TOTAL QUALITY MANAGEMENT IN PROPERTY/CASUALTY INSURANCE: AN ACTUARIAL PERSPECTIVE

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by
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Biography

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Abstract

This paper examines the motivations and procedures for applying the principles of Total Quality Management (TQM) to Property/Casualty insurers. The basic premise emerges that the essential measure of product and service quality for an insurer is the overall financial soundness of the company. It follows that the Actuary, custodian of the riskiest items on the balance sheet, has a special interest and a central role in the TQM process. We examine the application of TQM to the various functional areas of an insurance company, studying both internal activities, external workflows, and the flow of information to the "actuarial nexus". We then review Deming's "Fourteen Points", commenting on their implications for the property/casualty industry and conclude with a review of the Baldrige Award and its importance to the industry.

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Introduction

Statistical Quality Control, long a standard technique in the manufacturing industries, has, over the years, evolved into a mature and inclusive discipline, Total Quality Management, which embraces all functions of the enterprise, and involves a comprehensive philosophy of management. The global success of pioneering Japanese companies has made adoption of this approach in manufacturing more a necessity for survival than just a nice thing to try. Global competition and the steady erosion of trade barriers have made the trend irresistible in industries that are not somehow sheltered. The service and financial sectors have been slower in adapting and adopting the principles of TQM for several reasons:

- The measures of quality and productivity are less clear than in the manufacturing sector. Indeed, the very definitions of product and product quality need close study.
- Service and financial enterprises are often sheltered from international competition by regulation, protective legislation, and cultural barriers.
- Financial institutions, insurance companies in particular, deal in promises which often are fulfilled only after a substantial time lag. This tends to make the company's performance harder to quantify on a timely basis. Often mistakes come home to roost only after the perpetrators have retired from active management.
- The management philosophy which has evolved as part of TQM, in many respects a profoundly humane doctrine, stands many cherished precepts and ingrained habits on their heads, calling for a revolution in management style. Such things do not come about overnight nor, usually, without the pressure of stark necessity.

However, the Savings and Loan and Commercial Banking crisis, governmental concern over the solvency and financial solidity of insurance companies, and the increase in global competition are creating an atmosphere that is less forgiving and less tolerant of inefficiency, in which the important survivors will be "world class" enterprises. The ancient bane of the "underwriting cycle" can be blamed in part on poor quality information too long delayed. TQM holds the seeds to a solution of the problem. Further many quality-conscious manufacturing enterprises view their insurers as suppliers and are keenly aware of what a supplier's inefficiency can cost

them. As this consciousness grows, commercial insurers will come under pressure to adopt TQM. Finally, the growing trend toward globalization will create the need to free managers from routine for the more important tasks of learning and strategic thinking. TQM carries the capability to define, detect and prioritize exceptional conditions which require management intervention. If managers can direct their attention where it is required and leave alone that which is better left alone, the time saved can be applied to the vital undertaking of learning and coping with a changing environment. The urgency is evident, but there is still time for a reasoned and thorough approach to the problem. Our purpose here is to examine the application of TQM in the property/ casualty (P/C) industry while it is still an option and before it becomes a stark and urgent necessity.

A calm and thoughtful examination is necessary because the issues are broad and subtle. A policy of insurance is not something you can park in the driveway or take out for a spin. It is a promise to compensate for losses which may never occur. The roster of interested parties may go far beyond the policyholder to include family members, potential claimants, creditors - in a word, the public at large. It is an instrument that has become essential to the responsible conduct of affairs. How, then, shall we define and measure the quality of such a product? Ask someone who owns one, and you will find that efficient underwriting service is important, honest and expeditious claim service is important, prompt and polite response to inquiries and complaints is important, but the reliable long-term ability to pay claims is essential. The basic definition of product quality goes directly to the bottom line; to the issue of the insurer's financial soundness, present and future.

