those who were “known” or “notable”. The notability of hereditary has been effectively replaced by the notability of wealth and political influence, or access to it.



“Management and other employees may find themselves offered incentives or placed under pressure to commit fraud. When, for example, remuneration or advancement is significantly affected by individual, divisional, or company performance, individuals may have an incentive to manipulate results or to put pressure on others to do so. Pressure may also come from unrealistic expectations of investors, banks, or other sources of finance”.

There is nothing new about white-collar crime, occupational malfeasance, or corporate fraud. Almost everyone is familiar with the “fraud triangle”: motive (or pressure), rationalization, and opportunity, first coined by Donald R. Casey (Wells, 2009, p. 7). While the magnitude of individual fraud and theft is undeniable and serious, we are not talking about “several frozen turkeys and a large bag of yams” (Wells, p. 4) going out the back door, here. There is fraud occurring at a much greater and pervasive scale. It threatens us all.

One need only review the headlines – if only limited to the past decade: Microstrategy, Unify Corporation, Computer Associates, Xerox (2000); Enron (2001); AOL, Duke Energy, Dynegy, El Paso Corporation, Halliburton, Merck & Co., Mirant, Nicor, Peregrine Systems, Qwest Communications, Reliant Energy, WorldCom, Bristol-Myers Squibb, CMS Energy, Homestore.com, Kmart, Adelphia, Freddie Mac, ImClone Systems, Merrill Lynch, Sunbeam, Rite Aid, Arthur Anderson (2002); HealthSouth Corporation (2003); Chiquita Brands International, AIG (2004); and Bernard L. Madoff Investment Securities LLC (2008), Pfizer (2009), to name just a few of the most recent of these infamous companies.

Federal governmental spending, too, is a sizable cash-cow that attracts fraud (Lander, Kimball and Martyn, 2007), resulting in settlements and judgments for fraud cases amounting to \$ 1.4 Billion for FY 2005, \$ 3.1 Billion for FY 2006 (Lander, Kimball and Martyn, p. 3); \$ 2.0 Billion for FY 2007 (USDOJ, 2007); \$ 1.34 Billion for FY 2008 (USDOJ, 2008); and \$ 2.4 Billion for FY 2009 (USDOJ, 2009).

All of this – of course – fades in comparison to the “credit crunch” of 2007 (Hull, 2009) and the subsequent impact upon the United States’ Subprime Mortgage Crisis that devastates both the U.S. and World economies. Earlier in September 2008, it was announced that the Federal Bureau of Investigation (FBI) was investigating the collapse of the subprime mortgage market, and looking into potential accounting fraud practices by 26 companies, including Fannie Mae, Freddie Mac, Lehman, and AIG (Bloomberg.com, 2008). The United States government allocated over \$900 Billion to special loans and rescues related to the U.S. housing bubble, with over half going to the quasi-government agencies of Fannie Mae, Freddie Mac, and the Federal Housing Administration. This was followed in December 2009 with the Treasury Department announcing that it would provide Fannie Mae and Freddie Mac – despite acknowledging their cumulative losses in excess of \$400 Billion – with unlimited financial support through 2012.

We are talking about risk-taking at unsafe-at-any-speed² proportions that resulted from a combination of the unintended consequences of political benign and corrupt influence, individual and corporate greed and deception, governmental indifference to unambiguous warning signs, and a lackadaisical and preoccupied public. We need not point fingers at political parties, individuals, or institutions; there is enough blame to go around. As the cartoonist Walt Kelly called to our attention in his Earth Day 1971 cartoon panel, “We have met the enemy and he is us.”³

About a dozen years ago, our fledgling company was hired by a manufacturing firm in trouble. The founder of the company had built the company into a thriving business, and ran it successfully for many years.

Upon the founder’s retirement, the company’s stewardship was handed over to the company’s head salesman, who also happened to be the founder’s son-in-law. The decision was disastrous. The new CEO literally ran the family-owned company into the ground, and it eventually went into bankruptcy.

Several years later, the founder’s granddaughter, daughter of the failed CEO, resurrected the company. From its ashes, she restored the company into a thriving and profitable business. All went well until she made the personal

² Unsafe at Any Speed: The Designed-In Dangers of the American Automobile by Ralph Nader, is book published in 1965 that exposed the strong resistance by American car manufacturers to introduce safety features – notably seat belts – and their refusal to invest capital for the improvement of automobile safety. While Nader’s personal polemic style has been criticized by many, there is no doubt that his self-anointed gadfly-role resulted in pioneering modern consumer advocacy.

