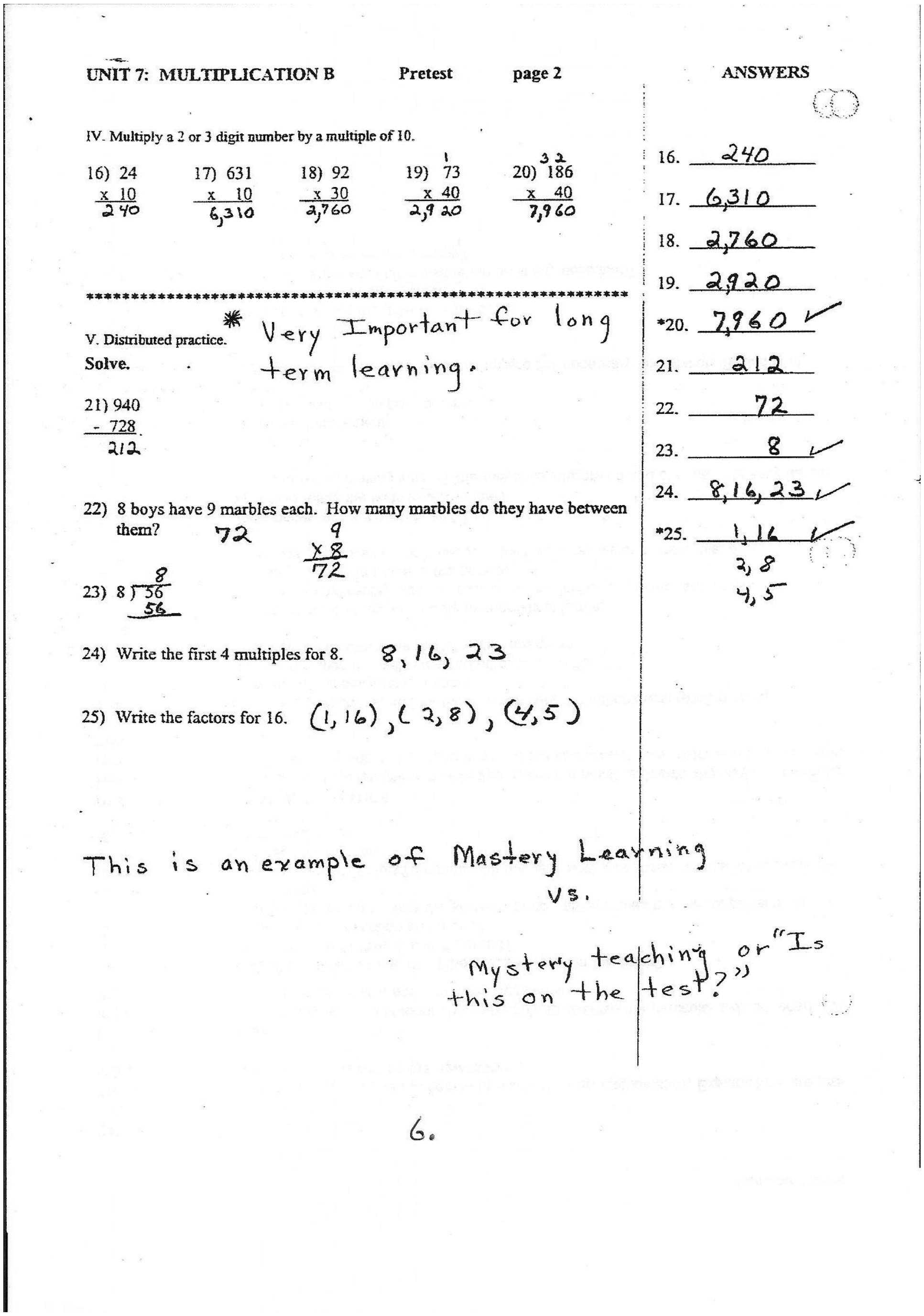


UNIT 7: MULTIPLICATION B **Pretest** **page 2** **ANSWERS**

IV. Multiply a 2 or 3 digit number by a multiple of 10.

16) 24
x 10
240

17) 631
x 10
6,310

18) 92
x 30
2,760

19) 73
x 40
2,920

20) 186
x 40
7,960

****

V. Distributed practice. * Very Important for long term learning.

Solve.

21) 940
\- 728
212

22) 8 boys have 9 marbles each. How many marbles do they have between them? 72

9
x 8
72

23) 8)56
8
56

24) Write the first 4 multiples for 8. 8, 16, 23

25) Write the factors for 16. (1, 16), (2, 8), (4,5)

16. 240
17. 6,310
18. 2,760
19. 2,920
*20. 7,960 ✓
21. 212
22. 72
23. 8 ✓
24. 8, 16, 23 ✓
*25. 1, 16 ✓
2, 8
4, 5

This is an example of Mastery Learning
vs.
Mystery teaching or "Is this on the test?"

6.

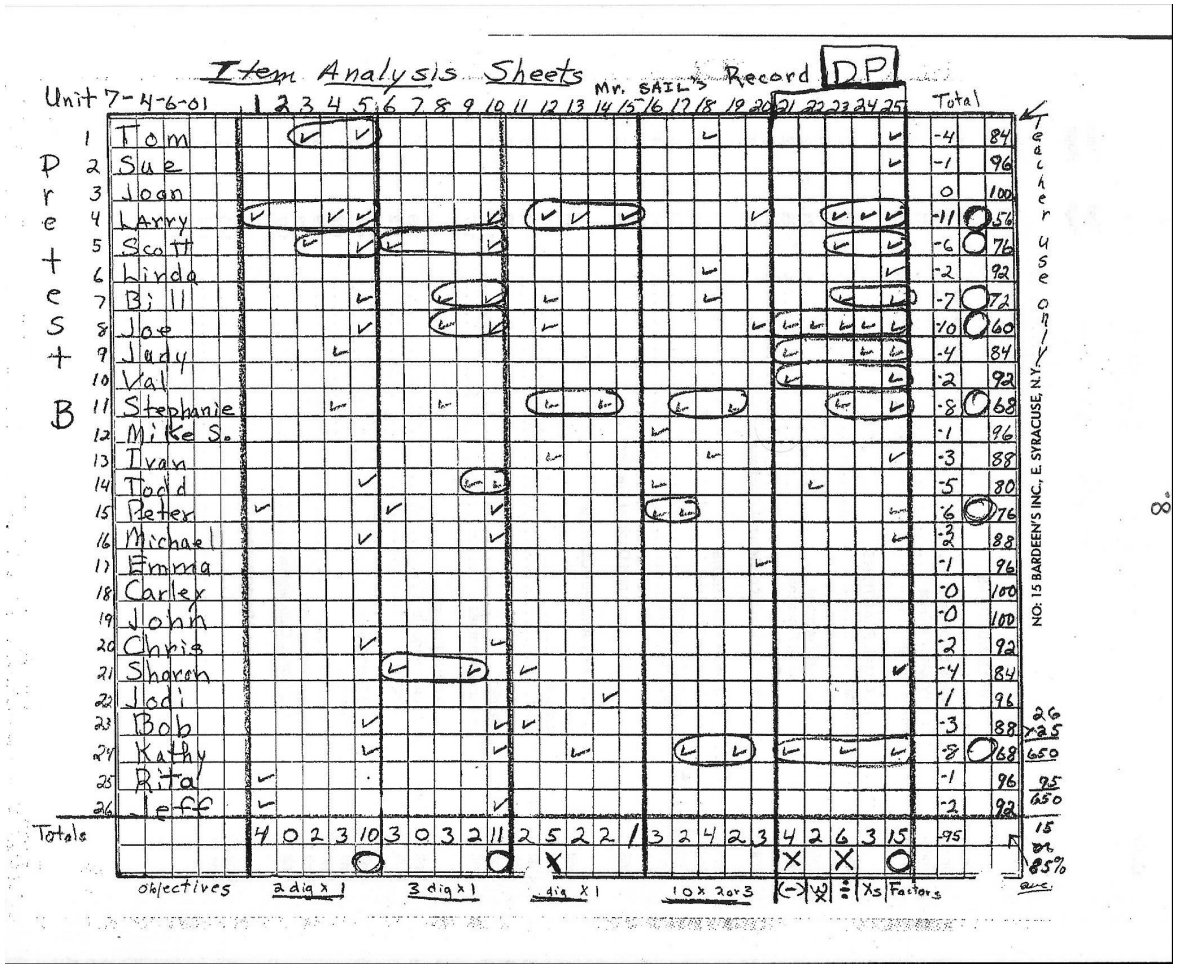
Subject _____ Grading Period Begins _____ Grading Period Ends _____

Unit 7
~~Period~~ _____
Grade 4th

Name		1st Week M	T	W	T	F	2nd Week M	T	W	T	F	3rd Week M	T	W	T	F	4th Week M	T	W	T	F	5th Week M	T	W	T	F	Final Grade
		Pretest	(II) Review	Test 1.	2.	3.	Pretest	(II) Review	Test 1.	2.	3.	Pretest	(II) Review	Test 1.	2.	3.	Pretest	(II) Review	Test 1.	2	3.	21	22	23	24	25	
																						DP					
Tom	1	I					100					100					80										
Sue	2	100					100					100					100										
Joan	3	100					100					100					100										
Larry	4	I	I	80			80					I	I	I	100		80							I	I	I	
Scott	5	I	100				I	80				100					100										
Linda	6	100					100					100					80										
Bill	7	80					I	80	100			80					80										
Joe	8	80					I	100				80					80										
Judy	9	80					100					100					100										
Val	10	100					100					100					100										
Stephanie	11	80					80					I	I	I	80		I	100									
Mike S.	12	100					100					100					80										
Ivan	13	100					100					80					80										
Todd	14	80					I	100				100					80										
Peter	15	80					I	I	I	80	100	100					I	80									
Michael	16	80					80					100					100										
Emma	17	100					100					100					80										
Carley	18	100					100					100					100										
John	19	100					100					100					100										
Chris	20	80					80					100					100										
Sharon	21	100					I	I	80	100		80					100										
Jodi	22	100					100					80					100										
Bob	23	80					80					80					100										
Kathy	24	80					80					80					I	100									
Rita	25	80					100					100					100										
Jeff	26	80					80					100					100										
	27																										
	28																										
	29																										
Objectives	30	2 digits x 1					3 digits x 1					4 digits x 1					10 x 2/3 digits										
	31																										
	32																										
	33																										
	34																										
	35																										
	36																										

Mr. Sail's grade book.
Notice how some students have several grades in the same objective. (Peter) #15,

7.



Item Analysis Sheets Mr. SAIL's Record DP

Unit 7-4-6-01

Pre-test B

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Total		
1	Tom			✓		✓													✓							✓	-4		84
2	Sue																									✓	-1		96
3	Joan																										0		100
4	Larry	✓			✓	✓					✓		✓	✓		✓					✓			✓	✓	✓	-11	O	56
5	Scott			✓		✓	✓				✓													✓		✓	-6	O	76
6	Linda																		✓							✓	-2		92
7	Bill					✓			✓		✓		✓						✓					✓		✓	-7	O	72
8	Joe					✓			✓		✓		✓								✓	✓	✓	✓	✓	✓	-10	O	60
9	Judy				✓																	✓			✓	✓	-4		84
10	Val																					✓				✓	-2		92
11	Stephanie				✓				✓				✓		✓			✓		✓				✓		✓	-8	O	68
12	Mike S.																✓										-1		96
13	Ivan												✓						✓							✓	-3		88
14	Todd					✓				✓	✓						✓						✓				-5		80
15	Peter	✓					✓				✓						✓	✓								✓	-6	O	76
16	Michael					✓					✓															✓	-2		88
17	Emma																				✓						-1		96
18	Carlex																										-0		100
19	John																										-0		100
20	Chris					✓					✓																-2		92
21	Sharon						✓			✓		✓														✓	-4		84
22	Jodi														✓												-1		96
23	Bob					✓					✓	✓															-3		88
24	Kathy					✓					✓			✓				✓		✓		✓		✓		✓	-8	O	68
25	Rita	✓																									-1		96
26	Jeff	✓									✓																-2		92
Totals		4	0	2	3	10	3	0	3	2	11	2	5	2	2	1	3	2	4	2	3	4	2	6	3	15	-95		
						O					O		X									X		X		O			
	Objectives	2 dig x 1					3 dig x 1					dig x 1					10 x 20 or 3					(−)	(+)	(÷)	(x)	Factors			

Teacher use only

NO. 15 BARDEEN'S INC., E. SYRACUSE, N.Y.

26 × 25 650

95 650

15 or 85% a.c.

8.

Expedients are for the hour; principles for the ages.
— Henry Ward Beecher

3
Monday
April 2000
94th Day 272 Left Week 14

Monthly Focus: Values—
Are the things you value most governing your decisions?

D = student does actual example
In = pick or choose answer

Daily Record of Events

Task Analysis - CAKE
Learning Components - Objectives
Unit 7.
Objectives 1,2,3,4
Essential Components

D/In	Y	N	DK	
D				1) Multiply facts 0, 1, 2, 3, 4, 5
In				1a) 4X3= A-16, B-12 C-7, D-1 - Choose one.
D				2) Multiply facts 6, 7, 8, 9
D				3) Name place value
D				4) Write and align numbers
D				5) Add basic fact 0 - 9
D				6) Write numbers correctly
D				7) Write numbers legibly
D				8) Multiply numbers in correct sequence
D				9) Carry number (put in correct place)
D				10) Add the carried number correctly
D				11) Multiply "0" and carry correctly
D				*12) Write numbers on the line
D				*13) Write magic X square in 2½ minutes
D				*14) Write numbers perfectly
				15) Read, comprehend and setup word problem
				16)
				17) * desirable, but not absolutely essential skills.
				18) (Would most teachers choose SAIL or Traditional?)
				19)

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Original Monarch

12, 13, 14 - desirable, but not absolutely essential.

9

A. 16/100 = 84% or does it?

X	2	9	1	4	8	6	7	0	3	5
3	6	27	3	12	24	18	21	0	9	15
7	14	63	7	28	56	42	49	0	21	35
9	18	81	9	36	72	54	63	0	27	45
4	8	36	4	16	32	24	28	0	12	20
8	16	72	8	32	64	48	56	0	24	40
1	2	9	1	4	8	6	7	0	3	5
6	12	54	6	24	48	36	42	0	18	30
0	0	0	0	0	0	0	0	0	0	0
5	10	45	5	20	40	30	35	0	15	25
2	4	18	2	8	16	12	14	0	6	10

Results Dx
① 4, 6, 7, 8, facts
②

Rx
① Use chart
② Practice in school/home x

Another Dx - give several similar problems and let Larry use a chart to get x facts. See if that works.

x home - not all are equipped to help.

+	5	0	1	7	3	2	8	6	9	4
1	6	1	2	8	4	3	9	7	10	5
4	9	4	5	11	7	6	13	10	13	8
8	13	8	9	14	11	10	16	14	17	12
6	11	0	7	13	9	8	14	12	15	10
0	5	0	1	7	3	2	8	6	9	4
9	14	9	10	15	12	11	17	15	18	13
7	12	7	8	14	10	9	15	13	16	11
3	8	3	4	10	6	5	11	9	12	7
5	10	5	6	12	8	7	13	11	14	9
2	7	2	3	9	5	4	10	8	11	6

Results Dx

Rx

NO: 15 BARDEEN'S INC., E. SYRACUSE, N.Y.

B 3/100 = 97%

Addition

10.

Curricular Approach and Instructional Focus

Going upstream
SAIL ***prevents*** a child from becoming a so-called "At-risk" student. No child, at any age, should have to suffer the indignity of being called a failure. Successful student learning, not teaching, will be the focus and fundamental business of our school. Teaching without successful learning is like the old medical joke: "The operation had been a success, but the patient died."

SAIL is a diagnostic/prescriptive method of instruction that builds upon the student's developmentally appropriate level. **SAIL** is an individualized learning process. **SAIL** takes full responsibility for student learning by using data driven, documented performance-based learning

School Culture
We will repudiate the notion that low academic achievement and behavior problems are to be expected of kids from low-income families. Instead, we will establish a school culture where daily success will be the norm! And as we all know, "Nothing Succeeds Like Success."

No child ever went to first grade with the idea that he/she was going to fail on purpose, become a delinquent and end up in jail or dead at an early age. They all have dreams of becoming teachers, firemen, musicians, actors, entrepreneurs etc. First graders want to learn! They expect to learn to read in the first week of school. At **SAIL** we teach them to read on the first day.

They are eager and enthusiastic about school. Students, like us, are willing to try and try again as long as they see progress. They are very resilient, but without progress and sustained success, they soon give up on their dreams. Without hope and positive results, the burning fire to succeed is soon extinguished.