The prime guardian of this stability is - or should be - the Actuary who is uniquely equipped by knowledge and training to confront the central quantitative issues involved in keeping an insurance operation on an even keel financially. This is so because of the Actuary's traditional involvement in the activities most fraught with risk and uncertainty: product pricing and loss reserve valuation. These activities are reflected on the balance sheet in the reserve for unearned premiums (UPR) and the reserves for losses and loss adjustment expenses. The uncertainty inherent in loss reserves is widely acknowledged and a common target of regulatory scrutiny. Recent regulatory decisions - notably the Colorado loss reserve opinion requirements - have posed the significant challenge of quantifying this uncertainty. The UPR is another matter. Calculating its expected value is usually an accounting exercise. But consider the underlying random variable: the eventual cost of coverage promised but not yet provided; and you have the scariest item on the entire balance sheet. Recently we have also seen the actuarial purview extending to the asset side of the balance sheet as the option of ignoring the question of asset

quality and stability has begun to disappear. The asset book must support the liabilities, and managing the assets to that purpose requires an understanding of the structure and variability of the liabilities as well as knowledge of investments. The NAIC's Risk-Based Capital (RBC) initiative brings together all these concerns under a single heading and represents an important milestone for the industry. Approached constructively, it may eventually become more important as a vital management tool than as a regulatory discipline. Indeed RBC involves many of the same conceptual tools as TQM, in terms of characterizing and quantifying financial variability.

Our thesis, then, is that TQM, now a very desirable option will soon become a necessary discipline, and that, applied in the insurance industry without a central role for the Actuary, it will fail of its promise. Actuarial participation in the TQM process will require considerable extensions in actuarial scope and method. This is because any effort that stops short of the bottom line will fail, as will any effort that stops short of full understanding and characterization of the underlying variability.

In the rest of this paper, we shall examine the genesis of TQM and shall discuss the implications for the actuarial discipline. Since problems can be detected and characterized in the actuarial and financial areas of a company - but not solved - we shall then study the application of TQM in the operating areas of an insurance company,

- insurance processing operations
- underwriting
- claims
- marketing and sales
- information processing
- research and development
- financial management, reinsurance, investments,

focusing both on the workflows and on the flow of information. We shall summarize by presenting Deming's "Fourteen Points" in terms of their application to the business of insurance and shall conclude with a brief discussion of the Malcolm Baldrige National Quality Award, the "Baldrige Process", and their importance to the insurance industry.

Total Quality Management and Statistical Method

The entire discipline of statistically based quality management can be viewed as the first of many products which have been invented in America, ignored or rejected on their home ground, and brought to fruition in Japan. In fact, it made all the other well-known Japanese commercial triumphs possible. Those of us who were born before the end of World War II can remember when "Made in Japan" was synonymous with "shoddy goods". It was not by accident that this same label has now become a hallmark of quality. The gospel carried to Japan, as part of the postwar reconstruction effort , by such American apostles as W. Edwards Deming, was taken to heart, put into practice, and developed into a comprehensive philosophy of management. These men, Deming foremost among them, are now national heroes in Japan.

It was reading Dr. Deming's book *Out of the Crisis*(1) and hearing his Statistician of the Year address to the Chicago Chapter of the American Statistical Association which brought home to me the truth that statistics is a humane discipline. The fear and loathing often occasioned by statistics in the non-specialist is an artifact of the way it has usually been taught at the basic level. Properly understood, statistics is a tool for reading numbers, filtering out the noise, and interpreting the signal. It is a means of removing the hard-edged tyranny of mathematical models and of characterizing ambiguities that cannot be resolved. Its most important function by far is to engender humility in those who wield the numbers and might otherwise use them to afflict the innocent.

Statistical Quality Control began as a set of tools and rules for monitoring the performance of men and machines and interpreting the resulting numbers. In monitoring a process, the first step is to choose the quantity to measure, usually an item of the product specifications. Next the measurements are charted in sequence and scrutinized to decide whether or not the process is stable. Instability in the parameters of the process usually indicates a defect in the equipment or the way it is being used. Once stability is achieved, the process is said to be in a state of "statistical control". At this stage, and not before, it makes sense to prescribe control limits for the process, based on the product specifications and the "capability" of the process. Measurements falling outside these limits are anomalous and require investigation. The object of all this is to control and reduce random variation in product characteristics. Once statistical control is established, any improvement in performance must come from improving the process itself. This "control chart" technique is the central methodology of statistical quality control and was pioneered by Walter Shewhart (2).

Deming makes the point that product specifications are expressed in terms of strict limits while process errors follow normal (or other) distributions, with always some observations in the wings. Hence there is always something to be gained by improving the process by reducing the error amplitude, including the leeway needed to speed up the process. This is a key realization and leads to one of the cardinal points of TQM: the need for continuous and unending process improvement. It also clarifies the relationship between quality and productivity. Attempts to speed up processing, without first achieving and maintaining statistical control, are in vain. Merely speeding up the line without reference to statistical guideposts will result in costly rework, confusion and disarray downstream, and ultimate customer dissatisfaction. A process can be speeded up on a trial basis after it has been improved to exceed substantially the nominal quality requirements, and the judgment to maintain the extra speed can be made only after statistical control has been reestablished.