³ Pogo by Walt Kelly, from Earth Day 1971. Retrieved June 11, 2006, from: <http://www.planetwaves.net/pogo.html>.



decision to work substantially from her home so that she could care for her newly born child. The company started to lose a substantial share of its business. Our company's task was unambiguous: find out why the company was losing its business share, and give our recommendations to correct it.

Among the irregularities mentioned in our report – and there were many – the fact that the CEO was spending most of her time working from home was noted as a major contributing factor to the company's current problems. It was pointed-out that not only did the CEO's absence from her business give her employees (some of whom were also relatives) a bad example to follow, but also it provided the opportunity for much mischief.

The CEO was aghast at our criticism of her behavior; how dare we suggest that she was the main cause of her company's problems. Didn't we realize that she was our customer? I replied as gently as I could, that she was mistaken; while she might have the authority to run her company, and we certainly appreciated her decision to hire us, our client was in fact her company, not she.

Not too long ago, too, a Senior Analyst and I were exchanging war stories, and bemoaning how the marketing of Six Sigma training in lieu of preparing the customer's organization to be culturally prepared to actually do Six Sigma has led to widespread project failure (i.e., Lefcowitz, 2007). He recounted a story about a Six Sigma kickoff meeting he led, in which a Senior Vice President from the customer company interrupted the kickoff presentation and said, "So what you are saying is that you want us to be responsible for our actions."

Without another word, the Vice President then stood-up and left the meeting, never to be seen by the Senior Analyst again. In the end – after all the anecdotal tales have been recounted – the real reasons for limiting statistical acumen in the workplace seems to be nothing more or less than: the maintenance of socio-economic or professional status, and the avoidance of responsibility.

Organizations and businesses may be legal entities, but they certainly are not monolithic with a single mind. Assuming that all within the organization, including its executives and senior managers, have the company's true best interests at heart is naïve at best.

Like the astrologers of old noted by Carl Sagan (1980, p. 48), the science of management and its many associated sub-specialties – largely based upon the knowledge and the ability to use statistical methods and statistical models – determines the fate of a very different set of kings, dynasties, and empires than their counterparts from ancient times. Just like with astrology, the tools of understanding – the "ability to read the portents in the skies – are restricted to those who serve those at the top of the organizational and social hierarchy because, "a good way to overthrow a regime... [is] to predict its downfall" (Sagan, p. 49). Like astrology, the science of management has, "developed into a strange combination of observations, mathematics and careful record-keeping with fuzzy thinking and pious fraud" (Sagan, p. 49).

The aftermath of the Subprime Mortgage Crisis continues to play itself out. As of this writing, "Wall Street tactics akin to the ones that fostered subprime mortgages in America have worsened the financial crisis shaking Greece and undermining the Euro by enabling European governments to hide their mounting debts" (NYT, 2010). And it turns out that Goldman Sachs has been implicated in helping the Greek government to quietly borrow billions in 2001, hidden from public view because it was treated as a currency trade rather than a loan. This ruse has helped Athens to meet Europe's deficit rules and join Europe's monetary union – all the while continuing to spend beyond its means.

In the United States, too, a new round of foreclosures is expected to cycle within the next few months. Eventually, it will likely force political action that will lead to even more Federal Regulation and oversight responsibilities to a Federal bureaucracy that is already out-manned and out-gunned at every turn. Whatever the outcome, it is clear that the current financial crisis will not just go away anytime soon – whether a deep recession turns into a second Great Depression or not. It is clear, too, that more laws will not change the human predisposition to be self-absorbed, self-interested, and self-serving.

The famous quote that Mark Twain (1906) erroneously attributed to Benjamin Disraeli that, "There are three kinds of lies: lies, damned lies, and statistics" has been over-used to the point of metaphor. The quote is funny and witty, it makes a good point, but it is misleading in the sense that it blames the perpetrators of misdirection, lies and deceit upon the liars and not those of us who accept their misdirection, lies and deceit without challenge.



Statistics can be – and certainly are – used to mislead, but only when people allow themselves to be deceived through ignorance, fear, or apathy. We need a new paradigm, a new way of thinking. We need another way to protect ourselves from those individuals and institutions that recklessly put their own aggrandizement before the welfare of all others, who acknowledge no social responsibility except to their own comfort, gain and well-being.

That paradigm is staring at us right in the face. We now have the means and the tools to protect ourselves from the predators that live amongst us; it does not require new laws, it does not require the cooperation of political parties; it does not even cost money; it requires only that we have the will to change ourselves and the business culture within which we all live.