Project Oriented
As we all know, if you don't use it, you lose it. That is why **SAIL** gets the students to practice what they have learned and then put it to use in a relevant project. This application does two things: first, it gives the students a meaningful reason for learning the skill, information, or knowledge. Second, the hands-on approach makes for greater retention of the material. Haven't we all experienced the "a ha" feeling after completing a project that at first looked daunting? In most schools, students learn facts for a test. That information is soon forgotten. Hands-on relevant projects provide long-term retention and understanding.

Remediation vs. In Class Tutoring
In business it is said that it costs tens times as much to rework a product as it does to do it right the first time. Remedial education is also very, very expensive.

Since a child in the **SAIL** system never finds himself/herself failing, there is never a need for remediation. Remediation implies that lack of student success was the student's fault, when it actually is the teacher who needs to remediate his /her lesson.

SAIL uses a performance-based format that ensures that a student learns correctly. Every day and in every lesson, the classroom teacher provides all the help necessary at the moment of learning; therefore, there is no need for remediation. A formative assessment is given after an objective has been taught. When a formative evaluation determines that a student lacks certain learning components (we call it a gap analysis) the teacher looks to himself to determine what he must do to help the student learn. A task analysis is performed to determine what learning strategies the teacher must implement in order for the student to succeed.

Failure Is Not an Option
100% - 80% and "**UC**" for "**Under Construction**" are the only grades that are given. Failure is not an option for the student or the teacher. Often students get so desensitized to failure that an "**F**" means that they are **Free** from doing any more work on that material. They believe that they have been freed from any

11.

further responsibility. The motivation of success is much stronger than the fear of failure. **SAIL** believes that all kids want to learn and be successful, if for no other reason than to be like their friends.

Students also appreciate the fact that if they receive a "UC" on an objective they only will have to work on that one. Since the content is criterion-referenced, only the "UC" objective in question is addressed.

Accountability/Performance Based Instruction
SAIL believes that accountability for learning **should not** be placed on the shoulders of a 5-year-old child who has no say in the manner in which she is taught. She has no recourse for faulty instruction. She has no way of seeking resolution when blamed for being a "failure". **SAIL** takes full responsibility for student learning.

In a performance-based learning system, all assessment is criterion-referenced, rather than norm referenced. That is, students are assessed against the content of the curriculum, and not against one another. The content would reflect NYS Standards and the local school's curriculum.

Cost Effectiveness
First- Students will correctly learn the material at the mastery level. When this happens, the number of students in need of special education drops dramatically. This could save the schools districts millions of dollars every year. Special education would be provided for those student who are considered "low incidence" which is less than one percent of the student population. Compare that to some inner city school districts that have over 20% of the students classified through the CSE.

Second-There will be no failures; no student will have to repeat a grade. Every time a student repeats a grade or needs special instruction, it costs tens of thousands of dollars extra that could be used more effectively elsewhere.

Third- There will be very low administrative costs since most of the administration will be done at the grade level by the team. No money will be spent on special math and reading teachers, curriculum specialists, administrative assistants etc.
Teachers would be expected to work a full 8 1/2 hours per day. There will be daily team-level meetings and daily inter-level meetings.
All teachers will construct a weekly newsletter that explains to the parents what will be happening academically and logistically. Teachers will keep parents apprised of any situations ASAP. NO SURPRISES is one of the tenants of **SAIL**.

Fourth- There will be very little need for psychological testing and counseling since most needs arise out of students failing! Failing causes most emotional, psychological, and disciplinary problems.

Fifth- Teacher burnout and the resulting absenteeism can be very costly in terms of money, wear and tear on the staff and a disruption in student learning. Teachers who are successful in the classroom are a lot less likely to need R & R. The same is true for the students.

Sixth- Labeling a student is just a convenient way for the school to abdicate its responsibility. Labeling a first grader as LD, Learning Disabled, is a cruel hoax. Soon the student begins to believe that she is a failure. As Dr. Wayne Dyer once said, "If you label me, you negate me." Let's stop making students invisible.

Seventh- Teacher training and teacher implementation of the process would be highly regulated and subjected to evaluation for job continuation. The prescribed content, Gap Analysis, and procedures will ensure student success by means of a data driven process.

Finally- People do not mind paying taxes when they get value for their money. Businesses and parents are attracted to districts where their children are offered a bright future because of their success in school.

SAIL is easy to replicate and maintain since it is data driven. 100% replication is an absolute must for any venture to be viable in the long term. We believe that the best scores now obtained by so-called "Top schools" will be our baseline for success. How could we shoot for anything less?

At Firefly Academy we believe that all children have a burning desire to learn-
Our job is to fan the flames.

Larry Sformo
SAILEE, LLC,
President

CONCLUSION

Major improvements in U.S. education will not come from the education community! The establishment has too much political baggage and no real reason or desire to change. Failure to perform has no consequences. The decision makers all come from a demographic of wealth and well-being. At least 30% of their children attend private schools. They are all making money without any real oversight or accountability. What other business could continue with a failure rate of 1% let alone 65%? Everyone blames someone else and nothing gets accomplished.

Dr. Deming once said that many businesses try to improve quality by "frittering" around the edges without any meaningful changes only to find that the results are dismal. Education has been around the edges so many times that it hardly knows what to call the "new" concepts.

SAIL offers an educational process that guarantees student success or the district gets its money back. Wal-Mart offers a 100% money back guarantee on a pair of sneakers- we should be able to do the same for the education of our children?

13.

AACSB ACCREDITATION: A POSITION PAPER ON DEMING PRINCIPLES

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Introduction

The mission of the Association to Advance Collegiate Schools of Business (or simply AACSB) is "to spread accreditation to advance the quality of management education" (Runcieman, 2009). AACSB has been so successful communicating the importance of its quality assurance mission, that many schools now perceive the lack of accreditation as a competitive disadvantage (Lowrie & Wilmott, 2009; McKee, et al., 2005). Revisions to its standards over the past few years, combined with an ambitious international expansion strategy, have resulted in a forty-two percent growth rate in the number of accredited schools overall (Runcieman, 2009), and a three hundred percent increase in accreditation of schools internationally (Kraft, 2006, p. 42). As of January 2010, AACSB reported a total of 579 accredited institutions, of which 109 were outside of the U.S. (AACSB, 2010).

At a superficial level, the standards and processes required by AACSB are reasonable. Accreditation assures that the faculty who teach subjects have either academic or professional qualifications to teach those subjects. It assures that a process is in place to monitor the voice of the customer and to feed back that voice to improve the program. It is difficult, if not impossible, to argue that such assurances should not be in place. However, as with any policy or standard, the proof of the pudding is in the eating. And, as anyone with a modicum of systems understanding knows, simple, common sense polices can have a host of unintended consequences. In his critique of AACSB operations, Mullin (2006, p. 1) observes, "…quality cannot be incrementally added to a system not designed for quality and continuous system improvement."

In this paper, we first examine the literature on AACSB accreditation, with an eye to the Deming System of Profound Knowledge. We provide background on our interpretation of Deming and the accreditation standards and processes. We then examine the implications, with an emphasis on the possible negative implications, given the Deming view. The authors represent various stages of application of AACSB at mid-size state universities: considering adoption, in candidacy, and about twenty years after acceptance. Our focus is on universities with a teaching mission and management education. Our purpose here is to present an alternative, Deming view of accreditation and to raise potential issues for further consideration.

Review of the Literature

A review of the literature leaves one with the impression that AACSB is either the most important guarantor of the quality in business education, or that it is to be blamed for spawning a tsunami of inferior research, destroying faculty morale and reducing innovation and autonomy in business school operations. The truth, at least as it is reflected in the literature, lies somewhere in between these two extremes. Nevertheless, AACSB must be considered a *force majeure*, influencing the lives of millions through its mission of quality assurance. A brief summary of the streams of research targeting the impact of AACSB is provided in Table 1.

Table 1 Selected research streams on AACSB accreditation

Research Stream	Sample Literature
AACSB operations & growth	Jantzen, 2000a; Thompson, 2004; McKee et al., 2005; Scherer et al., 2005; Kraft, 2006; Linker, 2007; Muuka et al., 2007; Trapnell, 2007; Runcieman, 2009
AACSB mission-based standards	Jantzen, 2000; Yunker, 2000; Mangan, 2003; Thompson, 2004; Lowrie & Wilmott, 2009
Impact on Curriculum Changes; Organizational Processes	Drexler & Kleinsorge, 2000; Sinning & Dykxhoorn, 2001; Smith, & Rubenson , 2005.
Costs of Accreditation	Mangan, 2003; Scherer et al., 2005; Heriot, et al., 2009
Faculty: qualifications; intellectual contributions; salary; satisfaction	Stark & Miller, 1976; Porter and McKibben, 1988; Lervernier & Miles, 1992; Hardin & Stocks, 1995; McKenna, 1995; Henninger, 1998; Bertin et al, 1999; Agarwal & Yochum, 2000; Srinivasan, 2000; Miles et al., 2004; Spritzer and Billings, 2005; Francisco et al, 2008; Koys, 2008; Hedrick et al., 2009; Smith et al., 2009; Spritzer and Garceau, 2009
Continuous improvement; quality management	Falk et al., 1994; Bhattacharya et al., 1998; Dube, 1997; Jantzen, 2000b; Mullin and Wilson, 2001; Durand & McGuire, 2005; Hedin et al., 2005; Mullin, 2006; Ahmad and White, 2007; Trapnell, 2007;
Assurance of Learning; Teaching Effectiveness; Assessment	Noser et al., 1996; Nicholson et al., 2005; Aurand & Wakefield, 2006; Martell, 2007; Pringle, 2007; Pringle & Michel, 2007; Shaftel & Shaftel, 2007; Kilpatrick et al., 2008; Iossifova, 2008

AACSB has a history of influencing curriculum development and programmatic changes in business schools. For instance, AACSB is credited for being one of the first to recognize the importance of the international dimension for U.S. business education as early as 1959 (Thanopoulos & Vernon, 1987). Teaching ethics has been a “requirement” since 1979 (Shannon & Berl, 1997), and information technology, culture, diversity, and social responsibility all have taken their turn at being promoted through "white papers", and all are incorporated into AACSB’s expected curriculum content. Whether AACSB is responsible for initiating these major thematic elements of business education is debatable, but the organization is nevertheless credited with both positive (Ng & Spooner, 2007) and negative (see e.g., Albritton, et al., 2003; Lowrie & Wilmott, 2009) changes in quality of educational programs.

While AACSB's impact on education quality is questioned by some, there is little doubt that a primary benefit of AACSB accreditation is the perception of quality conveyed by the coveted "seal", or stamp of approval. AACSB's chief accreditation officer posits that AACSB status helps parents, prospective students, faculty and employers shop for quality education (Trapnell, 2007). Jantzen (2000b. p. 738) takes an even stronger position, stating, “the accreditation status of a business program is the *sine qua non* in determining how prospective business students judge the quality of a program”.

Perceptions of quality appear to confer at least some financial benefits to the main educational participants (faculty and students). Hardin & Stocks’ 1995 study found that accreditation enhanced the entry-level job prospects for accounting students, and a number of studies report that faculty salaries are higher at AACSB accredited schools (see e.g., Agarwal & Yochum, 2000; Bertin et al, 1999; Levernier & Miles, 1992).

Higher faculty salaries, obviously, also add to the cost of operations (and tuition), but are only a part of the total cost associated with accreditation, another frequent criticism of the organization's impact (see e.g. Mangan, 2003; Scherer et al., 2005). In a 2009 study of accreditation costs, the mean initial cost (self-study, documentation, surveys, training, infrastructure, etc) was approximately $50,000 while the mean increase in operating expenses (faculty salary, recruitment, technology, library holdings, etc.) was reported at

approximately $400,000 per year (Heriot, et al., 2009).

As stated at the outset, improving the quality of management education is the organization's prime directive, and the literature is not particularly kind to AACSB in the evaluation of this objective. AACSB's current quality standards (interpreted by most as requirements) are "mission-based", and fall into the general categories of *strategic planning (standards 1-5)*, *educational participants (standards 6-14)*, and *assurance of learning (standards 16-21),* and are the result of several major revisions over the in the past 15 years (Spritzer & Billings, 2005). A significant number of recent studies on AACSB investigate the impact of AACSB's shift to mission-based standards of accreditation (see e.g., Yunker, 2000; Mangan, 2003), and the motivation behind the change. Jantzen (2000) and Lowrie & Wilmott (2009) both conclude that this move was not based on improving business education, but was one of organizational survival, as explained below.

As the market for accrediting research institutions matured, several competing accrediting bodies (e.g., ACBSP and EQUIS) were having increased success at accrediting the non-tier one institutions. AACSB (a for-profit organization) does not accredit for-profit institutions (Linker, 2007), so targeting the high growth on-line university market was not a viable option. In order to maintain growth, AACSB revised its standards to make accreditation more accessible to non-research, or "teaching" institutions (Thompson, 2004), and also began expanding internationally.

Accrediting on the basis of "good teaching", however, is not as simple as counting publications (Yunker, 2000), and faculty at non-research institutions were simply not as prolific as their tier-one counterparts. In order to avoid the appearance of diluting their accreditation standards, AACSB broadened the types of research (or intellectual contributions) that count for academic qualifications, and moved to mission-based, not absolute, standards.

While many aspects of AACSB's accreditation philosophy have been researched, the most resilient stream (and one that predates mission-based accreditation) challenges the assumption that research output should be used as the main standard for academically qualifying faculty. Not surprisingly, there is a strong correlation between levels of research output and AACSB accreditation (Srinivasan, 2000). While there have also been reports of a link between research output and teaching effectiveness, student evaluations are the most frequently used indicator of teaching effectiveness (see e.g. Noser et al., 1996). An extensive review of the literature echoing this fundamental flaw in reasoning is not in the purview of this paper. The flaw, instead, is best summed up in an AACSB publication, where it is admitted that there is "*no definitive research linking research output with effective teaching ... yet AACSB clearly believes that interdependency exists and is a positive aspect of effective business education"* (AACSB, 2008).

Even if the link did exist, however, the actual impact on the quality of education is the opposite of what AACSB intends. Faculty at AACSB accredited institutions are given reduced teaching loads so that they have more time to publish (Hedrick et al., 2009; Honeycutt & Ford, 1995; Stark & Miller, 1976). They are then frequently replaced in the classroom by teaching assistants, adjunct professors, visiting professors, etc., who generally do not have comparable research records. While these employees may, in fact, be quality teachers, how does the system improve education quality? By taking the researchers out of the classroom. Every system is perfectly designed to produce the result it achieves (Senge, 1990).

Background

Deming's System of Profound Knowledge

In W. E. Deming's (1994) last book, *The New Economics*, he introduced his System of Profound Knowledge. It represents a restructuring of his management philosophy and of his Fourteen Points. The system serves as the basis of our approach to applying Deming to AACSB accreditation and it consists of four parts: systems, variation, theory of knowledge, and psychology. Each part is described here along with the implications for our critique of the accreditation process.

Appreciation for a System. Central to Deming's System of Profound Knowledge is the notion of a system.

Seeing systems represents a dramatically different way of viewing the world. Indeed, for Russell Ackoff (1999, p. 1), a system is not a concept but a worldview. For Robert Kegan (1994, chap. 5), systems thinking is a level of consciousness and is, therefore, not something that can be taught. Systems thinking is the antithesis of analytical thinking. For the most part, management students are trained to deal with complexity by stopping the action, breaking the problem/issue into parts, and dealing individually with the parts. A technology has built up around this approach and involves the General Linear Model in statistics, spreadsheets, and a host of decision support tools. Unfortunately, we do not spend as much time on system dynamics modeling, idealized design, or soft systems methodology – technologies designed to support systems thinking.

It is not possible in the scope of this research to elaborate on systems. A definition from Peter Senge (1990, p. 68) will have to suffice: "Systems thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for *seeing patterns of change* rather than static 'snapshots.' "

For our needs in this paper, appreciating systems means we must acknowledge that management education is a complex web of highly interactive problems. This is what Russell Ackoff has defined as a mess. We have to consider that addressing one part here at a point in time can have implications for another part over there at a different point in time. There are unintended consequences. There are feedback loops over time, reinforcing or counter-balancing effects. There are non-linear relationships that can cause unexpected shifts in responses.

Knowledge About Variation. Variation has to do with the dilemma that every manager faces when presented with performance data; to respond to the change by investigating and explaining or to ignore the change as random variation. If the manager responds to random variation, at the minimum they will increase the variation in the system. If they fail to respond to a significant change, they may miss important information about the system. In order to make the right decision, the manager must understand the nature of variation as to its causes. There is either a special cause such that an investigation will yield useful information about predicting future performance or there is a common cause – a host of causes that are so complex that investigation is fruitless. With common cause variation, the manager must ignore the change and resist any temptation to investigate.

What is critical to appreciate regarding variation is to know what type of system you are dealing with. Is the system in-control, meaning that it is producing consistent results within a normal range of variation? Or is the system out of control where it is not producing consistent results? This is essential for improving the system, continuous or otherwise. If the system is out of control, then you are not faced with a single system. You are faced with multiple systems and you do not know which system you are dealing with. Only when you have a single system producing consistent results can you begin to improve it. This is essential for developing theories.