Therefore TQM does not pursue fixed goals nor ever consider that the job is finished. Instead process improvement is moved upstream from final inspection to process monitoring to process design to dealings with suppliers. The current emphasis in manufacturing technology is on experimental design for process improvement and for designing quality into the product.

Shewhart's invention has evolved into a discipline which involves the entire enterprise in every aspect. The emphasis is on disciplined communication, in real time, involving all employees from the production line to the executive suite. Statistical analysis is still a central tool but is considered another medium of communication: when you need to talk about numbers, this is the way to do it (3).

Implementation of Total Quality Management

There is an extensive literature on implementation of TQM in the actual context of a working company. Reference (3) is but one example. It is not our task here to repeat that material but to point out what is special or unique in the P/C insurance operation. It is generally agreed that successful implementation is not possible without active involvement by the CEO and corporate staff. Our argument here is that the full support and participation of executive level actuaries is also necessary. It is also clear that TQM is much more than merely keeping score and interpreting the numbers using SQC methods, involving as it does radical changes in corporate culture and management style. However, the scorekeeping is still essential and indispensable. There has been considerable activity in the industry of late reëngineering business processes for greater accuracy and efficiency and labeling the undertaking TQM. Actually two things are

needed before process improvement can be called TQM. One is the global, company-wide commitment to improving quality; the other is a system for keeping score, for quantifying the process improvement in terms of both throughput and variability

In a P/C insurance operation, we must go further. Process improvement in critical functions, *e.g.* claims or premium processing, can cause transient disturbances in the corporate numbers, undermining crucial actuarial assumptions and possibly impairing management's understanding of the company's financial position. Such an event, as we have discussed, is clean contrary to the obligation to maintain product quality. This is the most compelling reason why the Actuary must be one of the best informed and most active participants in any TQM effort. The Actuary needs to have a say in how the scorekeeping is done, what quantities are recorded, how they are benchmarked, how they are transmitted. Finally, the Actuary has a creative role in figuring out the impact of recorded operational changes on reserve levels and pricing. This is an extension of present actuarial knowledge and a significant challenge to the profession. However, we submit that it is necessary to avoid the irony of a situation where an attempt to improve operations actually makes things worse by impairing knowledge of the company's financial position.

Total Quality Management and Insurance

We are ready now to discuss TQM and P/C insurance in functional detail. We do so without comment as to whether the functional organization common in the industry is in fact the most efficient form and the most conducive to high product quality. We begin with a consideration of the product itself.

As we have already remarked, a policy of insurance is a very complex object, and its value to the policyholder and other interested parties depends on many factors. Like any product, it can be examined under the rubrics of price, aptness for use, and reliability; but these considerations ramify in all directions and into all corners of the insurance enterprise. Price depends on underwriting, marketing, processing efficiency, and the accuracy of the actuarial pricing function. Aptness for use depends on product design, policy language and design and the quality of claim service. Reliability depends on all the factors which influence pricing plus the accuracy of the actuarial loss reserving function, the quality of financial management, and the soundness of the investment operation. We cannot suppose that the statistical knowledge needed for this complex task is cut and dried. Nor are all the necessary tools ready for use. These must be developed over time, and they will not be developed in a think tank or an ivory tower. They can be forged only in the crucible of practical experience.

The Actuarial Nexus

We have already argued that the actuarial function is central to the problem of controlling the quality of the insurance product. This is, or should be, the nexus where all the streams of information converge, where the crucial management decisions are supported. We would argue further, however, that new kinds of information are needed as well as improved quality for existing information.

The central management decision affecting the quality of the insurance product is that of the company's basic financial posture: liabilities are compared with assets, and the difference is the financial cushion available to support new writings and to absorb adverse fluctuations. What volume of new writings can be supported, given what is known about the company's current financial condition? The answer to this question determines the reliability of the company's policies: past, present, and future. The key word is "fluctuations". The industry is set up to take exposures which are unmanageable, or at least inconvenient, at the individual risk level and to combine them into a collective that is financially manageable in the sense that expected fluctuations are very unlikely to cause liabilities to exceed assets. This hope is based on the fact - or the hope - that random loss events are uncorrelated so that the more we add up the smaller is the relative dispersion. Some uncertainties, however, cannot be "diversified" away in this manner. Errors in pricing the product, or deliberate underpricing to meet the market, add coherently across large blocks of business and contribute to the massive swings of experience known as the "underwriting cycle". Large natural catastrophes also act coherently to threaten the solvency of overexposed companies and sometimes delay or impair the payment of claims to hard-pressed insureds. The potential magnitude of catastrophic events and the room for improvement in the industry's means of coping with them have been underlined dramatically by recent events.