In 1964, Kitty Genovese – a 28-year New York City resident – was raped and stabbed to death just yards from her home while returning from work. Within weeks, an investigative article by Martin Gansberg appeared in the New York Times (NYT, 1964) that detailed the events of the murder, and alleged that Ms. Genovese’s neighbors watched the assault upon her and did nothing to try to save her. The incident came to symbolize public apathy and abrogation of social responsibility, and the fierce public reaction to the Genovese murder, and others, led to the beginning of the Neighborhood Watch movement that ultimately culminated into the formation of citizen groups like Guardian Angles and USAonWatch (2010):

“From the earliest studies on ‘communities and crime’ ... to much more recent works ... research has shown that there is a link between areas with high crime rates and neighborhoods characterized by a heterogeneity of economics and ethnicity, high levels of population turnover and transience, and other physical and economic conditions. Most of this line of research has concluded that crime is higher in "socially disorganized areas" marked by weakened informal control due to an erosion of shared norms.”

The Four central ideas upon which a neighborhood watch program rests are:

- The police cannot be everywhere, all the time;
- When police are seen to be not actively present in a neighborhood, the opportunity for criminal behavior increases;
- The people who have the greatest interest in a safe neighborhood are its residents; and
- Neighborhood residents taking the responsibility to patrol their own neighborhood on a regular basis, in support of their local police, can effectively decrease the opportunity for criminal behavior.

We spend as much time – and often more – at our places of business or employment than we do in our own homes. Yet most of us persist in accepting the outmoded notion that that the workplace belong solely to the employer, and whatever that employer chooses to do with their business is not of our concern. The debate (Friedman, 1970 and Reason Foundation, 2005) as to whether or not businesses should be socially responsible – and thus to be held legally and morally responsible, along with their agents and/or owners, for their actions – is moot. They are responsible; the legal issue has been settled for some time.⁴ However, it does not appear that current laws, government oversight, and law enforcement are enough. Something is missing.

⁴ The issue of corporate status under the law and the issue of corporate criminal liability under the law was settled in two landmark cases: *Santa Clara County v. Southern Pac. R. Co.*, 118 U.S. 394 (1886), and in *New York Central & Hudson RR Co. v United States* 212 US 481 (1906). In the former decision, the High Court established that private corporations are considered to be legal entities, entitled to the legal rights and protections that the Constitution affords to any person. In the latter decision, the Court ruled that corporations could be held accountable for actions of their agents. From this foundation, other landmark cases have followed, strengthening the Federal government’s authority to regulate corporate malfeasance. In *Neder v. United States*, 527 U.S. 1 (1999) the Court held that materiality is not an element of a “scheme or artifice to defraud” under the mail fraud, wire fraud, and bank fraud statutes. In *Mistretta v. United States*, 488 U.S. 361 (1989), the Court held that the delegation of powers under the Sentencing Reform Act of 1934 were Constitutional. In *Braswell v. United States*, 487 U.S. 99, the Court enumerated the collective entity rule, where "individuals, when acting as representatives of a collective group, cannot be said to be exercising their personal rights and duties, nor be entitled to their purely personal privileges.



This brings us to the central question: If mismanaged and fraudulent businesses – and the individuals who manage them and who are their agents – can threaten our collective welfare through malfeasance and fraud, can any of us afford to stand idly by without trying to do something to prevent it? For when it comes right down to it, if an unsafe workplace can reach out and touch us in our neighborhoods, what then is the difference between the self-interest of having a safe neighborhoods and the self-interest of a having a safe workplace?

Am I then suggesting the formation some kind of citizen’s anti-corporate crime whistle-blower organization that would “patrol” the corporate world? Of course, not.

What I am suggesting is that our world has fundamentally changed with the inception of the Information Age. Not only is the world bound together more tightly, but also each of our individual lives and the well-being of our families are more profoundly impacted by the interdependence of economic and political interests. The original assumption of Frederick Winslow Taylor – that the fundamental interests of employees and employers are not necessarily antagonistic – has yet to be realized.

4. SOCIAL RESPONSIBILITY AND SELF-DEFENSE IN THE 21ST CENTURY

All of us have a common personal interest – whether we are employers or whether we are employees – to work in a more efficiently and effectively managed workplace. Efficiency and effectiveness, however, are impossible in an organization whose culture is oriented toward self-aggrandizement, distinctions of status that correspond to overt privilege, and a philosophy of certainty that is based solely on hierarchical and socio-economic status.

In all human societies, knowledge is rationed. Knowledge rationing is justified in a variety of guises, but appear to boil-down to either paternalism or cost. Justifications based upon paternalism revolve around an individual or groups’ ability to grasp key concepts or skill-sets, their ability to use the knowledge in question in either a wise or a safe manner, or the inappropriateness of imparting that knowledge due to that individual or groups’ role or status within the greater group or society. Cost justifications revolve around issues of budget or expenditures of time. By itself, the rationing of knowledge is neither functional nor dysfunctional. It is only when the rationing is examined within the context of its consequences – both intended and unintended – that a determination of functionality can be made.