Regarding our purpose here, we must apply notions of statistical process control in order to know if your educational system is in-control or out of control. We have to know if our system is producing consistent, predictable results. We have to have some inkling of the limits of the natural variation. We have to understand the type of variation we are dealing with so that we are not tampering with the system.

Theory of Knowledge. Deming differentiated facts and information from knowledge. Knowledge involves prediction and can only come from theory. Managers are concerned with knowledge and prediction. Working from theory implies that we understand cause and effect. Understanding cause and effect comes from controlled experiments that provide predictive validity. Short of this we are working with superstitions, not knowledge. In an analytical sense, we need to isolate cause and effect and design rigorous experimental designs to understand causal relationships. In a systems sense, we need to develop theories of complex interactions for future testing. In either case, theory is critical.

The implication for our view of accreditation is that we have to have a model of the complex web of interactions affecting management education. We must have a theory from which to base experiments. This is the only way knowledge can proceed.

Psychology. Management education is a social system; it involves people. Any time you have human beings (self-consciousness) as parts of a system, it makes the system that much more complex. This brings theories of human behavior to the fore, especially as they relate to systems and variation. Central to Deming's concerns regarding psychology were concepts of intrinsic motivation, pride of work, and cooperation. Fear and coercion reduce intrinsic motivation and drive out pride of work. Perhaps more importantly, incentives and rewards also reduce intrinsic motivation and pride of work. These are not Deming's ideas but they are based on a large body of psychological research. Cooperation is also a core concept for Deming. Competition pits individuals against each other which could easily harm the overall system.

For Deming, the research is clear – eliminate any concept of Management by Objectives with the attendant incentive programs to reward the accomplishment of objectives. Given that individual performance is the result of the complex interaction of scores of causes, most of which are outside the control of the individual, then individual performance evaluations, especially those that hold individuals accountable for objectives, will do more harm than good. They will serve to decrease intrinsic motivation and pride of work. Decreasing intrinsic motivation and pride reduces quality.

The implications for this paper involve the appreciation that humans are an important part of the system and their feelings and motivations are of central concern. Intrinsic motivation – the degree to which faculty, staff, and administrators care about their work – and the degree to which they take pride in their work are vitally important to the system and add to the degree of complexity in the system.

System of Profound Knowledge. As a system, Deming's ideas cannot stand alone. The parts are highly interactive and dependent upon each other. As a result, we have to accept Deming as a whole or not accept him at all. It is from this integrative systems standpoint that we apply Deming to AACSB accreditation.

AACSB Standards

There are three areas of focus within the AACSB accreditation process: strategic management, participants, and assurance of learning. Our focus will be on the last two sets of standards. Regarding participants, the standard for faculty is that a minimum of 50% of the faculty must be academically qualified (AQ). A total of 90% of the faculty must be either AQ or professionally qualified (PQ). To be considered PQ a faculty member must have high level experience within their field.

AQ status is based upon a rolling 5 year period. To become AQ, a faculty member must have a doctorate and have a minimum number of peer reviewed journal publications within the 5 year period. The requirements for the number of publications will depend upon the nature of the academic institution. At a university just seeking accreditation with a teaching orientation, the number could be as low as one but more likely will be two or more. At a research institution, the number could be two per year.

Assurance of learning starts with the learning goals and then attempts to measure those goals and apply a continuous improvement process. In the jargon of AACSB, continuous improvement means "closing the loop" or acting on the data that has been collected.

In its seminars, AACSB stresses that the assurance of learning process is not supposed to single out individual professors for criticism. The measurements that are taken are for components of classes and are separate and apart from the grading that goes on within classes. The measurements are supposed to be anonymous, based upon random samples, and the evaluation is done using an accepted rubric. The evaluators are not the class instructor. For example, if a goal is to be an effective oral communicator, in a class where oral presentations occur, the presentations would be taped and evaluated by other department members using the accepted rubric.

Implications

The AACSB standards and white papers do not explicitly acknowledge any aspects of Deming's System of Profound Knowledge. They do not represent business education as a complex system. While they

encourage the measurement of performance, they do not encourage an understanding of common and special causes of variation. The standards infer the need for theory and testing and explicitly call for operational definitions in their process for continuous improvement, however, there is no emphasis on the need for statistical control. And, finally, they do not address the psychological reactions of the conscious beings who are part of the complex social system. In this section, we would like to explore the potential for problems that would result from not understanding or appreciating Deming's system.

As a reminder, our concerns are framed with a teaching mission and a management perspective. Also, we must emphasize that not all problems would necessarily occur, but, again, our intent is to explore the possible unintended consequences. We will focus on two areas of accreditation: qualifications and assurance of learning.

Academic and Professional Qualifications

Perhaps one of the most egregious violations of Deming's principles and the greatest opportunity for unintended consequences lies in the determination of the qualifications of faculty. For AACSB, the justification for qualifications are tautological: *"Since the intent of academic qualifications is to assure that faculty members have research competence in their primary field of teaching, the existence of a current research record in the teaching field will be accepted as prima facie evidence of academic qualifications"* (AACSB 2008). In this standard, faculty are labeled as either academically qualified (AQ), professionally qualified (PQ), or other. At most, ten percent of faculty can be in the other category, which we interpret as unqualified. In this process, competent, effective, and professional faculty can be labeled unqualified without evidence regarding the predictive validity of the qualifications.

The standard, in both definition and interpretation (Smith, Haight, & Rosenberg, 2009), requires at least one publication in a peer-reviewed journal every five years. Yet, there are no longitudinal experimental studies to demonstrate that meeting the standard will improve teaching performance or the performance of the program. This is perhaps one of the most confounding elements of AACSB's method for determining academic qualifications – effective teaching experience counts for absolutely nothing. If a faculty member's initial academic qualification (e.g. a PhD in the field) is more than five years old, that person is automatically disqualified, unless he/she can produce a current research record. The belief in this hypothesized link has spawned a wave of merit-based pay systems in member schools designed to reward research output – not quality teaching. For instance, in a follow-up letter to one of its recently accredited schools, AACSB asked for:

1. A review of revision to the faculty recruiting, development, and evaluation policies and processes to enhance the production of intellectual contributions, especially articles in refereed journals.

2. *An updated review of faculty intellectual contributions, by discipline and faculty member, analyzing trends since the writing of the self-evaluation report.*

What is the rational organizational and individual response to these requests? An immediate change in school policy increasing the minimum requirement for intellectual contributions – with no increase in pay or research funding was the first step. Despite a strong teaching mission and a university-wide core value of small class size, several departments responded by encouraging faculty to teach "double sections", reducing the contact hours for faculty (but doubling class size). Some faculty responded by giving more multiple choice tests and requiring fewer written assignments, thus freeing more time for research. An increase in the number of intra-organizational multiple-author publications is another rational response by faculty interested in assuring a merit pay increase (no more cost-of-living pay increases either).

In order to attract "research" faculty, higher salaries were authorized for new faculty, resulting in a drastic increase in salary inversion. Newly hired assistant professors now come in at salaries 20-30% higher than associate/full professors with 15-30 years of teaching experience – despite their having met or exceeded the school's existing requirements for publishing.

To illustrate some of the other possible consequences, consider a hypothetical school of thirty faculty

where half are new and active in research, and half are older, tenured faculty who have not kept up with publishing. However, these older faculty read regularly in their field. They have developed interests that have enhanced their teaching such as learning new technologies and teaching techniques. They also read outside their specialties making them more well-rounded. They are committed and caring faculty both to their institution and to students and they are committed to mentoring the younger faculty.

Now the older faculty, in light of AACSB, are classified as "other," knowing they are being labeled as unqualified. We know of instances where this labeling is extreme whereby unqualified faculty are placed in a separate department and given a deadline by which to become qualified. And what are the likely results? First, such a classification is divisive. It creates a caste system where some faculty are considered 'better' than others as measured by their publications. This is certainly not conducive to the older more experienced faculty mentoring younger faculty. Actually, it may lead to younger faculty being coerced into helping the older faculty publish. In this case, the younger faculty could end up resenting the time this takes away from their publishing. And, the older faculty could easily resent the "mentoring" by younger faculty.

Second, the older faculty see the publishing requirement as a control issue where they are coerced into behavior that they do not believe is relevant or a requirement for the profession. The older faculty are also aware that the standard is arbitrary – that there is no evidence that publishing has predictive validity for future performance in service or teaching.

Third, as discussed above, the new faculty in non-union schools with publishing records are often paid well above the older faculty. In union schools, where salaries are bracketed, new faculty are often brought in at higher ranks to give them a higher salary. In many cases, this salary is still short of AACSB averages so the new faculty are also often offered incentives, such as reduced teaching loads or guarantees of extra pay opportunities. Older faculty feel they had to earn their rank and resent that they are not given equal opportunity for extra play.

Fourth, the older faculty may experience a sense of unfairness regarding the shift in requirements. They had been hired and rewarded for years under one system and now the rules have changed.

We would like to pause at this point to consider some of the ramifications of the above points. How do professionals, especially those as independently minded as academics, respond to coercion, threats, intimidation, embarrassment, and inequitable pay? Most likely they will respond with resentment and anger. Will they be as committed to the school? Will they care as much as they had before about either the program or the students? Will they be as likely to continue to explore new teaching methods? Will they be inclined to mentor the younger faculty?

In Deming's terms, all of the above would have contributed to reduced pride in work and reduced intrinsic motivation – the degree to which they care about their work. The evidence for this response is not from Deming but from a body of psychological literature (for a summary, see Deci, 1995). We have to ask, how does treating faculty this way – even if they become academically qualified – improve the business program? Do the benefits out-weigh the costs?

A fifth possible consequence of qualifying faculty is the message sent to new faculty: publishing is more important than teaching. Faculty can be removed from the school of business for not publishing (determined unqualified) but not for teaching less effectively. Actually, if individual faculty can be associated with teaching performance, they may be affected through the assurance of learning standards. However, as we will see in the next section, if data are used against individuals, there will be a host of other problems.

Sixth, it may restrict cross-fertilization of disciplines. Schools may be less willing to admit visiting faculty from other disciplines for fear of getting caught in a qualification pinch.

Seventh, it directs faculty into areas where publishing is easier, rather than to areas of faculty interest. If cross-sectional empirical studies, as opposed to longitudinal or constructionist research, are easier to conduct and easier to get published (more journals available), then faculty may be more inclined to choose

those types of studies. If broad system-based studies fail to fit a journal, they will be subject to more desk rejections. Faculty may be encouraged to stick to narrow specialty fields where the contribution is incremental as opposed to venturing into broad, perhaps controversial, and perhaps more fertile areas.

Eighth, and last, it may hinder service and shared governance by discouraging medium-term administrative appointments such as being a department chair or taking as interim role in the Dean's office. It will also discourage service activities such as committee work or transfer registrations, meeting with stakeholders, etc. Will faculty take on leadership positions in governance if it will detract from their publishing and, therefore, qualification? In the example of the hypothetical school that created two departments, there could conceivably be no tenured faculty in the "qualified" department. In fact, we know of an actual case where this was so.

The implied message with these last consequences is that publishing, especially for empirical studies in a narrow field, is what is most important. Teaching and service are less important. If we have driven caring out of the older faculty (items 1-4 above), they will do the bare minimum regarding publishing, since they have been forced into it. They could also easily shut down regarding teaching and service – what they previously valued has been defamed and devalued by the new rules. In this case, we will have taken dedicated faculty who care and produced uncaring publishers. Again, we have to ask, how will this make the program better?

And there is another aspect tying Deming to publishing. For Deming, if you use measurements, in this case the publication count, to evaluate people, then you open the door to abuse. People will start fudging numbers or gaming the system. The publication requirement then becomes a game. Editors of low-level journals now have significant power. Imagine a non-tenured faculty member who is such an editor – or who has access to an editor. He or she can make deals with senior faculty who need publications. The quid-pro-quo agreement becomes, "I'll publish you if you support me for tenure."

Finally, Deming argued against inspection at the end of the line. Hiring faculty who cannot conduct quality research is part of the system. Finding out why faculty do not publish is an important part of understanding the system. Perhaps one reason that older faculty do not publish is that they have come to realize that publishing, especially in lower tier journals, does not contribute to knowledge. If the journal is not listed in a database, the articles are not read. Even if they are listed, the articles are often not cited. Or faculty may realize that the publications, in general, are not contributing in the larger, global view of the world's ills. If any aspect of this is true, then it is a very different issue regarding qualifications. Advancing the field becomes much more complex and controversial.

Assurance of Learning

The assurance of learning standards ensure that there is a system in place to encourage continuous improvement. Surely there is nothing to criticize here regarding Deming, after all, this is essentially the plan, do, check, act cycle Deming advocated. But, again, the potential problems lie in the implementation.

Deming's theory of knowledge requires that work on the system be driven by theory and the constant comparison of prediction to observation. This may be implied in the standards but the explicit emphasis on theory is missing. And in management education the range of theories is extensive. If we also have appreciation for a system, then we see that any educational system, as a social system, is highly complex. As such, it is difficult to envision working with theories without system technologies such as system dynamics modeling, soft system methodologies, or idealized design techniques. Statistical models cannot deal adequately with the complexity. The AACSB standards are silent on these issues.

Knowledge about variation requires that the system be predictable, that is, in a state of statistical control. Otherwise there is no understanding of which system is being tested and improved. This, in turn, requires an understanding and application of statistical process control theory – the use of control charts. Also, any measurements must contain explicit operational definitions and must be validated. Finally, the outcomes of interest are presumably long-term, especially for management. For example, Deming aimed ten years in the future since traditional students would not likely be in management positions until this time. This requires

longitudinal research and its incumbent issues. To do this well would take a substantial team of researchers dedicated to the task for years. And while this may be seen as a research stream, it is educational research and, we suspect, few management faculty want to be educational researchers. Plus, a ten year horizon extends far past the five year rolling period for AQ status.

Thus, on one level, the AACSB standards encourage the collection of data on the outcomes of interest and feeding those results back to improve the program. However, viewed through the lens of the System of Profound Knowledge, the standards appear superficial, at best. There appears to be a lack of appreciation for the complexity of the process of assuring learning and of the technical requirements in resources to conduct adequate research. And this is from a technical standpoint. We have not added the human, psychological dimension.

If the data and processes are done well and focused on system improvement, then the psychological dimension will likely not be an issue. However, if the individual becomes the focus, there will be substantial problems. In Deming's system, the data can in no way be used to either punish or reward an individual. It cannot be used as objectives for individuals. It cannot be used for incentives. It cannot be used to evaluate an individual. Why? As soon as the data are used this way, the door is opened for fudging, manipulation, and gaming the system. Then you can no longer trust the data that is collected and any analysis of the data is compromised. The feedback then could easily lead to incorrect decisions. Thus, from the Deming view, individual performance cannot be linked to assurance of learning.

In one of the author's experience in a seminar, AACSB stressed repeatedly that measurement should be anonymous. They seemed to be adamant on this issue. But why the repeated warnings? As is common in business operations, there is a tendency to attach individuals and personal characteristics to causes. The fundamental attribution error in psychology tells us that when we search for a cause in a social system, we tend to attribute the cause to an individual, not the system (for a summary see Darley & Cooper, 1998).

Focus instead must be directed away from individuals onto structural factors. Structural factors include, but are not limited to, class size, student aptitudes, learning styles, hiring processes, and support for teaching (e.g., faculty development, training, staff support). Program performance is a function of a host of complexly interacting factors complete with reinforcing and counter-balancing feedback loops. The individual is only one small contributing factor with little or no power to influence results. For Deming, holding teachers accountable for learning is an absurdity.

The final issue with assurance of learning deals with what students are supposed to learn. There is a risk that programs will rely on short-term measures that do not have predictive validity. Standardized tests are easy to implement but need to be validated by longitudinal experimental research. Such tests can lead to teaching to the test or, perhaps more importantly, the belief by students that there are right and wrong answers, thus missing the ambiguity of organizations (Kilpatrick, Lund Dean, & Kilpatick, 2008). This is especially true in management where we do not conduct the rigorous research needed to validate theories (Pfeffer & Sutton, 2006). Similarly, subjective evaluation of competencies that use panels of judges, despite rubrics, have to worry about inter-rater reliability and the varying philosophies among management faculty. Both standardized tests and panel reviews might lead to a standardization of content (Kilpatrick, Lund Dean, & Kilpatick, 2008). There are many viable theories, some of which get more exposure in the texts than others, not because they have been proven but because of beliefs in their validity. But with beliefs we can succumb to self-fulfilling prophesies (Ferraro, Pfeffer, & Sutton, 2005). Might AACSB inadvertently purge critical thinking in management theory. As members of the academy, is this what we want to model for our students?

Overall Accreditation Process

In the issues raised under the qualifications, we have shown how we may drive caring out of faculty. Under the assurance of learning standards, we would expect these same faculty to fully engage in data collection, evaluation, and program improvement processes. How sound is this?