Knowledge cannot – and should not – be shared equally. Social organization requires social controls. Ultimately, someone or some executive group needs to decide what needs to be done and how to do it. At some point – if the group is going to achieve its common goal – all argument needs to stop. This objective is both rational and functional. However, it is of course the very same argument that one makes when the goals sought are irrational and dysfunctional. Internal debate can be squelched; political power can be maintained; self-serving deals can be made that serve only the individual, not the organization – all hidden from the view of others.

Let us take a concrete example: the ability to understand and use statistical methodologies and statistical tools.

It seems improbable that anyone could or would argue against the benefits of increased knowledge of statistical methodologies and tools either for our children, the public at-large, or by individual members of the workforce. A better understanding of the tools and methodologies of statistical probability by an organization’s members and employees cannot but help any group assess risk and mitigate constraints.⁵ Statistics – the analysis of probability – is one of the tools we use for that purpose.

Rather they assume the rights, duties and privileges of the artificial entity or association of which they are agents or officers and they are bound by its obligations." In *California Bankers Ass'n v. Shultz*, 416 U.S. 21 (1974), the Court held that the Constitution did not protect the privacy of personal information in records maintained by business and government.

⁵ “Risk” and “constraint” are used in the project management sense of the words: an unidentified restriction or limitation, either internal or external to the project that will affect performance the project or a process. A constraint that becomes known, is a risk, an identified “uncertain event or condition that, if it occurs, has a positive or negative effect on a project’s objectives.



Yet despite the concerted effort to expose students to statistical concepts at the primary and secondary educational levels, the use of these tools and methods is limited to a relatively small and elite portion of the workforce.

In the past, the argument has been made that employer's fail to take a proactive approach to skill-set acquisition (Lefcowitz, 2006). The argument has been made that the common justifications given for rationing statistical skill-sets fail to hold the water they are intended to carry (Lefcowitz, 2008). This implies that the rationing of statistical skill-sets in the workplace is inherently dysfunctional. The argument has been made, too, that a peer-to-peer ("shoe-string") training approach is the preferred method for assuring the acquisition of specific "*applied*" general skill-sets – and more specifically statistical skill-sets – within organizations at the business unit-level (Lefcowitz, 2009).

Finally, the argument has been made that Microsoft Excel is the logical tool to use for initial statistical skill-set acquisition, by virtue of the fact that it is an established tool, almost universally present within any workplace around the globe (Lefcowitz, 2008 & 2009).

All evidence available strongly suggests that – except in very specific instances – issues of computational reliability (Keeling & Pavurb, 2007, and Simonoff, 2006) are not generally relevant when it comes to the issue of rejection or acceptance of the null-hypothesis. Using Excel as a statistical tool does not result in the computed statistical value being located correctly in relationship to its corresponding calculated critical value. In other words, issues of Microsoft Excel's computational reliability do not alter the ultimate decision to either reject or accept the null-hypothesis.

When one considers the overwhelming penetration of *Excel* in the business marketplace, and its' almost universal availability to every worker around the globe, the rather lame explanations for this sad situation can only be described as being incomprehensible. More to the point – irrespective of individual employer policy, employer willingness or ability to train, or even employee job function – why is it necessary for anyone to wait for permission to become more skilled in the use a software program that is already bought and paid for and waiting to be used? *Excel* skill-sets are in high demand, and a concrete demonstration of growing technical acumen in it can only add to the marketability of any employee or job candidate. Likewise, why is it necessary for anyone to wait for permission to become more skilled in statistical methods and statistical analysis? Statistical skill-sets are in even higher demand, and often give its practitioners high visibility and financial rewards.

Unlike previous human epochs, in the Information Age there is a plethora of free information on the internet, as well as a multitude of well-written books available to anyone who takes the time to look.

5. R AND REXCEL

What then are the legitimate criticisms of MS *Excel*, computational reliability or otherwise?

Microsoft has a very conservative approach to software development. The secret to its success has been the company's ability to bundle useful software packages together, and to never be at the forefront of breaking new ground in software functionality. Instead, the company waits until the market shows them which functionality is in demand, whereupon they will try to re-create the desired functionality within their own existing software programs, if they can. When necessary, Microsoft will buy-up companies that have the technology they need. When software packages or software functionality fails to get the market response that is hoped for, they are unceremoniously dropped from the Microsoft catalogue.

The first criticism of Microsoft *Excel* is generally true of all statistical software. Out of necessity, all software development is a compromise between cost (effort), marketability (demand by users), and the limits of normally available computing capacity (technology). The field of statistics is always evolving, with new ideas and methods to analyze data. All statistical packages lag in this respect, some more than others. Even though *Excel* was never intended to be a statistical package, but rather a business spreadsheet capable of doing some limited statistical functions, Microsoft's general disinterest in keeping up-to-date with the field of statistics is reflected in its decision not to expand the basic statistical capabilities of *Excel* since Excel 4.0 (Heiser, Chapter 1, p. 6).



Microsoft has also been criticized for its graphic default settings which tend to distort the graphic representations of data (Su, 2008 and Few, 2006) upon which unsophisticated users rely, as well its normal probability plot (McCullough, and Heiser, 2008).

More specifically, Microsoft has been accurately criticized for not being responsive to correcting known computational reliability errors – most of which could be easily done through patches or version upgrades – and would thereby make *Excel* a much stronger statistical software package. Why Microsoft has resisted correcting its computational reliability error issues is unknown, but it is probably – ultimately – because they feel that they don't need to. Not surprisingly, this sort of perceived overt corporate arrogance – whether viewed rightly or wrongly – has a tendency to set other's teeth on edge.

“It is a known fact that Excel is commonly used in a wide range of decision making processes from options trading to research in physical laboratories. Offering statistical functionality in a computer program is a serious matter and it brings important responsibilities to the software vendor. Microsoft has repeatedly shown its lack of interest to this concernment by releasing new versions of Excel without first correcting the problems documented by different authors on various different occasions. Because of Microsoft's lack of commitment to accuracy, it is now possible to find on the Internet various users' custom scripts and macros for proper computation of statistical distributions in Excel10. It is unclear when, if at all, Microsoft will properly fix Excel's inaccurate procedures for all of which there are free, well-known, and reliable alternatives. Meanwhile, researchers should continue to avoid using the statistical functions in Excel 2007 for any scientific purpose” (Yalta, p. 4585).

The key phrase here is “scientific purposes”. There are to be sure, open source alternatives to *Excel* – notably Gnumeric⁶ – for those who require the kind of calculating accuracy that is required by hard science applications. The current commercial gold standard for technical and scientific computing is Wolfram Research's Mathematica.⁷ However, despite the protestations and valid criticisms leveled at Microsoft by purists and technicians, this level of calculating power is not required for most low-level, day-to-day, in-the-trenches business problems. Again, as long as the calculated statistical value is on the correct side of the established critical value, then there is no change in the decision to accept or reject the null hypothesis. The business decision made will be the same.

Most important, the issue central to the discussion before us is one of general organizational cultural change. Cultural change is an absolute necessity if organizations are to be successful in their attempts to become more efficient and more effective. To do this we need an approach that will not only allow cultural change to occur, but to steer it in the direction that will be most beneficial and functional to the organization itself and society-at-large. We need to breakdown the artificial barriers we have constructed as to how knowledge is created, how it is maintained, and how it is shared so that true collaboration is possible within the context of a hierarchical structure.

Once, Microsoft Office was a software only for use by executives and managers, it was a tool whose use was restricted due to both its initial expense and because of the skepticism of elitism and professional status. Its usefulness as a tool for frontline workers, too, was not quickly recognized. When Microsoft switched to its 386 Enhanced Mode with the Windows 95 operating system, again, a similar series of events took place. At every step in the evolution of Microsoft's and other business software products, functionality was a metaphor for the relative importance of one's role and status within the organization. A metaphor that persists to the present day.

The predominance of Microsoft *Excel* in the business world and educational marketplace is a fact-of-life. If we are to do what we must, we cannot afford the time to wait for market pressures to force a change in Microsoft's willingness to remediate the *Excel*'s numerous problems and deficiencies. We must work with what we have.

Ironically, that is precisely what we have done. *Excel* add-ins are a major cottage industry that has long since graduated to the **BigTime**. A recent Google Boolean query of “*Excel Add-in*” resulted in 2,460,000 hits. Even

⁶ Downloadable from <http://projects.gnome.org/gnumeric>.

⁷ <http://www.wolfram.com/products/mathematica/index.html>.



accounting for duplicates and other irrelevant web site references, the sheer size of the query results establishes that the gaps in *Excel* functionality are not only well-known, but actively being pursued for realistic solutions.

As it happens, an open source statistical package available – while not up to the gold standard of Mathematica – that does have the computational reliability required for scientific commercial and research applications. It is called “R”.

“R” is a free, “open source” dialect of the older “S” programming language originally developed by John Chambers, Rick Becker and Allan Wilks of Bell Laboratories, the de facto statistical programming language since its release in the early 1980s for UNIX, and gradually for other operating systems. The development of “R” was in reaction to the high cost of S-based statistical software protected by patent and copyright laws.