Consider a hypothetical group of fifteen faculty who have not published in the past five years –

acknowledging that they were never hired with this expectation nor have they been expected to publish in the past. We place them in a separate department – labeling them as unqualified – and threaten them with not being able to teach in business if they do not publish. We have ignored their prior contributions to the school and done everything in our power to embarrass them or coerce them into publishing.

Now consider what happens. First, we will assume that half of the fifteen retire or leave the profession (and this may have been the desired result all along). They could easily have published, but they were so upset with the way the process was handled that they simply refused to be bullied into it. What are the psychological ramifications? Is this a fitting end to a career in academia? Somehow this seems inhumane.

Then consider the other half who publish. We have embarrassed them and forced them to do something to keep their job. Are they fully committed to the program? Can they be relied on to do their utmost to improve the program? Or will they do the bare minimum? Will they game the system to make themselves look good? Will they sabotage the system out of spite? We believe the latter responses are more likely. And for what purpose? In the end, the school of business will have abused individuals by embarrassing them, harassing them, manipulating them, coercing them – all to get publications. What will have changed? Will the program be substantively changed? Have we advanced the values of the academy?

Conclusions

In summary, while the scenarios explored above appear to be extreme, we know of specific cases where they have occurred. In fact, we believe the responses are reasonable in light of Deming's philosophy. The question then becomes, to what extent do these unintended consequences occur? How prevalent are they? What is the ultimate effect on quality? It would be important to know.

And for what purpose? What problem are we fixing? Employers felt that students were not adequately prepared. Legislators wanted to document a return on their investment. Might the problems, however, be a function of the larger educational system rather than faculty not publishing or students not memorizing appropriately? Might our education system drive out a desire for learning through intimidation, threats, and fear? Deming certainly believed so.

In our effort to control individuals, namely faculty, through accreditation, what harm are we inflicting on the larger system? Are the negative consequences – even the potential for them – worth it? While we are not necessarily against the ideals of AACSB efforts, we are, however, pessimistic about the ability to substantially improve performance.

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INTEGRATION OF INNOVATIVENESS AND SUSTAINABILITY FOR THE ENHANCEMENT AND MAINTENANCE OF FINANCIAL PERFORMANCE VIA DEMING'S SYSTEM OF PROFOUND KNOWLEDGE

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Introduction

Deming spent a portion of his career writing about and applying sampling methods and as an expert witness on legal cases involving sampling.[2] I am now engaged in a similar practice. For the last four years I have been retained by Administrative Law Judges (ALJs) to be an expert witness to help them adjudicate appeals from health care providers that have been accused of being overpaid by the Center for Medicare Services (CMS). Since I feel like I am following in Deming's footsteps, I would like to begin by quoting from his "Principles of Professional Statistical Practice".[3] When Dr. Deming and I jointly consulted with clients starting in 1980, he suggested that this would be a good basis for our working together with our clients. Later, at the urging of Deming I adopted the "Deming Code of Professional Conduct" for Harold S Haller & Company and for the Case Statistical Consulting Center in the Statistics Department at Case Western Reserve University.

"Necessity for the consultant to keep in touch. The consultant when he enters into a relationship with a client accepts certain responsibilities. He does not merely draft instructions and wait to be called. The people whom he serves are not knowledgeable enough. They can not always know when they are in trouble. The consultant will ask questions and will probe with the help of proper methods, to discover for himself whether the work is proceeding according to the intent of the instructions. He must expect to revise the instructions a number of times in the early stages. He will be accessible to answer questions and to listen to suggestions.

What is an engagement? The dangers of informal advice. It may at first be thought that a consultant ought to be willing to give to the world informally and impromptu, if he so desires, the benefit of his knowledge and experience, without discussion or agreement concerning participation and relationships. However, most consultants can recall instances in which informal advice backfired. It is the same in any professional line. A consultant who tries to be a good fellow and give advice under adverse circumstances is in practice and has a client, whether he intended it or not; and he will later on find himself accountable for the advice. It is important to take special precautions to state the basis of understanding for any statements or recommendations, and to make clear that other conditions and circumstances could well lead to different statements.

The single consultation. From experience it was found to be wise to avoid a single consultation with a commercial concern unless satisfactory agenda are prepared in advance, and satisfactory arrangements made for absorbing advice offered. This requirement, along with an understanding that there will be a fee for a consultation, acts as a shield against a hapless conference that somebody calls in the hope that something may turn up. The consultant, a professional person, although eager to teach and explain improvement methods, is not on the outlook for chances to demonstrate what he himself might be able to accomplish. What may be intended as a single consultation often ends up with a request for a memorandum. This may be very difficult to write, especially in the absence of adequate time to study the problem. The precautions of informal advice apply here."

Thus, when I am retained by an Administrative Law Judge (ALJ) to opine on the sampling methods used by the CMS Program Safeguard Contractor, (PSC) Beneficiary Integrity (BI) unit's audit of a healthcare provider, the number of hours of my time required is agreed upon in advance of my starting the work. The time required depends to a large extent on whether the data are available in an electronic format like Excel® and can vary from as few as eight hours to as many as 40 hours, which includes my time in court to deliver testimony and to be cross examined. After my case review or request for interrogatories, a formal report is written to the ALJ explaining in detail my opinion and the basis for my findings. In my reports I

have the opportunity to educate the court in laymen's language relative to appropriate statistical principles for sampling and extrapolation of estimates from the sample to the entire population or universe.

Medicare Policy Guidelines for Obtaining a Statistically Valid Random Sample

The CMS audit process is described in Chapter 3 of the Medicare Program Integrity Manual (PIM).[5] This document is the statistician's policy guide, which I will cover first, not the statistical guide, which will be discussed later. It should be noted that Medicare hires contractors to monitor compliance with Medicare policy. The Medicare staff does not perform audits.

In the introduction to the Medicare PIM[5], Section 3.1 is the following quote.

"Contractors must analyze provider compliance with Medicare coverage and coding rules and take appropriate action when providers are found to be non-compliant. Medical Review (MR) staff [PSC or BI units] should not expend resources analyzing provider compliance with other Medicare rules…The overall goal of taking administrative action should be to correct the behavior in need of change, to collect overpayments once identified, and deny payment when payment should not be made."

Toward these ends, the Medicare BI unit uses the Provider Tracking System (PTS) to "identify all individual providers and track all contacts made as a result of actions to correct identified problems such as eligibility and medical necessity issues and repeated billing abusers who frequently change the way they code their bills to their financial advantage."[6] This is a process called "up-coding", which is illegal and fraudulent.

The MR process based on the PTS frequently begins with Probe sample gathered from the healthcare provider. The PIM[5] Section 3.2 states that, "Probe reviews require the examination of the provider's medical documentation but do not require use of statistical sampling for overpayment estimation methodologies. It [Probe sample] does not allow projection of overpayments to the universe of claims reviewed." Thus the Probe sample is used once a healthcare provider has been identified as outside the "system" based on data gathered from the PTS where the system is defined as the distribution of all provider fees monitored using the PTS. Section 3.11.1.2 does indicate that "Probe reviews conducted post-pay should include in the probe sample a random or stratified sample of generally 20 – 40 claims from that provider with dates of service from the period under review." Clearly the type of sampling used in Probe reviews need not be random. But, if a statistically valid random sample (SVRS) is taken as a Probe sample, it could be considered first as a Probe sample, and then, if there are sufficient overpayment errors, the same SVRS could be used to compute the total overpayments to the provider's universe via extrapolation.

The Program Memorandum from the Department of Health and Human Services, Health Care Financing Administration[7] "provides clarification and direction for Medicare carriers to use when conducting statistical sampling for overpayment estimation." Referring specifically to Section I.C, Statistical Sampling Steps, "The major steps in conducting statistical sampling are: (1) Selecting the physician or supplier; (2) Selecting the period to be reviewed; (3) Defining the universe, the sampling unit, and the sampling frame; (4) Designing the sampling plan and selecting the sample; (5) Reviewing each of the claims if there is an overpayment,….; (6) Estimating the overpayment." However, PIM[5] Section 3.10.1.1- General Purpose states, "These instructions are provided so that a sufficient process is followed when conducting statistical sampling to project overpayments. ….. Failure by the PSC BI unit or the contractor MR unit to follow one or more of the requirements contained herein does not necessarily affect the validity of the statistical sampling that was conducted or the projection of the overpayment. An appeal challenging the validity of the sampling methodology must be predicated on the actual statistical validity of the sample as drawn and conducted. Failure by the PSC BI units or the contractor MR units to follow one or more requirements may result in review by the CMS of their performance, but should not be construed as necessarily affecting the validity of the statistical sampling and/or the projection of the overpayment."

In my capacity as an expert witness concerning the validity of the statistical sampling of medical records and extrapolation of over payment to the entire universe, I am guided most by the following policy statement in the PIM[5]:

"3.10.4.4.1 – Documentation of Universe and Frame (last three sentences)

A record shall be kept of the random numbers actually used in the sample and how they were selected. Sufficient documentation shall be kept so that the sampling frame can be re-created, should the methodology be challenged. The PSC BI units or the contractor MR units shall keep a copy of the frame."

It is imperative that these records be made available for my case review in order to opine on the extrapolation of overpayments to the provider's universe by the CMS PSC BI unit's or contractor MR unit's auditor.

A Review of Finite Universe Sampling Theory for Enumerative Studies

Suppose the universe or population consists of N elements as shown in array below.

$$x_1, x_{2,} \ldots, x_N \quad [1]$$

The universe could be defined as the N medical claims submitted to and paid by Medicare for a given period of time and the measure, x_j associated with the jth claim is the difference between the amount paid and the amount approved by the auditor, which is subject to differences of opinion depending upon the auditor, a non-sampling error. The total over or under payment paid to the provider for these medical services is the sum in equation [2].

$$x_1 + x_2 + \ldots + x_N = \sum_{j=1}^{N} x_j \quad [2]$$

This sum would be positive if the payments over the period of time specified were more than those approved and negative if those paid were less than those approved. In order to determine if the provider has been over paid or under paid, a random or probability sample of size n from the universe is drawn by sampling without replacement.

The random sample gathered in this manner is denoted by the array below.

$$X_{k_1}, X_{k_2}, \ldots, X_{k_n} \quad [3]$$

The importance of taking a statistically valid random sample (SVRS) is that the expected value of the average of the random variables in array [3] is equal to the average of the entire universe or array [1].

$$E\left(\frac{\sum_{j=1}^{n} X_{k_j}}{n}\right) = E\left(\overline{X}_k\right) = \frac{\sum_{j=1}^{N} x_j}{N} = \mu \quad [4]$$

Because the random sample from the universe is taken without replacement and the universe is finite, the variance associated with the sample mean is equal to the expression in equation [5].

$$V\left(\overline{X}_k\right) = \sigma^2 \frac{N-n}{n(N-1)} \quad [5]$$

In equation [5] the parameter, σ, is computed from equation [6].

$$\sigma^2 = \frac{\sum_{j=1}^{N} \left(x_j - \mu\right)^2}{(N-1)} \quad [6]$$

But equation [6] is based on the entire universe, the data for which is not available unless the entire universe was audited. In practice one uses an unbiased estimator of σ^2 shown in equation [7], which is computed from the random sample of size n shown in array [3].

$$S_k^2 = \frac{\sum_{j=1}^{n}\left(X_{k_j} - \overline{X}_k\right)^2}{n-1} \text{ where } \overline{X}_k = \frac{\sum_{j=1}^{n} X_{k_j}}{n} \quad [7]$$

Based on a sample of size n one can only estimate the population mean, μ. Thus, what is needed is a method of specifying with some confidence that the mean of the universe is known with a certain accuracy. Suppose the accuracy of knowing μ is the value m. Typically the accuracy, m, could be say $1.00 or $10.00, but the value must be specified in advance of any sampling based on the subjective judgment of the auditor.

The accuracy and confidence associated with estimating the sum of the over and under payments among the claims in the universe, Nμ, can be determined from the following argument. Because of a result from probability theory called the Central Limit Theorem (CLT), the sample mean given in equation [7], which is a random variable, has approximately a normal distribution with mean μ and standard deviation σ given in equation [6]. This approximation is excellent as the sample size, n, becomes large. Suppose for example the confidence desired is 80%. Then the interval [8] which has random variables for endpoints will contain the population mean, μ in roughly 80 out of 100 random samples of size n.

$$(\overline{X}_k - 1.28\,S_k\sqrt{\frac{N-n}{n(N-1)}}, \overline{X}_k + 1.28\,S_k\sqrt{\frac{N-n}{n(N-1)}}) \quad [8]$$

But the accuracy, m which is related to half the length of this confidence interval must also satisfy equation [9].

$$m = 1.28S_k\sqrt{\frac{N-n}{n(N-1)}} \quad [9]$$

Finally, equation [9] can be solved for n as a function of known quantities to provide a method for selecting the sample size required by the problem specifications, which is shown in equation [10].

$$n = \frac{1.28^2}{\frac{N-1}{N}\left(\frac{m}{S_k}\right)^2 + \frac{1.28^2}{N}} \cong \frac{1.28^2}{\left(\frac{m}{S_k}\right)^2 + \frac{1.28^2}{N}} \quad [10]$$

It is clear from equation [10] that the specifications for the sampling plan require the auditor to choose a level of confidence or risk associated with the estimation process, an accuracy of knowing the population mean, and an estimate of the standard deviation of the universe. If the standard deviation of the universe is unknown, which is typical and no estimate of this value is available, the auditor may state that the accuracy of knowing the mean, m is equal to some fraction of a standard deviation of the universe. Thus it is not uncommon for the following assumptions to be made in order to determine n.

m/S_k
1.00
0.50
0.33
0.25
0.10

In conclusion, in order to determine the sample size for a SVRS the auditor should specify:

1. The one sided confidence level required, which is typically 90% based on the Medicare PIM, Chapter 3[5], Section 10.3.5
2. The required accuracy of estimating the mean of the universe, m
3. An estimate of the standard deviation of overpayments to the universe, S_k.
   Alternatively the auditor could replace items 3 and 4 with the ratio of m/S_k. Another approach would be to specify the accuracy of knowing the mean of the universe as a percentage of the mean, say 10%,

and then use an estimate of the coefficient of variation for the universe. Either way the auditor should examine a random sample of as few as ten claims in order to estimate S_k or the CV for the universe in advance of finalizing the sample size for the SVRS. As Cochran[1] points out, "In practice, there are four ways of estimating population variances for sample size determinations: (1) by taking the sample in two steps, the first being a simple random sample of size n_1 from which estimates s_1 and the required n will be obtained; (2) by the results of a pilot survey; (3) by previous sampling of the same or similar populations; (4) by guesswork about the structure of the population, assisted by some mathematical results."

Before leaving this portion of the discussion of sampling theory, it should be pointed out that the universe in the cases I have reviewed is frequently defined as "claims or claim lines for which the amount paid to the provider is greater than zero for the time period in question". However, it would be very difficult to gather a SVRS of claim lines or claims for the audit. What is much easier is to gather a SVRS of beneficiaries and audit the claim lines for claims paid to the provider for these beneficiaries where the amount paid is greater than zero. In this case the frame is the beneficiaries. As Deming[2] explains, "A frame is a means of access to the universe or a sufficient portion thereof."

At this time I would like to quote a section from Lindgren's text[4], but put this into the context of the problem of estimating the average overpayment to a provider and a 90% one-sided confidence interval.

"In general a confidence interval for the mean overpayment to a provider's universe of beneficiaries, μ, is constructed from the sample average overpayment, X_{avg} whose distribution depends on μ, in the following way: Determine two numbers depending upon μ, $t_1(\mu)$ and $t_2(\mu)$ such that for the given confidence coefficient, 0.80, the following probability equation can be written.

$$\Pr\{\ t_1(\mu) < X_{avg} < t_2(\mu)\ \} = 0.80 \quad [11]$$

Then invert the inequalities in equation [11]: solve for μ, to obtain an equivalent inequality of the form where h and g refer to functions of the sample average.

$$g(X_{avg}) < \mu < h(X_{avg}) \quad [12]$$

The inequality in [12] has the same probability, 0.80, and the statistics $g(X_{avg})$ and $h(X_{avg})$ are called the confidence limits for μ. These limits are random (they vary from sample to sample); some of the time they do include the actual value of μ, and some of the time they don't. Unfortunately, giving a confidence interval in an actual problem with actual numbers sounds like something different from what is really meant. Stating that a lower 90 percent confidence interval for μ is $g(X_{avg})$, for instance, would suggest that μ is a random variable that, with probability 0.90 is greater than $g(X_{avg})$. In the analysis leading to a confidence interval, however, it is assumed that μ is a constant that, although not known, remains fixed throughout the sampling process. Nevertheless, a user of statistics (who is not a statistician) is likely to interpret a confidence interval statement as giving a probability for the "random variable" μ; in other words, as coming from a posterior distribution for μ."

This quote indicates that the problem of providing a lower 90% probability limit for μ is a Bayesian problem requiring knowledge of the distribution of X_{avg} and an assumption of the prior distribution for μ. A common prior distribution for μ is the uniform distribution, which assumes complete ignorance of the value of the mean overpayment or underpayment to the universe or at least an unbiased opinion. If in addition to this assumption the distribution of X_{avg} is normal, then μ is a random variable that with probability 0.90 is greater than $g(X_{avg})$.

In concluding this section, I want to enumerate the process I use to opine on the overpayment estimate to a provider that is computed by the CMS PSC, BI unit auditor.

1. Healthcare provider is designated in the data file.
2. Data in the file agrees with the period to be reviewed.
3. Universe is defined as are the strata if the sample is to be stratified.
4. Sampling unit is defined.

5. Sampling frame is defined.
6. Size of the universe is defined as are the sizes of the strata if the sample is stratified.
7. Accuracy in estimating the mean of the universe is specified.
8. Sampling plan is defined as either a simple random sample or stratified random sample.
9. If a simple random sample is used, the overpayment assumptions for equation [10] are specified.
10. If a stratified random sample is used, each stratum is defined, the size of each stratum is given, and the overpayment assumptions for computing the sample size for each stratum are defined including the allocation method employed (proportionate sampling or Neyman allocation)
11. Method for selecting the random sample including the seed number(s) used.
12. Spreadsheet of amounts paid and overpayments for the sample.
13. Extrapolation of overpayments to the universe from the sample.

This is the "Sufficient documentation [that] shall be kept so that the sampling frame can be re-created, should the methodology be challenged"[5] for my independent case review, written interrogatories, opinion on the adequacy of sample size used, stratification of the universe, and extrapolation of overpayment to the provider. In the following examples, I will indicate the sufficiency or deficiencies of the audits performed, which impacted my written opinion to an ALJ who had requested my services.

Case Study 1

In a memo from the PSC,BI unit statistician, nowhere did he indicate that the distribution of X_{avg} for each stratum is normal or that this requirement was checked. It is true from the Central Limit Theorem that as the sample size tends to infinity the distribution of the sample average tends to the normal distribution. But in this case the sample sizes in the three strata were 31, 71, and 5.

A better way to approach this problem is to begin by examining the distribution of the auditor's determined overpayments to the provider. In this case none of the distributions of the individual overpayments to the beneficiaries from the strata are normally distributed. But by modeling each of these cumulative distribution functions from the stratum one can simulate 100 independent random samples of size 37 from stratum 1, of size 71 from stratum 2, and of size 5 from stratum 3.

The distributions of the resulting averages are shown in the following normal scores plots, Figures 1, 2, and 3, to be normally distributed. Thus, the following probability statement based on Bayesian theory is valid.

$$\text{Probability } \{\mu > \$1{,}780.62\} = 0.90$$

Consequently, based on my calculations a lower 90% confidence limit for total overpayments to the universe of provider claims is $1,853,460, which the ALJ decided must be repaid by the provider.

Figure 1

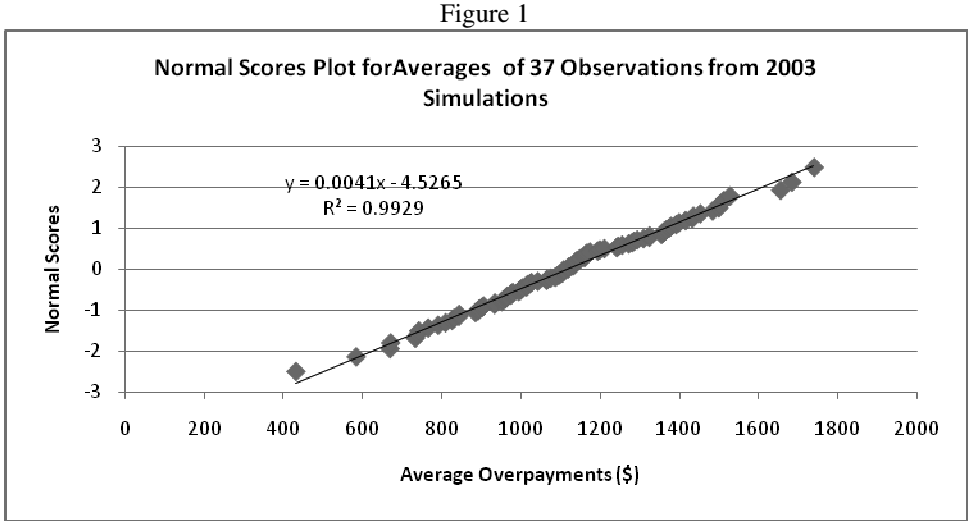


Figure 2

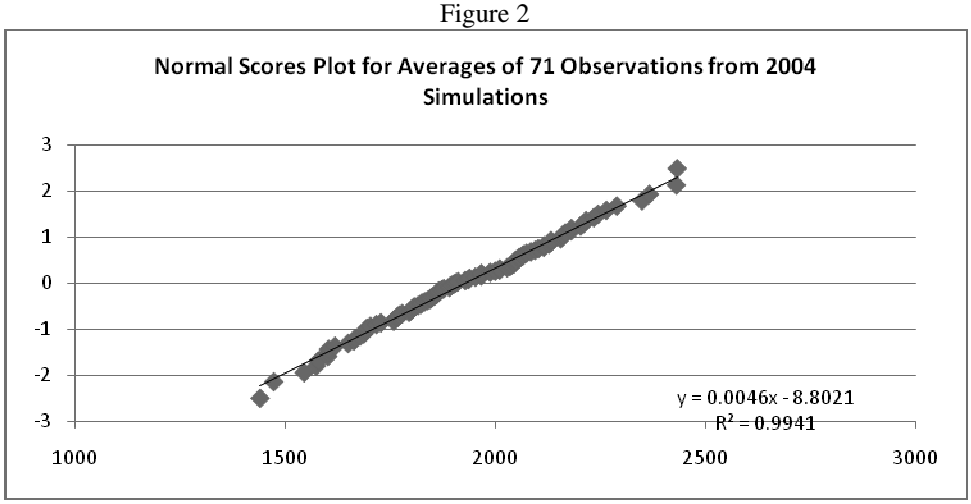
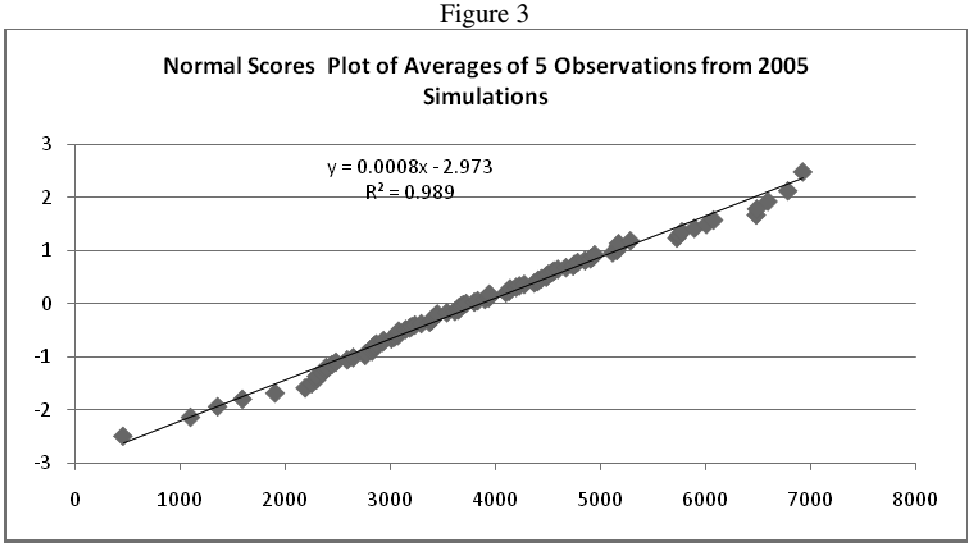


Figure 3



Case Study 2

The PSC, BI unit's statistician indicated that the lower 90 percent confidence interval for μ is $24.06. But nowhere did he state in the documentation I reviewed that the distribution of X_{avg} for each stratum is normal or that this requirement was checked. Goodness of fit tests for the distributions of the individual overpayments to the beneficiaries from the strata indicated that the distributions were not normally distributed. By modeling each of the cumulative distribution functions for the samples from procedure codes 98940 and 9894 and determining their inverse functions, I was able to simulate 100 independent random samples of size 33 from stratum 1 and 36 from stratum 2. The distributions of the resulting averages are shown in the normal scores plots, Figures 4 and 5, to be non-normal. Both distributions of averages are skewed to the left. Thus, the following probability statement is not valid.

$$\text{Probability } \{\mu > \$24.06\} \neq 0.90$$

Consequently, I opined that the computed value, $41,696.00, is not a lower 90% confidence limit for total overpayments to the universe of claims as certified by the PSC, BI unit statistician.

A further point that was made by the attorney for the provider concerned non-sampling errors, on which I was required to testify during cross examination. Deming[2] discusses in Chapter 5 uncertainties attributable to sampling. There are two general categories of uncertainty or error. The smaller of these is random

sampling error, which I have been able to simulate by modeling the sample cumulative distribution functions for each stratum based on the audited overpayments and simulating the distribution of average overpayments for each stratum. However, the larger component, non-sampling errors (persistent errors) are more subjective as they are due to the person performing the audit. These cannot be simulated. But, as Deming[2] shows on page 62, they account for the larger part of total error. I have had to assume that the claims examined in each stratum have no non-sampling or persistent errors due to the person performing the audit, i.e. two independent auditors would agree that a payment to the provider is totally or partially disallowed and by how much. Because of both of my opinions, the ALJ had to find in favor of the provider.

Figure 4

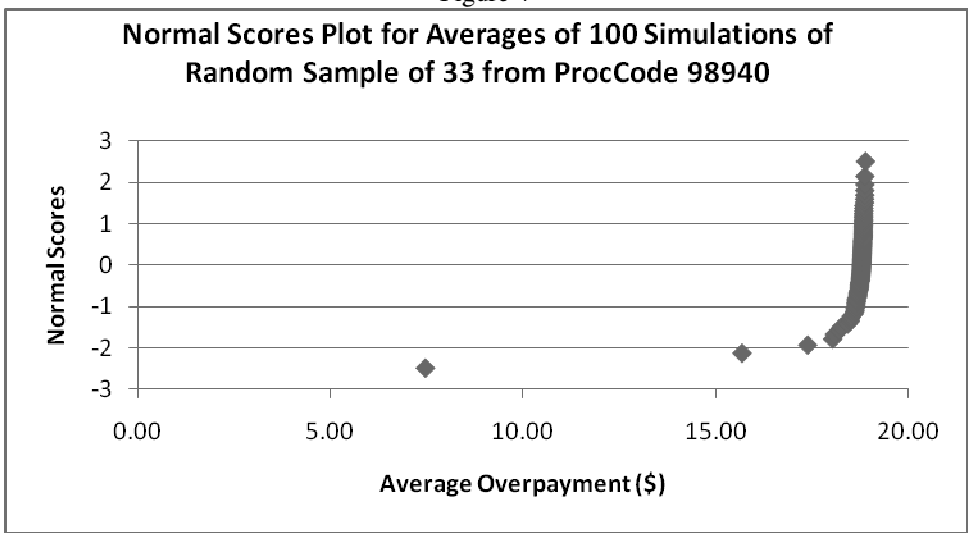
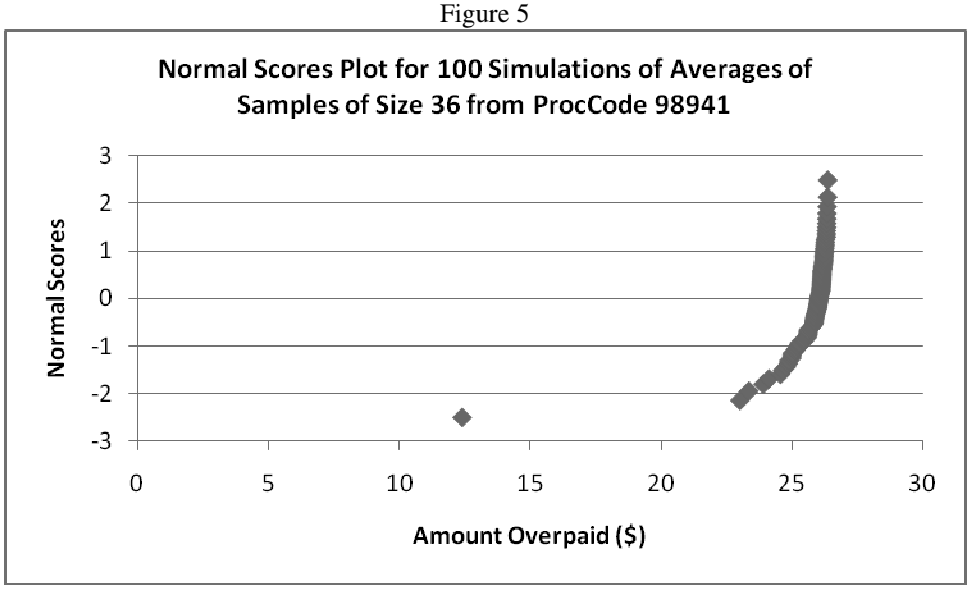


Figure 5



Case Study 3

Here is a typical request from an ALJ for my opinion. "Is it your opinion that the sample used to extrapolate the overpayment amount to the provider was of sufficient size? State the reasoning for your conclusion. On what principles and/or documents did you base your conclusions?" My response to this request is as follows.

An overpayment calculation sheet for this case was submitted to me for review, which was completed by a statistician for the BI, unit. The documentation provided indicates that the period for review was 01/01/2002 to 4/30/2005 or 40 months. The sampling unit was defined as a claim line. The population was identified as a total of 13,705 claim lines. According to the documentation a total of 102 services were reviewed by an expert from the BI unit. Of the services reviewed 60 services were allowed and 42 were not allowed primarily because the "documentation does not substantiate the medical necessity for the frequency billed." The formula used by the statistician for extrapolating the overpayment is correct, but the manner in which the random sample was taken is an issue.

The population consists of 13,705 claim lines. But the manner in which claim lines would normally be sampled is to define beneficiaries for whom claims were paid to the provider for the 40 month period in question. Let's say there are M beneficiaries served during the 40 months. A random sample of m beneficiaries would be selected using a random seed number to determine which of the enumerated beneficiaries to review. How many beneficiaries to sample in this manner would be based on some preliminary estimates of the average overpayment per beneficiary and the standard deviation in overpayments per beneficiary. The BI unit auditor would review the files for the random sample of beneficiaries selected by the statistician and compute the actual average and standard deviation of over or underpayments to the provider.

However, there is no mention of a frame, which the PIM[3] requires. As Deming[2] states on page 39, "A frame is a means of access to the universe or to a sufficient portion thereof. A frame is made up of sampling units, and this is true whether the survey is to be conducted by a complete coverage or by a small sample." To obtain a random sample of the sampling units or claim lines from the provider's records, the statistician would have provided the BI unit with a list of 102 random numbers from the series of numbers, 1 through 13705. Next, the BI unit must enumerate the claim lines for the provider's beneficiaries. This could be done as shown in Table 2.

Table 2

Bene	**Claim Lines**	**Enumeration of Claim Lines**
1	1	1
	2	2
	.	.
	.	.
	.	.
	n_1	n_1
2	1	n_1+1
	2	n_1+2
	.	.
	.	.
	.	.
	n_2	n_1+n_2
.	.	.
.	.	.
.	.	.
M	1	.
	2	.
	.	.
	.	.
	.	.

	n_M	13705

As above, the number of beneficiaries for the 40 month time period designated is M. Such a table would have to be created by the BI unit so that given the random numbers provided by the statistician the BI auditor could have identified the claim lines to review from each beneficiary. Operationally this is not impossible, but there is no evidence from either the statistician or from the BI unit as to how the random selection of claim lines was made.

In summary, I found the method of selecting a random sample based on the sampling unit as a claim line very difficult to do and to do correctly. The usual approach would have been to use the beneficiary as the frame, select a random sample of m beneficiaries, audit these beneficiary medical records, compute the average over/under payment per beneficiary, verify that the distribution of average overpayments to the beneficiaries are normally distributed, and compute the total over/underpayment based on the standard deviation of the over/underpayments per beneficiary using the lower endpoint of the confidence interval formula in equation [8] times the number of beneficiaries, M. As a result of my opinion the ALJ found in favor of the plaintiff.

Case Study 4

The following list summarizes the information provided to me by the BI unit and their statistician.