Originally developed by Ross Ihaka and Robert Gentleman at the Department of Statistics of the University of Auckland, “R” provides:

“...a system for statistical computation and graphics. It consists of a language plus a run-time environment with graphics, a debugger, access to certain system functions, and the ability to run programs stored in script files... Whereas the resulting language is very similar in appearance to S, the underlying implementation and semantics are derived from Scheme.

The core of R is an interpreted computer language which allows branching and looping as well as modular programming using functions. Most of the user-visible functions in R are written in R. It is possible for the user to interface to procedures written in the C, C++, or FORTRAN languages for efficiency, and many of R's core functions do so. The R distribution contains functionality for a large number of statistical procedures and underlying applied math computations. There is also a large set of functions which provide a flexible graphical environment for creating various kinds of data presentations.

Additionally, over thousand extension "packages" are available from CRAN, the Comprehensive R Archive Network” (The R Foundation, 2010b).

The R package functionality includes:

- An effective data handling and storage facility,
- three special values: missing values, infinity, and not-a-number,
- a suite of operators for calculations on arrays, in particular matrices,
- a large, coherent, integrated collection of intermediate tools for data analysis,
- graphical facilities for data analysis and display either on-screen or on hardcopy, and
- a well-developed, simple and effective programming language which includes conditionals, loops, user-defined recursive functions and input and output facilities.

The software functionality includes a large number of statistical procedures; i.e., linear and generalized linear models, nonlinear regression models, time series analysis, classical parametric and nonparametric tests, clustering and smoothing. Additionally, there are a large set of functions providing a flexible graphical environment for creating various kinds of data presentations. Considering the initial cost of acquiring the software package (Free!), R stacks-up very nicely in relation to its expensive commercial rivals.

Much of the field-specific statistical working the natural and biological sciences already uses “R”. Consequently, “R” represents both the present and the future of almost all new statistical implementations

However, while free in the traditional sense that no money is exchange for the granting of a user’s license, R can hardly be considered free in the broader sense of time and effort. For most, it is not an easy software package to learn. Aside from the requirement to understand statistical concepts at a moderately sophisticated level, it also



requires knowledge of general programming concepts, and more specifically knowledge of the programming language, *R* for which the software is named. Thus, while *R* may technically meet the last of the four stipulated prerequisites – cost – for new tool acceptance, it only qualifies when the time and effort needed for a steep learning curve is not considered a relevant cost. Based upon our present myths about how training is accomplished in the workplace, most general business users would reject using *R* on that basis.

Neither does *R* provide a better solution to an old problem, nor is its utility over alternative tools readily apparent. According to Keeling and Pavurb (p. 3815):

“R’s performance is comparable to other leading software packages and is identical to Splus’ performance in computing the means and standard deviations. R’s performance is slightly lower than Splus in computing the autocorrelations on the average and high difficulty level data sets. R performs in line with JMP and Minitab in computing autocorrelations.”

Further, *R* requires input commands rather than the standard pulldown objects of a Graphical User Interface (GUI), and so is not similar to other tools or easy to master.

Nonetheless, *R* in relation to *Excel*, “is extremely powerful. It combines features of functional, object oriented, and imperative programming. Typically, an *R* function is applied to some data and a complex object containing many different subunits is returned. In many cases, parts of these compound objects then need to be transferred to *Excel*” (Statcomm, 2010).

Enter *RExcel*. Written by Thomas Baier and Erich Neuwirth, *RExcel* is a software package that actively interfaces with *Excel* and extends its functionality.

A sophisticated usage of *R* and *Excel* together is not less difficult than using *R*; in some important ways it is more challenging because the user may need to concurrently consider multiple and severely different programming languages: *Excel* worksheet functions, *RApply* worksheet functions, and Visual Basic for Applications (VBA)⁸.

Excel functions are prewritten formulas provided by the software. Functions differ from regular formulas in that the user supplies the values and arguments, but not the operators, such as +, -, *, or /, but like formulas an, “in-cell function will update automatically when the input cells for a formula change” (Baier & Neuwirth, 2003, p.2). There are 11 (eleven) general categories of *Excel* worksheet functions, of which the Statistical functions, the Math and trigonometry functions, the Logical functions, and the Lookup and reference functions are most often used either directly or indirectly for the purposes of Statistical analysis.

Excel also allows for the programming of custom functions using *Excel*’s built-in VBA editing functionality. *RApply* functions are functions of this type, turning any *R* function into an *Excel* function (Baier & Neuwirth, 2003, p.3).

Unfortunately, *impatience* is not found among the seven deadly sins listed in the Roman Catholic Catechism.⁹ It should be; there is no doubt that *impatience* has caused more human suffering and damage than all the other human failings combined. More-to-the-point required here, it assumes that time – and time alone – is the critical factor for getting big things done. Consequently – rather than redefining the *things that need doing* to fit the limited time or

⁸ In a press statement released on May 13, 2008, Microsoft’s Macintosh Business Unit (Mac BU) announced that VBA will be returning in the next version of Office for Mac. Microsoft has also clearly stated that they have no plans to remove VBA from the Windows version of Office. Microsoft has also announced that VBA will be upgraded to 64 bits, along with other improvements.

⁹ While *patience* is listed among the seven holy virtues, its listing is specifically as the antonym of *wrath*; i.e., unrequited anger. I take the meaning of *patience* as, the unhurried care given to a task to assure that it is done correctly and completely. I do not claim, however, that I am personally always a patient individual; I only claim that I know that I should be.



resources available – the decision is made to charge forward, thus increasing the likelihood that it will be done incorrectly.

The reality is that most of what we do in life – both personally and in business – is either a matter of habit or our own response to resolving problems not of our own making. When someone else imposes upon us the task of solving their problem, time is implicitly a critical factor; they want the problem solved and they wanted it solved yesterday. Generally, we accept the implicit premise of time criticality without examining whether – in fact – time is actually a critical factor, or the probable adverse consequences of proceeding on any solution that fails to limit scope as a means to assuring quality.

When the impulse of impatience leads organizations in the business world to be in a hurry it inevitably leads to disaster. Toyota, a company who built its reputation and literally wrote the book on eliminating manufacturing waste, is just the latest example:

I believe that around the turn of this century... [Toyota] made a very human error by deciding it wanted to become the biggest auto maker quickly, a goal of no interest to any customer. Then it worked backward to do what it took to rapidly become the biggest, surpassing the "do not exceed" speed that every organization has on its instrument panel.

By stomping on the gas Toyota briefly lost touch with the core values and rigorous methods that had worked brilliantly for solving customer problems over the preceding 50 years while permitting Toyota to prosper. (Womack, 2010)

Let us then apply this principle to our present *RExcel* quandary. We have a sophisticated software solution that costs nothing for the licensing for as many individuals as we require. It interfaces with the most successful spreadsheet program on the market today. However, it requires a great deal of time and effort to learn how to use properly, even for sophisticated users. Since time is assumed to be a critical factor, R and *RExcel* fail to meet the criteria for a new tool to gain general acceptance and broad use.

On-the-other-hand, what if time is not truly a critical factor? Does that change our assessment of *RExcel's* utility? And if so, what does that mean for our solution?

When organizations attempt to change their internal culture quickly, only disaster can be expected.

There is the now well-known military mantra, "Slow is smooth, smooth is fast." Its meaning – whether within a military context or some other – is clear: when you allow the impulse to move fast, or the pressure of time to rush your actions, the results are often disastrous:

- The failure to ask the correct questions will always result in the study of the wrong phenomena.
- The failure to measure the phenomena accurately will always result in the collection of faulty data.
- Faulty data will always lead to the incorrect answer.
- The incorrect answer will always result in an incorrect action.

The key to organizational change and business transformation in a highly dynamic environment is to have a way of developing and maintaining the local knowledge over time in response to local needs and local problems that still allow knowledge (data) to be shared with others outside. Because accurate communication of both information and ideas is crucial, is necessary too to have a commonly shared language so that important concepts can be exchanged. In the Information Age, that commonly shared idiom is the language of statistical probability.

The tools we use for problem solving need to be standardized and generally shared, too, so that the time needed to communicate information within the organization is routine, accurate, verifiable, and accessible to all who need to



use it. That commonly held tool – for the present – is Microsoft *Excel*. However, *Excel* lacks the computational reliability and functionality required for sophisticated data analysis. To make it useful we must integrate it with a low cost high performance statistical package, using a middleware package that allows for the easy and uniform transformation of data and calculations between the two.

The software packages *R*, coupled with *RExcel* seem to be very strong candidates for that purpose.

6. PEER-TO-PEER TRAINING; SLOW AND STEADY

Even if training everyone in an organization in a more sophisticated use of *Excel*, or any other software, were financially possible, it would remain operationally infeasible. New skills and new ways of doing things are disruptive at best: people have their various day-to-day responsibilities to attend to, and individuals learn at different paces and with different styles. The training solution of a 1 – 2 week basic course offered in the corporate world is rarely integrated with the actual operational needs of the organization, and keeping training professionals on-hand to be available for consultation is very expensive.