1. The period of review was from 1/1/04 to 8/31/05 (as processed through 8/31/05)
2. The universe of claims was not included in the EXHIBIT LIST. So, for example, I was not able to verify that the Sampling Frame consists of 3372 claims as stated in the statistician.
3. The sampling unit defined by the statistician is "Claim submitted by the provider with at least one line of service Paid > 0 to the provider".
4. The Sampling Frame was defined as follows. "For each stratum a sampling frame of sampling units was created by first obtaining a universe of claim lines for claims meeting the above criteria and then identifying the list of unique Claim Control Numbers (CCN's) (i.e. unique claims) within this universe of claim lines."
5. Two methods of determining an appropriate sample size were used, simple random sampling and stratified sampling. In both cases the statistician states that estimates of the overpayment mean and standard deviation are required for determining the sample size but that the BI unit uses the means and standard deviations of the amounts paid for claims. For the case of simple random sampling, the statistician indicates that 258 claims are required for an accuracy of 10% and 90% confidence based on amounts paid. Using three stratum defined as follows: (0,$90), [$90, $210], ($210 and higher), the sample sizes determined were 15, 11, and 11, respectively, based on amounts paid.

Table 3 summarizes my calculations for the stratum sample sizes using Neyman allocation (see Cochran[1] page 105, equation 5.47). The appropriate sample sizes from stratum 1, 2, and 3 are 18, 24, and 18, respectively, which is substantially different from the 15, 11, and 11 shown in item (5) above.

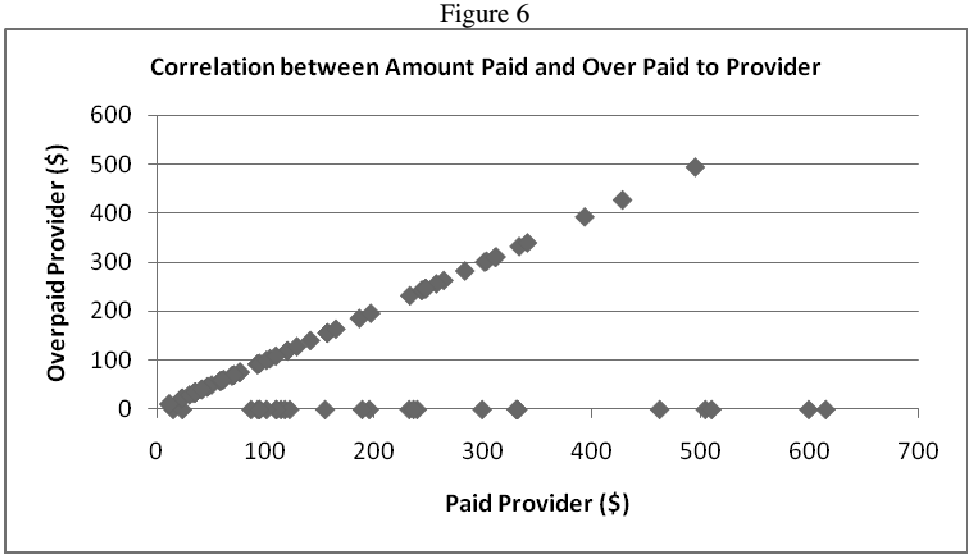
Table 3

Calculation of stratum sample sizes from amounts over paid provider with presumed Neyman allocation				
N	3372			
t-value	1.645			
Strata	1	2	3	
N_h	2112	960	300	
s_h	22.68	66.38	161.51	
Accuracy	10			
W_h	0.63	0.28	0.09	

n	59			
W_h*s_h	14.21	18.9	14.37	
w_h	0.3	0.4	0.3	
n_h	**18**	**24**	**18**	

The argument may be that the auditor does not know the average and standard deviation of the overpayments at the time the sample size computation is requested. Moreover, the statistician may claim that the overpayments are highly correlated with the amounts paid, and, therefore, amounts paid can be used instead of overpayments. However, the figure below illustrates that there is no correlation between the amounts paid and the amounts of overpayment. In fact, Figure 6 strongly suggests that there are two distributions of overpayments: one distribution of zero overpayments and another distribution of 100% overpayments. One has to be concerned about non-sampling errors from this example as this seems very peculiar. Were there two auditors assigned to this provider? This illustration emphasizes the importance of following Cochran's advice for obtaining estimates for the standard deviations prior to selecting the sample size if only using conservative estimates[6]. In this case too, the ALJ found in favor of the plaintiff.

Figure 6



Case Study 5

The BI unit's statistician defined the universe as claims for which at least $ 0.01 was paid to the provider for procedure (CPT) codes 99215 and 99215 with 99354 and 99355 when provided on the same day for the period of time January 1, 2001 to December 31, 2001. The sampling frame for this period of time is all unique beneficiaries for whom these services were provide. The documentation provided indicates that 184 beneficiaries or sampling units constitute this whole universe and that they do not overlap as required.

The BI unit used a simple random sampling which "sorts the beneficiaries in the sampling frame by HIC number, then applies the algorithm described in the SAS Language and Procedures Manual: Usage 2, Version 6, First Edition, 1991, p. 233 - 235". The BI unit uses the computer clock to set the seed from which the random numbers are selected and thence the random sample of beneficiaries. The PIM[3] requires that the sampling plan recommended by the BI unit be approved by a professional statistician. A total of 30 beneficiaries were included in the sample.
For these 30 beneficiaries the following mean and standard deviation of overpayments were computed.

$$\frac{\sum_{j=1}^{30} x_j}{30} = \bar{x} = \$216.88 \text{ and } \sqrt{\frac{\sum_{j=1}^{30} (x_j - \bar{x})^2}{29}} = s_{30} = \$243.34$$

Using equation [10] the first approximation to the sample size is 155 beneficiaries. Here the sample size is designed to provide an estimate of the mean of the universe within ± $10 with 80% confidence. Cochran[1] suggests computing the sample size when the ratio of $n_0/184$ "is appreciable" using the following formula.

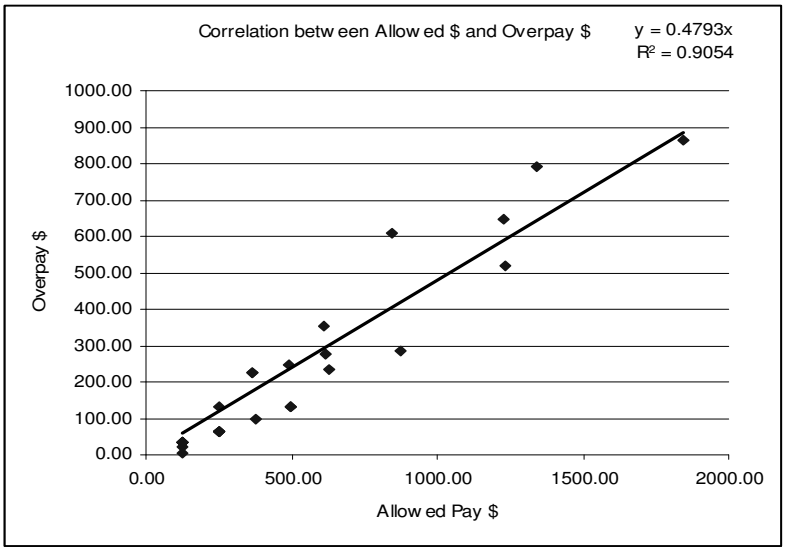
$$n = \frac{n_0}{1 + \frac{n_0}{184}} = 84$$

But even this calculation reveals that the random sample should be more than two and a half times the sample size recommended by the BI unit's statistician because the variation in the sample overpayments is so large relative to the sample mean of overpayments. Why did the BI unit's statistician conclude that a sample of 30 beneficiaries would be a SVRS meeting the sampling plan's specifications? The problem is that the sample size was selected based on amounts paid rather than on amounts overpaid, which has a higher standard deviation and smaller average.

BI units have used a ratio estimator for purposes of estimating the total over/under payment, which is designed to increase the precision by taking advantage of the correlation between the amount paid, p_j, where there is a complete census of data and the over payment, x_j, to beneficiary j, which is sample data. Figure 7 shows that there is a variate with which the over payment is correlated, linearly with a zero intercept, namely the amount paid to the provider in this case.

Using the logic for ratio estimates to estimate the total overpayment to the provider based on the ratio of the average overpayments from the sample to the average allowed payments from the sample, the expected overpayment from the product of the ratio estimate and the total allowed payments for the calendar year 2001 is $106,233. As a result the lower confidence limit which reflects how much the provider should repay CMS is $24,907.85 rather than the $84,233.92 claimed by the BI unit's statistician.

Figure 7



Case Study 6

In this case the BI unit's statistician used a stratified sampling plan with a random sample of 30 beneficiaries per stratum. In analyzing the overpayment data he assumed the distribution of X_{avg} to be normal and used the lower one-sided 90% confidence interval to compute the overpayment estimate to the provider for purposes of recoupment. Since the sample size for each stratum was 30 beneficiaries, which was adequate, a better way to approach this problem with fewer assumptions was to examine the distributions of the auditor's determined overpayments to the provider. If these distributions are non-normal, can a transformation be applied to the data such that the transformed data are normally distributed?

In my analysis of the 30 claims from Strata 1 and 2, the distributions of the auditor's determined overpayments to the provider were skewed to the right and both were distributed as log-normal random variables. In this transformed metric the average of the natural logarithms of the overpayments in the each stratum sample is normally distributed. So, assuming a uniform prior for the average natural logarithm of overpayments to the universe, one can compute the posterior distribution for the natural logarithms of the overpayments and back transform these to the original metric, dollars. In this way I was able to provide a lower, one-sided 90% confidence interval for the mean overpayment to the universe with fewer assumptions about the distribution of overpayments to the provider, which defeated the defense attorney's complaints about the method of computing the recoupment.

Conclusions

Deming devoted much of his career to research in sampling and application of this research to sampling studies. As an expert witness in Medicare appeals, I rely upon his Code of Professional Conduct[3] and his text on sampling[2] to guide my work. It is disappointing to find in so many of the more than 30 cases on which I have opined that some basic principles of finite universe sampling theory for enumerative studies are not followed by the statisticians consulting for PSC, BI units as these case studies have tried to point out. The deficiencies found in my case reviews can be summarized as follows:

1. Failure to compute the sample size for simple and stratified random sampling based on estimates of the average and standard deviation of the property of interest, namely the amount of under or over payment to the provider.
2. Failure to use Neyman's optimum allocation in cases of stratified random sampling.
3. Failure to verify that the distribution of average overpayments is normally distributed before claiming to compute a Bayesian estimate for overpayment based on the lower confidence limit.
4. Failure to adequately define the frame, which is used to obtain the sample and central to explaining how a statistically valid random sample is obtained.
5. Failure to provide documentation relative to the process used to obtain a random sample, which includes providing the seed or the random numbers actually used to obtain the statistically valid random sample.
6. Failure to provide the data from which to verify the calculations of the overpayment from the random sample.

   Under oath, when asked about these failures, the PSC, BI unit statisticians' responses have been that no one ever asked for this much detail in the past. But the problem is that they could not produce the detail when asked to do so. Hence one can only conclude that it did not exist in the first place. We statisticians must start to police our own profession before someone else does it for us, which would be very disconcerting if not extremely embarrassing.

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6. *PIM*, Section 3.1.1 Provider Tracking System (PTS) (Rev. 174, Issued: 11-17-06; Effective: 10-01-06; Implementation: 10-06-06)

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DEMING AND MCGREGOR: RESTORE THE INDIVIDUAL

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Introduction

Dr. Deming theorized that management is in a stable state (1). He asserts that we are in a rut. To compensate for declining economic success in outcomes, leaders have taken upon themselves to resort to quick fixes and blaming people. Increased reliance on the use of extrinsic motivation prevails, i.e., institutionalization of performance appraisal, ranking of people, MBO, MBR, incentive systems, merit increases, pay for performance, piece-work and the like. All these practices only exacerbate the condition because they are based on faulty assumptions about the nature of people and work.

Experience tells us extremely powerful belief systems are ever present that are not guided by effective theory. This human condition must be overcome in order to move out of this predictable state. Theory is available from several sources that suggest that a *high-order paradigm shift* can be achieved as part of personal transformation if the interdependency of these available theories can be optimized.

Implicit in Dr. Deming's Theory of Management is a predisposition for leaders to possess a positive, optimistic mindset about the nature of people in everyday work processes. Assisting leaders in understanding the sets of assumptions that they adopt naturally leads to more effective assimilation of the values, concepts and techniques typically associated with the Deming's Theory of Management.

Complementary theories of Douglas McGregor's Theories X and Y and Robert Rosenthal's Pygmalion effect (otherwise known as The Self-fulfilling Prophecy) augment testing of Dr. Deming's Theory of Management. While similarities and differences exist between the theories, analysis suggests there is much to be gained by understanding their interdependency in the context of improving the process of leadership.

First introduced in 1960, McGregor's Theory X and Y provided a rationale for examining one's set of assumptions about the nature of people and work. Specifically, he challenged leaders to closely examine personal beliefs to the extent that these sets of assumptions influence their interaction with the system of work. McGregor's theories have withstood the test of time and are as viable today as they were nearly fifty years ago when first introduced. The essence of McGregor's Theory Y taps into the intrinsic motivation that exists in all of us. Working in accordance with Dr. Deming's Theory of Management, it is speculated that this complementary theory can assist individuals with personal transformation.

Similarly, the Pygmalion effect offers an addendum perspective that demonstrates an important responsibility of leaders in the process of influencing others. What a leader projects on others, consciously or unconsciously, can set in motion an endless cycle of events that can perpetuate desired, as well as undesired responses from others. Often, leaders underestimate the significance of their influence on others and are unaware of how this phenomenon affects change in others.

Comparing, contrasting and demonstrating the compatibility of these complementary theories with Deming's *System of Profound Knowledge* will reaffirm Deming's call to get back to the individual and reestablish joy in work. Viewing these theories as a system can assist leaders in the development of personal action plans for transformation. The key to breakthrough improvement is successive iterations in testing these theories in an environment of trust and respect.

The Foundation

An appropriate beginning is in Deming's arena of a *System of Profound Knowledge*; especially in the element of Psychology of people. This arena helps us to understand the actions of people in everyday circumstances.

How do we accomplish joy in work? To answer this question, Deming indicates that we must understand how we ended up where we are. He identifies that at the core of current state of affairs is the mistaken assumption about the effects of *reward* in our society. In his description of the *Forces of Destruction*, he elegantly presents the source of discontent in the individual (2). He hypothesizes that during life extrinsic motivation suppresses our natural source of motivation, i.e., intrinsic motivation. As leaders have become dependent on the use of extrinsic motivation as the preeminent method to entice people to perform, the system of reward has been turned upside-down (i.e., the ship has capsized). Work that was once something joyful now has become drudgery. Deming's contention is that we must reverse this trend and turn this situation around in order to achieve transformation (i.e., the ship must be righted).

To initiate this transformation we must start with the *individual* to regain our balance. We must start with roles of leadership that reverse this dependence on providing extrinsic motivation as the means to accomplish quality in work. The proper method to follow is to adopt purposeful theory to begin the improvement journey.

Deming's Theory of Management

Deming outlined a new theory of management based on *A System of Profound Knowledge* (3). Dr. Deming described that four key elements interact as a system in order to produce the necessary insights required for effective leadership in the real world, a variable world.

The four elements (or disciplines) are described in such a way that they are not considered mutually exclusive events. The elements are highly interdependent in nature and function together as a system. They are identified as:

1. Appreciation for a system
2. Knowledge about variation
3. Theory of knowledge
4. Psychology

Dr. Deming understood that the first step is transformation of the individual. Effective leadership entails a willingness and ability to apply *A System of Profound Knowledge* in everyday situations. This transformation takes place amid people and work in order to achieve a simple aim. An effective leader is accountable for results and simultaneously allowing people to take pride in their work. It is a challenging role for any leader. How do they get the job done and create joy in work? What is in the way of accomplishing this aim? Leaders are the purveyor of the systems in which people work and it will take a "new lens" of observation through which to observe and improve the system (4).

Personal transformation can start by focusing on the element of Psychology of *A System of Profound of Knowledge.* Dr. Deming stated that:

"The most important act that a manager can take is to understand what it is that is important to an individual. Everyone is different from everyone else. All people are motivated to a different degree extrinsically and intrinsically. This is why it is so vital that managers spend time to listen to an employee or understand whether he is looking for recognition by the company, or by his peers, time at work to publish, flexible working hours, time to take a university course. In this way, a manager can provide positive outcomes for his people, and may even move some people toward replacement of extrinsic motivation with intrinsic motivation." (5).

And in the Deming Library video series, Deming says:

"One is born with a natural inclination to learn and to be innovative. One inherits a right to enjoy his work. Psychology helps us to nurture and preserve innate attributes of people." (6)

In Dr. Deming's writings, it is clear that his perspective about people is very positive, yet always veiled in the context of a variable world that we live in. He continually refers to intrinsic motivation as the true motivator, the one we naturally possess. He recognizes that what drives people to do great things comes from within, not from extrinsic motivation. He realizes that people are naturally, intrinsically motivated and that our problems arise from the myth that the only way to motivate people is through methods of extrinsic motivation. He points out how the individual is crushed and molded into something totally dependent on a system of extrinsic motivation, reward, recognition and punishment alike. Henry Neave underscores Deming's words:

"They (those that prescribe to an extrinsically-motivated society) squeeze out from an individual, over his lifetime, his innate intrinsic motivation, self-esteem, dignity, and build into him fear, self-defense, and extrinsic motivation." (7)

Dr. Deming understood the power of intrinsic motivation and so eloquently articulated that we must learn to stop de-motivating people as they already are motivated. He sees the values within people as something inherently good, not distorted with assumptions of greed, laziness, lack of ambition and dislike of work.

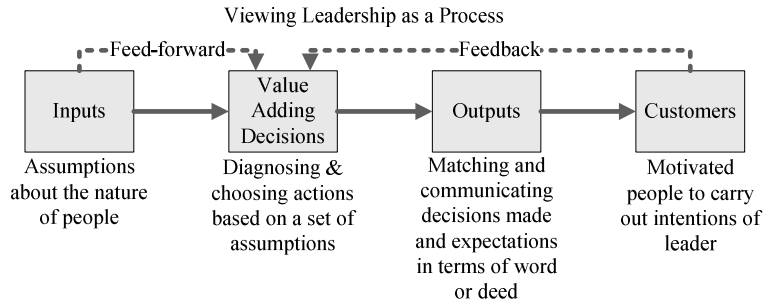
In the same writings, Neave reminds us of Deming's quote in the context of leadership:

"Improve the system, and variation between people will diminish." (8)

As we begin to improve the current system of management, Deming believes that if we closely examine the true nature of people, we will find that apparent differences in outcomes are not just due to people, but to the systems that drive people's behavior. What we will discover is that people are more alike in their intrinsic motivation levels than they are different.

Understanding Leadership as a Process

A useful operational definition is that leadership is simply "the process of influencing others to get results". The operative word in this statement is "process". Analyzing leadership in the context of a system helps to organize our thinking. We can see new relationships that open up new possibilities for meaningful learning and improvement. We can begin to see the process as a sequence of steps. The diagram below facilitates understanding the process of leadership as a "system", not just the random effects of a series of events that cause responses from those it affects. In other words, when a person is "leading" in a situation, there are inputs that are used by the leader to evaluate a given situation. Simultaneously, leaders have a set of theory-based reactions to employ that leads them to anticipate predictable reactions from those they influence. The inputs include the sets of assumptions the leader employs to influence others in a given situation. As result, leadership looks something like the system outlined below.



The diagram is simplified in order to explain the dynamics of leading based on theory (or assumptions). Obviously, there are other factors involved in this complex process, but use of this basic format keeps it understandable by only focusing on one aspect of the entire process. The theory presented here depicts the progressive sequence of thinking that a leader follows, consciously or unconsciously, as they try to influence others. It attempts to show that "assumptions" used by managers can have a profound effect on their own behaviors as well as the motivation levels of others as Deming suggests.

Where do we begin our search to restore the individual? Peter Scholtes writes about the "unquestioned premises of conventional management" as a source of misguided attempts of management to control the workforce (9). He asserts that at the root of conventional management practice are belief systems that are rarely questioned. As a result, practices such as performance appraisals and establishment of quotas proliferate and continue to diminish the individual. As part understanding what these premises might entail, he discusses the work of Douglas McGregor and Theory X and Theory Y as worthy of review.

McGregor's Theory X and Theory Y

In his 1960 seminal book, *The Human Side of Enterprise* (10), Douglas McGregor identified two dichotomous sets of assumptions that managers use to guide their behavior when managing their employees, which he labeled Theory X and Theory Y. Theory Y contended that individuals are naturally self-motivated and self-directed. Theory X contended that people are in fact, the opposite and must be threatened or coerced into performing work. But more alarming was the contention by McGregor that the latter theory was the one that was widely taught in business schools and was pervasive in the workplace. At the time he wrote his book, this was based on many decades of research in human relations. But over the past half century, not much has changed and is widely assumed even today.

McGregor's top question for management and the premise for his research were:

"What are your assumptions (implicit as well as explicit) about the most effective way to manage people?"(11)

Douglas McGregor challenged us much the same way Deming challenged us.

"Every managerial act rests on assumptions, generalizations, and hypotheses – that is to say, on theory. Our assumptions are frequently implicit, sometimes quite unconscious, often conflicting; nevertheless, they determine our predictions that if we do *a, b* will occur. Theory and practice are inseparable." (12)

McGregor also goes on to say:

"So long as the manager fails to question the validity of his personal assumptions, he is likely to avail himself of what is available in science. And much is there. The knowledge in the social sciences is not sparse, but frequently it contradicts personal experience and threatens some cherished illusions. The easy way out is rejection, since one can always find imperfections and inadequacies in scientific knowledge." (13)

Heil, Bennis and Stephens added when they wrote:

"Douglas McGregor's most important legacy was neither Theory X nor Theory Y. It was his insistence that managers question their core assumptions about human nature, and that they see how these mental models lead to managerial practices." (14)

Heil, Bennis and Stephens go on to say that managers resist taking a look at their core values. They note how uncomfortable leaders are with this concept. The authors make the statement:

"Above all, McGregor wanted people to look in the mirror and consider who they were and what they believe, a challenge that most people have at the very core of their being. And yet, until a person peels away the layers, looks at himself, and recognizes his deeply held beliefs and attitudes, he cannot lead or design a truly effective organization in today's world.

McGregor believed that organizations would be far more effective and powerful when managers offered employees the opportunity to align their individual goals with those of the business. His thinking reinforced the pragmatic message at the core of famed psychologist Abraham Maslow's work: People are capable of extraordinary accomplishments if they are able to meet their own self-fulfilling needs when pursuing the goals of the organization. Maslow referred to this approach as "enlightened management." (15)

When setting the premise for his theories, McGregor often used an effective analogy comparing physical sciences to social sciences:

"We do not, for example, dig channels in the expectation that water will flow uphill; we do not use kerosene to put out a fire. In designing an internal combustion engine we recognize and adjust to the fact that gases expand when heated; we do not attempt to make them behave otherwise. With respect to physical phenomena, control involves the selection of means which are appropriate to the nature of the phenomena with which we are concerned.

In the human field the situation is the same, but we often dig channels to make water flow uphill. Many of our attempts to control behavior, far from representing selective adaptations, are in direct violations of human nature. They consist in trying to make people behave as we wish without concern for natural law. Yet we can no more expect to achieve desired results through inappropriate action in this field than in engineering." (16)

In the same writings, McGregor goes on to say:

"Another fallacy is often revealed in managerial attempts to control human behavior. When we fail to achieve the results we desire, we tend to seek the cause everywhere but where it usually lies: in our choice of inappropriate methods of control. The engineer does not blame water for flowing downhill rather than up, nor gases for expanding rather than contracting when heated. However, when people respond to managerial decisions in undesired ways, the normal response is to blame them. It is *their* stupidity, or their cooperativeness, or their laziness which is seized on as the explanation of what happened, not management's failure to select appropriate means for control." (17)

When connecting action to theory, McGregor also points out when he wrote:

"Human behavior is predictable, but as in physical science, accurate prediction hinges on the correctness of the underlying theoretical assumptions. There is, in fact no prediction without theory; all managerial decisions and actions rest on assumptions about behavior. If we adopt the posture of the ostrich with respect to our assumptions under the mistaken idea that we are thus "being practical," or that "management is an art," our progress with respect to the human side of enterprise will be indeed slow. Only as we examine and test our theoretical assumptions can we hope to make them more adequate, to remove inconsistencies, and thus to improve our ability to predict.

We can improve our ability to control only if we recognize that control consists in selective adaptation to human nature rather than in attempting to make human nature conform to our wishes. If our attempts to control are unsuccessful, the cause generally lies in our choice of inappropriate means. We will be unlikely to improve our managerial competence by blaming people for failing to behave according to our predictions." (18)

Noting earlier annotations in his book Cutcher-Gershenfeld pointed out that:

Two decades after the publication of this book (The Human side of Enterprise, 1960), Dr. W. Edwards Deming echoed McGregor with his injunction: "Don't blame the people, fix the system." (19)

The system includes leadership of people. It is worth our time and energy to investigate the assumptions we choose in life. These beliefs direct our behavior and relationship with others whether we like it or not. A paradigm shift is required before true improvement can be achieved. A useful approach to self-realization is viewing McGregor's theories in the context of the Deming's Forces of Destruction. Conceptually, Theory Y set of assumptions is consistent with the start of life scenario that Deming described. Similarly, Theory X set of assumptions is more consistent with the end of life scenario.

Theory X

This set of beliefs is easily recognized because it is based on so-called incontrovertible evidence about the true nature of people. Therefore, correctness is not an issue because the leader accepts it as truth. Everyone knows it, and it will never change. It is a negative, pessimistic view of people. McGregor wrote that managers would (and most often did) base their decisions on the following set of assumptions:

1. "The average human being has an inherent dislike of work and will avoid it if he can.
This assumption has deep roots. The punishment of Adam and Eve for eating the fruit of the tree of Knowledge was to be banished from Eden into a world where they had to work for a living. The stress that management places on productivity, on the concept of a "a fair day's work," on the evils of featherbedding and restriction of output, on rewards for performance –while it has a logic in terms of the objectives of enterprise – reflects an underlying belief that management must counteract an inherent human tendency to avoid work. The evidence for the correctness of this assumption would seem to most managers to be incontrovertible.
2. Because of this human characteristic of dislike for work, most people must be coerced, controlled, directed, and threatened with punishment to get them to put forth adequate effort toward the achievement of organizational effectiveness.
3. The average human being prefers to be directed, wishes to avoid responsibility, has little ambition, wants security above all." (20)

The premise for action for the leader then is to control the ranks of the so-called apathetic, mediocre and lazy workforce. Leaders must rely on choosing actions that effectively counteract these negative tendencies

of people. They include the use of techniques such as tight controls, implicit threats, close supervision, coercion, intimidation, reliance on punishment, and negative rewards. Other more insidious methods can include installing performance appraisals, ranking of employees, incentive schemes and the like. The point here is that there is an unprecedented amount of countermeasures available if one is looking for them.

In addition, Warner writes:

"There are two approaches to Theory X: a 'hard' approach, which relies on coercion, implicit threats, close supervision, and tight controls – essentially 'command and control.' The 'soft' approach is to be permissive and seek harmony so that employees will cooperate when they are asked to do so. McGregor believed that neither extreme is ideal: The hard approach often generates hostility, deliberately low output, and hard-line demands. The soft approach results in ever-increasing requests for more rewards, in exchange for ever-decreasing work output." (21)

Moreover, McGregor writes:

"The philosophy of management by direction and control – *regardless of whether it is hard or soft* – is inadequate to motivate because the human needs on which this approach relies are relatively unimportant motivators of behavior in our society today. Direction and control are of limited value in motivating people whose important needs are social and egoistic.

People deprived of opportunities to satisfy at work the needs which are now important to them behave exactly as we might predict – with indolence, passivity, unwillingness to accept responsibility, resistance to change, willingness to follow the demagogue, unreasonable demands for economic benefits. It would seem that we may be caught in a web of our own weaving.

Theory X explains the *consequences* of a particular managerial strategy; it neither explains nor describes human nature although it purports to. Because its assumptions are so unnecessarily limiting, it prevents our seeing the possibilities inherent in other managerial strategies. What sometimes appear to be new strategies – decentralization, management by objectives, consultative supervision, 'democratic' leadership – are usually but old wine in new bottles because the procedures developed to implement them are derived from the same inadequate assumptions about human nature. Management is constantly becoming disillusioned with widely touted and expertly merchandized "new approaches" to the human side enterprise. The real difficulty is that these new approaches are no more than different tactics – programs, procedures, gadgets – within an unchanged strategy based on Theory X." (22)

Theory Y

McGregor offers Theory Y as an alternative to Theory X set of assumptions. They are based on an optimistic, positive view of people. Theory Y propositions are not offered as a form of abdication by managers, but as new theory for the management of human resources. Theory Y generalizations are based on many years of research in the social sciences and are conceived to be accurate descriptions of the nature of people. In fact, Theory Y is perceived as a solution for integrating individual and organizational goals. McGregor described Theory Y as:

1. "*The expenditure of physical and mental effort in work is as natural as play or rest.* The average human being does not inherently dislike work. Depending upon controllable conditions, work may be a source of satisfaction (and will be voluntarily performed) or a source of punishment (and will be avoided if possible).
2. *External control and threat of punishment are not the only means for bringing about effort toward organizational objectives. Man will exercise self-direction and self-control in the service of objectives to which he is committed.*

3. *Commitment to objectives is a function of the rewards associated with their achievement.* The most significant of such rewards, e.g., the satisfaction of ego and self-actualization needs, can be direct products of effort directed toward organizational objectives.
4. *The average human being learns, under proper conditions, not only to accept but to seek responsibility.* Avoidance of responsibility, lack of ambition, and emphasis on security are generally consequences of experiences, not inherent human characteristics.
5. *The capacity to exercise a relatively high degree of imagination, ingenuity, and creativity in the solution of organizational problems is widely, not narrowly, distributed in the population.*
6. *Under the conditions of modern industrial life, the intellectual potentialities of the average human being are only partially utilized.*" (23)

Following this train of thought, Warner speculates:

"By contrast, Theory Y holds that work is as natural as play and that people have a psychological need to work. They want responsibility, are capable of self-control, and desire to achieve. Therefore, managers should arrange the work environment and methods of operation so people can achieve their own goals by directing their own efforts. Theory Y holds that motivation can come from self-esteem and achievement; if people are properly managed, in fact, they will be more creative and team-spirited, and be willing to take on responsibility. McGregor believed that very few organizations make full use of their employees' inherent abilities and strength. The role of the manager is not to ask which set of attitudes is right, but rather ask: *What is the reality of our job situation, and how can I motivate my people to keep them involved and contributing?*" (24)

McGregor points out that Theory Y is centered on the possibilities of human growth and development. The strategy for its application should be for selective adaptation rather than adoption of a single, all-inclusive, absolute use of authority for control. He contends that Theory Y is not a limitation as implied with Theory X set of assumptions. Theory Y is more of an estimator of management's capabilities. McGregor writes:

"Above all, the assumptions of Theory Y point up the fact that the limits on human collaboration in the organizational setting are not limits of human nature but of management's ingenuity in discovering how to realize the potential represented by its human resources. Theory X offers management an easy rationalization for ineffective organizational performance: It is due to the nature of the human resources with which we must work. Theory Y, on the other hand, places the problems squarely in the lap of management. If employees are lazy, indifferent, unwilling to take responsibility, intransigent, uncreative, uncooperative, Theory Y implies that the causes lie in management's methods of organization and control." (25)

While McGregor understood that Theory Y was easy to say, their application in an organization would be challenging. He noted that it would not be easily accepted by managers because of deeply ingrained managerial habits of thought and action. After all, managers who have risen to the top have had their Theory X set of assumptions reinforced over and over again either by pay increases or promotions: why change now? Their beliefs have served them well so far in their career; it would be stupid to change now. The risks are too great.

The primary strategy to use when applying Theory Y is the principle of *integration*. It says that the best approach is the creation of conditions that allow employees to achieve their own goals in the context of directing themselves to achieve the goals of the organization. This is not business as usual. This is a different style of management all together. Deming would agree.

There is now an interim step that looks and feels uncomfortable to the manager. The objective is now for the manager to be thinking of how to match the organizational goals with the goals of the individual to get results. This is different than just reeling power to make a decision to get a specified result irrespective of

the needs of the people who have to perform. It was believed by McGregor that the synergistic effects of combining the two set of goals would result in the organization achieving lasting economic objectives more efficiently and consistently. The flip side of Theory Y is that unless integration is achieved the organization will suffer losses. What is presented above is goal alignment. It also accentuates the need for a clear aim of the system. Without a clear aim (creating joy in work), it is easy to regress to Theory X.

Application of Theory Y opens up many possibilities for innovation and creativity. Theory X limits the possibilities. It was McGregor's belief that the continual testing and re-testing of Theory Y precepts in the organization would allow development of the kind of knowledge that would sustain the viability of the organization. McGregor writes:

"There is substantial evidence for the statement that the potentialities of the average human being are far above those which we typically realize in industry today. If our assumptions are like those of Theory X, we will not even recognize the existence of these potentialities and there will be no reason to devote time, effort, or money to discovering how to realize them. If, however, we accept assumptions like those of Theory Y, we will be challenged to innovate, to discover new ways of organizing and directing human effort, even though we recognize that the perfect organization, like the perfect vacuum, is practically out of reach." (26)

The statement above is reminiscent of Deming's call to bring back the individual and return to joy in work. A Theory Y set of assumptions are tenets of the innate values that people bring to the workplace. Dr. Deming recognized these inherent qualities of people and added his unique theoretical framework to the management of people, e.g., systems and statistical thinking which have proven to be natural extensions to a Theory Y set of assumptions which McGregor challenged us to test. As McGregor surmised:

"Theory Y is an invitation to innovation" (27)

Jacoby and Terborg take a critical look from McGregor's perspective:

"In summary, McGregor believed that a Theory X philosophy of human nature – employees are incapable of innovation and responsibility and need to be controlled by extrinsic rewards and punishment – is simply not healthy. Jobs that do not allow for self-control and self-fulfillment can create counter-productive behaviors, i.e., employees may attempt to 'beat the system' in order satisfy their needs. (This sometimes involves creative behavior of the type considered improbable under the Theory X view.)