A Peer-to-peer approach to training (Lefcowitz, 2009) solves that problem.

Peer-to-Peer (P2P) training is a self-aware Community of Practice (Lefcowitz, 2009, pp. 4 - 6). In the professional workplace, the goal of peer-to-peer training is to establish a *knowledge organization*, “a concern whose primary asset is knowledge, and whose competitive advantage comes from having it and effectively using it” (Conklin , 2001, p. 3).

The key to the knowledge organization is the *knowledge worker*, who:

“... *unlike the blue collar and traditional white-collar worker, is an expert or specialist, because to be effectively applied, knowledge must be specialized. As a consequence, knowledge workers (unlike their clerk forebears) must routinely come together to solve complex problems—they work in teams*” (Conklin , p. 2).

P2P is different than traditional training approaches. It hands-off , “as much teaching responsibility to the learner as possible and to encourage as many students as possible to engage in the highest possible degree of activity” (Grzega, and Schöner, 2005, p. 1). It is the students that take on the role of teacher with their peers. Sharing the responsibility of organizing the material that must be taught, preparing lesson plans that considers the most appropriate teaching methods to convey their topics, and then individually presenting the material to the group-at-large. All of this, of course, under the watchful eye and overall supervision of a more experienced and knowledgeable individual (i.e., supervisor, manager, professor, etc.).

Peer-to-peer training has been successfully used in a variety of social environments, academic, non-academic, and business. It solves a number of pressing organizational problems:

- It is effective because it assures and builds upon needed skill-sets;
- It is efficient because it conserves institutional and functional knowledge within the group;
- It is flexible because it can be implemented incrementally, new skills can be taught as they are needed;
- It is functional because it minimizes disruptions to day-to-day responsibilities;
- It is sustainable because it positively changes group culture and strengthens group dynamics;
- It promotes self-confidence and leadership; and
- It is relatively inexpensive to maintain.



For the purposes of statistical skills and software acumen, peer-to-peer training answers the question, “How can we use software tools that are complex and difficult to learn, and still minimize the cost of implementation?” Training whose goal is slow and steady progress, rather than immediate success, is the solution.

As it happens, that is exactly how one would go about changing an organization’s internal culture, as well.

7. CONCLUSION

Our society continues to struggle with two conflicting views of the world: certainty and uncertainty.

In the world of certainty, knowledge is easy because everything is known. It is world in which everything can be explained and truth is revealed. Since all things can be explained, there is only one single version of the “*truth*”, only one single source of what that truth is, what it means, and what “*big things*” get done because of it. It is a secure world, an orderly world, a controlled world, an authoritarian world, and – for those chosen few having access to the truth source – a privileged world. It is a world full of unrealistic and dysfunctional conflict, because no alternatives to the *known truth* are ever examined for validity.

In the other world, the world of uncertainty there are relatively few things known to be true, absolutely. This is a world in which knowledge is not easy; often events are difficult to understand and easily explained; a world where there is no single version of the truth. In this world ideas compete against all others, based upon what can be observed and what can be proved as being accurate. The “*big things*” that get done are based upon taking the best, most plausible ideas available, and testing those ideas against reality. There is no single source of the truth; it is a world of probabilities where many linkages and unknown events may affect a single outcome. This is an insecure world; often, it is not an orderly world. However, it is not a controlled world where dogma prevails in support of the privileged few. It is the world of science and scientific method. It is a world where effort is made – sometimes unsuccessfully – to pursue realistic and functional goals and objectives.

In our culture, we profess to believe in an uncertain world. In so doing we prescribe to the process of scientific inquiry and its two fundamental rules (Sagan, p. 333):

“First: there are no sacred truths; all assumptions must be critically examined; arguments from authority are worthless. Second: whatever is inconsistent with the facts must be discarded or revised.”

The advent of the Information Age has changed the skill-sets we require. Where once whole communities existed in splendid isolation, now we live in a world where events affect all others through the networks of mutual dependencies. Where in other ages the pace of change was relatively slow, in the Information Age the pace of change has speed up to the point where the very stability of the social fabric is threatened. Where once we relied on our leaders solely to solve our common problems on our behalf, today we recognize our leaders need our active participation to achieve our commonly shared goals and needs. Where earlier eras required skill-sets like hunting, or mechanical skills, the Information Age requires us to understand large amounts of information, and to make judgments as to its meaning and relevance. Even the smallest business handles prodigious quantities of information, requiring information workers who have more than a nodding acquaintance with the concepts of statistical probability and statistical method.

The grand vision of Frederick Winslow Taylor, and the promise of the science of management, is finally within our reach. All we need do – each of us – is to reach out. We have the time, if we choose to take it.



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