In contrast, the Theory Y philosophy appears to be a more adequate description of human nature and makes managers responsible for harnessing the creative and positive aspects of human behavior for the benefit of both the individual and the organization." (28)

In practice, integration of employee goals and organizational goals, can take many forms. According to McGregor, some of the best include tactics such as job enlargement, job rotation, job enrichment, cross-functional training, employee empowerment, and job re-designs. All these stand to offer an alternative to the standard methods used today. Each will require astute understanding of the coalescence of employee-centered and organization-centered goals far different from what is occurring in the modern workplace.

The Pygmalion Effect

The third theory deals with the power of expectations on others. The Pygmalion effect is a long-understood theory in the field of social science used to explain why people behave the way they do. This phenomenon is well-known and used to help explain results in psychological studies exploring the causes of achievement in people's performance. It was well documented by Robert Rosenthal and Lenore Jacobson in their

seminal book, *Pygmalion in the Classroom* (1968). The powerful effect of this concept was noted by Dr. Deming as well:

"There is another factor to take into account, the Pygmalion effect. Rated high at the start, anyone stays high. Rated low at the start, he stays low." (29)

The concept of the self-fulfilling prophecy, as termed by Robert Merton, is based on four principles:

1. We form expectations of people or events
2. We communicate those expectations with various cues
3. People tend to respond to these cues by adjusting their behavior to match them
4. The result is that the original expectation comes true (30)

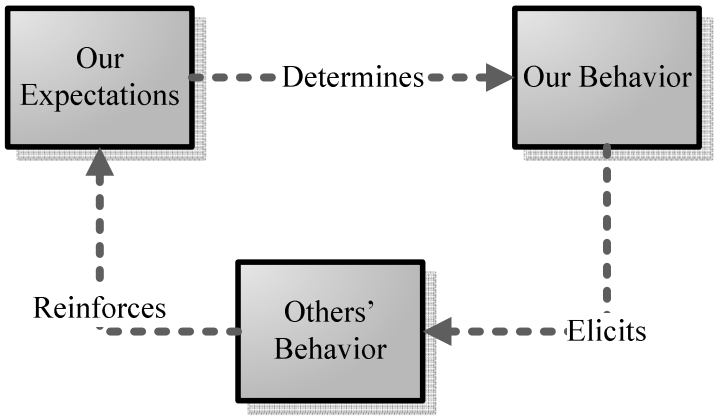
The power of expectations can not be overstated. Merton postulated that our expectations can have a powerful influence upon the future that unfolds, even when we might not be aware of those expectations. What he found is that once the expectation is projected by the sender consciously or unconsciously, people respond to it in ways so as to please the sender. Said differently, people behave in ways that are consistent with (and thus ultimately help confirm or fulfill) their prophecies. Merton concluded that somehow people's behavior and actions caused predictable outcomes. In other words, the way leaders view people affects the way that leaders treat people they influence which in turn can influence the leader's behavior again in the future.

Eden conceived his interpretation of the cycle as a method to enhance productivity on the job. He carefully defines the concept of this expectancy theory in terms of who is the initiator of this process. In other words, behavior of the leader is the cue to initiate the SFP – not the recipient.

"Thus, it is expectancy in the sense of that which the expecter [sic] *believes is likely to occur*, rather than that which a person believes *ought* to occur, that leads to the behavior that fulfills the prophecy. In particular, the present use of 'performance expectations' refers to the level at which the manager believes the subordinate is likely to perform". (31)

In addition, a flowchart from Hall's work is a useful diagram to demonstrate the cycle in a context of the act of leadership. (32)

Self-fulfilling Prophecy



The concept has value in the application of Theory Y. If the manager starts with a positive, optimistic attitude about people and uses Theory Y as the basis for action, there is a higher chance that employees will respond to the manager so as to please the sender. The implication is far reaching in the testing of Theory Y: the performance of people depends more on the manager than previously believed. Always expect the best from people and they will typically measure up to your expectations. Conversely, if Theory X is projected, and employees act out the negative script that they were given, the self-filling prophecy is confirmed.

In considering the motivation level of people in the accomplishment of goals, the manager has a significant amount of influence in the leadership process and needs a realistic platform from which to start when interacting with others. Before changing others, wisdom would tell us to consider that it is necessary to change ourselves first.

A New Paradigm

When considering attributes of leadership that Deming purports useful for the successful transformation of an organization, leaders would do well to possess a "new paradigm" so as to continually revise current theory with new theory after testing. Iterations of testing the new perspective would lead to new theories about the nature of people and work which is at the crux of the issue. If a person could take a snapshot of their current mental model, this new perspective would help them replace their current belief system with a different belief system.

Deming takes a unique approach in understanding the learning process and that other factors should be considered. For example, he writes:

"Anyone, when he has brought his work into a state of statistical control, whether he was trained well or badly, is in a rut. He has completed his learning of that particular job. It is not economical to try to provide further training of the same kind." (33)

Henry Neave put the situation into perspective:

"I think the basic reason is well-known human characteristic that bad habits are much harder to dispel than no habits! Once something has been learned wrong, learning it right consists of two parts: getting rid of the wrong and then receiving the right. The former is difficult, very difficult." (34)

It is entirely feasible that leaders can fall into a state of statistical control in their assumptions about people and work too. This condition has implications in adopting a Theory X set of assumptions. Once a leader has been conditioned to a negative, pessimistic viewpoint of people, typical training methods will not suffice to change that perspective. It will take new methods of training to supplement existing attitudes with the "new learning" and overcome old behaviors.

McGregor always intended that the Theory Y set of assumptions should be applied in the organization. Correspondingly, he observed, since Theory X is present and in place right now, why use it? It hasn't worked in the past so why use it in the future. He contended the process starts with the leader to act out his or her theory, i.e., Theory X or Theory Y. If he or she bases their actions on Theory X assumptions, do not expect different results even when trying to utilize Deming's Theory of Management. On the other hand, if he or she bases their actions on Theory Y assumptions in place of Theory X, new opportunities will arise. Theory Y will require <u>integration</u> of Deming's Theory of Management with personal goals of employees

and organizational goals. The prediction is a synergistic effect that will improve the organization's quality, productivity and competitive position as Deming predicted in the application of his theory.

Often times, leaders confuse cause with effect. In the context of companies, current practice suggests a pessimistic thought process. If workers were motivated to perform better and accept more responsibility, we wouldn't be in this mess. It's entirely their fault. In this scenario, the cause is the unmotivated, apathetic worker. Thus the leader becomes reactionary. The effect is loss of identity, unsatisfied workers and absence of joy in work. The system is perpetuated with increased counter measures and control.

In this scenario, the cause is not the worker; it's the leader's predisposition. The **effect** is the reactive behaviors and attitudes of the people doing the work. The **cause** is really faulty assumptions use by management to direct and motivate workers. As Deming always contended, the problem is not with the worker, it's with the people at the top (i.e. leadership). He understood the correct relationship of cause and effect and got the variables in the right order. McGregor understood these concepts too. He understood the power of theory and the source of costs in an organization as well: they come from faulty theory of management, not the other way around, i.e., the worker.

Conclusions

Examining the adequacies of McGregor's Theory Y (and the inadequacies of Theory X) offers the opportunity to change the current leadership system to a higher level of understanding and move out of the stable state of management that Deming identified. Giving leaders the opportunity to respond to McGregor's original question in a simple, straightforward, and understandable fashion will help "the ship to be righted". McGregor predicted that the set of Theory X propositions will implode on its own faulty moral and ethical foundations. Leaders need to explore the futility of Theory X propositions and the optimism that Theory Y tenets offer.

If leaders are going learn effectively from experience, they have to have good theory from which to evaluate. Not knowing their personal theories is tantamount to dereliction of duty. Leaders need to test and modify their hypotheses as a result of new data and experience. The topics presented here offer leaders the opportunity to identify the hypothesis they are currently applying to lead others. Awareness and understanding of the topics allows leaders to first become aware of their current state, and then second, allows them to modify their assumptions towards the actualization of Theory Y. In the context of the Pygmalion effect and the Shewhart Cycle, leaders can use Theory Y propositions in the workplace, apply them (test) to gain data and re-test the theory over time to learn and improve, not only for personal improvement, but for organizational gain. Leaders need to shun the idea that introspection is something esoteric, non-value adding, and promote learning to *restore the individual* that is in everyone.

Leaders need to test each of these complimentary theories in our quest to gain new knowledge. Effective leaders will be even more committed to Deming's Theory of Management as experience grows. Effective leaders must keep the aim in sight: restore the individual and allow people to take pride in their work. If this aim is followed, results will dispel future reliance on Theory X as a viable alternative.

Footnotes

1. Deming (1994) p. 123.

2. Deming (1994) p. 122.

3. Deming (1994) p. 93.
4. Backaitis (1995)
5. Deming (1994) p. 112.
6. The Deming Library (1992)
7. Neave (1990) p. 388.
8. Neave (1990) p. 337.
9. Scholtes (1998) p. 297.
10. McGregor (1960).
11. McGregor (1960) p. vii.
12. McGregor (1960) p. 6.
13. McGregor (1960) p. 8.
14. Heil (2000) p. 20.
15. *Heil (2000)* p. 21.
16. McGregor (1960) p. 8.
17. McGregor (1960) p. 10.
18. McGregor (1960) p. 11.
19. Cutcher-Gershenfeld (2006) p.xxii.
20. McGregor (1960) p.33.
21. Warner (2004) p. 2.
22. McGregor (1960) p. 42.
23. McGregor (1960) p. 47.
24. Warner (2004) p. 2.
25. McGregor (1960) p. 48.
26. McGregor (1960) p. 54.
27. McGregor (1960) p. 57.
28. Jacoby (1995) p. 2.
29. Deming (1994) p. 26.
30. Merton (1948) p. 193.

31. Eden (1990) p.8.

32. Hall (1995) appendix

33. Deming (1982) p. 249.

34. Neave (1990) p. 329.

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CUSTOMIZATION OF QUALITY PRACTICES: THE IMPACT OF QUALITY CULTURE

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Abstract

A wide range of outcomes have been experienced by firms that have adopted quality management practices, ranging from implementation failure to improved performance. One question that has not been resolved in guiding quality practices is whether firms should adopt all the relevant quality practices to obtain or maintain quality advantage. This study adopts March's learning framework and argues that the effectiveness of quality practices requires managers tailor the balance between exploitation and exploration to match the organization's inherent characteristics. We particularly examine the impact of organizational culture and quality culture on quality practices customization using a secondary survey data. Our results support the hypotheses that quality management practices must match with the nurture of quality culture to improve quality performance and overall operations performance. The findings offer firms concrete and valuable strategies to adopt quality management practices along the culture change.

Appendix

List of Authors

LIST OF AUTHORS

[x] The McKinsey Awards were established in 1959 by Ed Bursk, then the editor of *The Harvard Business Review*, with support from McKinsey & Company. The idea was simple: to recognize practical and groundbreaking management thinking by asking a panel of both business leaders and scholars to determine the two best articles each year in *The HBR*.

[xi] Deming's "New Philosophy" of leadership was often referred to by others as the "continuous improvement" leadership frame of mind. In fact, the New Philosophy is a sophisticated, holistic and integrated body of thought which provides the foundation for transforming organizations into optimized, productive, efficient, effective places where employees can find–and create—joy in work. The New Philosophy defines relationships with customers and suppliers, as well.

[xii] Deming has 7 citations in THE 100 BEST BUSINESS BOOKS OF ALL TIME, as does Marcus Buckingham, Jim Collins, Malcolm Gladwell, Tom Peters, and Ram Charan. Peter Drucker has 5 citations as an author and has an additional 12 citations for his books. Deming has a total of 11 citations when you add in the citations for his books.

[xiii] From THE AGE HERETICS by Art Kleiner, footnote 41, chapter 9: "Toyota Vision and Philosophy" retrieved January 2008 from http://www.toyota.co.jp/en/vision/tradition/sep_oct05.html

[xiv] From THE TOYOTA WAY, pages 82 and 83. I include this quote even though it is from the 2004 book because it is echoed in the later two books which fall into the 2005 – 2009 time frame of our research.

[xv] From the *Financial Post*, October 2, 2009.

[xvi] From *Business Week*, June 25, 2009.

[xvii] TQM was often used by authors and reporters to mean Deming's management philosophy. Deming, himself, tried to avoid such labels because they were often associated with management fads rather than with true transformation to the New Philosophy of management which he taught.

[xviii]The Hopper brothers quote Andrea Gabor's, THE CAPITALIST PHILOSOPHERS.

[xix] Point 7 of Deming's Fourteen Points for Management is "Institute Leadership: The aim of supervision should be to help people and machines and gadgets do a better job. Supervision of management is in need of overall as well as supervision of production workers."

[xx] I remind readers of Pfeffer's and Sutton's advance in HARD FACTS against embracing "breakthrough and revolutionary" ideas because they usually fail.

[xxi] The 3 books are: JUMP START YOUR BUSINESS BRAIN: The Scientific Way to Make More Money. JUMP START YOUR BRAIN 2.0: How Everyone at Every Age Can Be Smarter and More Creative. JUMP START YOUR MARKETING BRAIN.

[xxii] Hall also encourages people to read RE-IMAGINE by Tom Peters; THE RISE OF THE CREATIVE CLASS by Richard Florida; and AS THE FUTURE CATCHES YOU by Juan Enriquez.

[xxiii] Often these are referred to as applying "Six Sigma" tools to marketing. Six Sigma is not to be confused with Deming's more cohesive and holistic approach. The Six Sigma methodology did adopt elements from Deming's philosophy, but perhaps not enough of them. It also became somewhat faddish.

[xxiv] Kanban means "visible record, signboard, card, or ticket" in Japanese depending on who is doing the translating. Essentially it is a system of notification from one process to the other in a manufacturing system. Kanban cards are stored in a bin or container that holds the inventory. They describe the parts, supplier and quantity. When the bin is emptied, the Kanban is used to order more for Just-In-Time and Lean processes.

[xxv] In an article "The Unnatural Environment" published in 2009 by CQI, the Chartered Quality Institute, Johnson writes, "Toyota has reported annual losses in the last two years of global recession, after nearly 50 years of achieving unmatched financial results in its industry. Shoichiro Toyoda, the 84-year-old family patriarch and honorary chairman of Toyota Motors, responded to this by announcing a stunning shake-up of top management. He chastened top managers for losing sight of the fundamentals that had made the company so outstanding and promised that the company would return to the basics. The company's financial reversal occurred, he indicated, not primarily because of the recession's severity, but because after 2000 the company's top executives made the mistake of pursuing finance-driven growth and pricing at the cost of sacrificing the basic principles that had made Toyota thrive.... But Toyota's financial slump is not a call to tighten lean practices. Rather, it is the result of rapid and excessive global expansion...prompted by top management placing a new and unprecedented focus on reaching bottom-line financial targets. Is there a lesson here, not only for Toyota but for businesses worldwide?"

[xxvi] Peter Scholtes worked with Dr. Deming for many years. Scholtes wrote two best-selling books: THE LEADER'S HANDBOOK: Making things Happen, Getting Things Done; A Guide to Inspiring Your People and Managing the Daily Workflow. 1998. McGraw-Hill. THE TEAM HANDBOOK. 3rd Edition 2003. Oriel: A SAM Group Company.

[xxvii] I have been a speaker for—and a consultant to—the Agile Software Consortium and have become familiar with its philosophy, manifesto, and structure.

[xxviii] Taiichi Ohno is considered to be the father of the Toyota Production System, which of course, has strong elements of Deming's teachings embedded in it.

[xxix] Again, we are confident there are many more than 172 article citations. We checked 24 databases covering more than 3600 periodicals, which we believe is a worthy number. It doesn't begin to cover the sum total of databases available, however.

[xxx] Source: the compact disks of Deming's Four-Day Seminars

[xxxi] W. Edwards Deming: THE NEW ECONOMICS, second edition. Page 122. 1994. MIT Center for Advanced Educational Services.

[xxxii] Source: Kevin E. Cahill who received more than 500 Google News, Web and Blog alerts during the 6 months of July – December 2009.

[xxxiii] Mr. Costiglio is an attorney with a long and distinguished career. Now "retired" he works with the W. Edwards Deming Institute and Fordham in a variety of ways, including as co-chair (with Joyce N. Orsini) of the Sixteenth Annual International Deming Research Seminar.

[xxxiv] CHASING THE RABBIT. Spear, Steven J. New York: McGraw-Hill 2009, pg. 363.

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