The reason I recite these commonplace facts is to point up the urgent need for better numbers and better, more timely, knowledge to characterize and quantify the uncertainties which confront insurers and their industry. The company's internal numbers must be recognized as estimates, and not mere tallies, and must be presented with confident estimates of dispersion and intercorrelation. Companies which have such numbers and know how to use them will be able to meet the challenge we have described. Others, barring mere luck, will err in one direction or another and founder or relinquish market leadership.

One may well ask why such numbers do not exist already, along with the knowledge to create and use them. One answer is that the development of actuarial science has been conditioned, and in some ways hampered, by the old actuarial habit of treating probabilistic models by numerical methods, justified on the basis of the huge volumes of homogeneous data amassed for life insurance mortality studies. This has worked well enough for the life insurance industry but has served the P/C industry less well and engendered reliance on such quaint rules of thumb as the Kenney Rule and the five-percent underwriting profit load. It is clear that American insurers will need better navigating instruments in the future. One problem is that tried and tested TQM methodologies do not yet exist for P/C insurance. Another is that the art and science of gathering and interpreting information about process variability in insurance finance are in their infancy.

Developing such tools and concepts will require considerable effort and study, some of which is already underway(4,5). We have already stressed that even a merely plausible approach must go to the bottom line. The central quantity of interest is the insurer's net worth considered as a random variable. What does this mean? At the very least, it means that getting to the bottom line does not simply mean adding up a lot of numbers which we have estimated as accurately as we know how.

Bulk summaries, as they are usually designed, are efficient destroyers of information. When tall columns of numbers are added up, information about their variability disappears. Besides recording numbers and adding them up, one must also record basic descriptive statistics to characterize their dispersion and (This is much harder.) their intercorrelation.. Typically, when such information is needed, a special study must be mounted at considerable expense. I would argue that all managers should have access to such information as well as the training needed to interpret it. Managers typically must make use of reports consisting of page after page of numbers with no guide as to which of them represent a significant excursion beyond the expected noise level and are worthy of attention. I would argue that the sharp eye needed to extract useful information from such reports, while admirable, is not a centrally important **management** skill. It is a peripheral task which should be made as easy as possible so that the manager may have more time to manage.

Such information is particularly important - but seldom available - for carrying out actuarial chores. The Actuary makes use of numbers which flow in from diverse areas of the company - principally claims and underwriting. Anomalies in these numbers can indicate conditions which violate the assumptions of the actuarial models essential for quantifying the company's liabilities

and guiding its future course. Such anomalies must be identified, prioritized, and investigated. Close attention to these environmental factors is probably the best predictor of the success of an actuarial operation. However, such attention is much more costly in time and effort, and much less assured of success than it should be. What is needed is to establish statistical control limits for the incoming numbers and to use these limits to flag exceptions for scrutiny. Ratemaking and loss reserving are carried on largely in the absence of information about the dispersion of numbers, relying on first order bulk tallies. Layering by claim size and other measures of dispersion are usually only introduced for special studies. In general, the actuary exercises insufficient control over the numbers which come under scrutiny. Devices such as credibility need statistical tuning which can only be done reliably when well-designed data summaries are available. The obligation under TQM for continuous process improvement lies especially heavily on the actuary The need is urgent, and the solution must come from within the actuarial profession.

Insurance Processing Operations

The operations which carry on the insurer's business and feed numbers into the crucial actuarial control nexus stand in similar need of statistical monitoring and control. These are the areas where massive numbers of premium and claim transactions are entered and processed and where statistical quality control methods can contribute significantly in terms of process improvement, cost control, and employee morale. These by themselves are worthwhile, and companies and their consultants are making serious attempts at TQM implementation, some even preparing to compete for the Baldrige Award.

These attempts can be expected to produce important advances; but, as we have already seen, much more is needed. The reason is that the actuarial control nexus depends on input from these operations and relies heavily on assumptions about their stability. These assumptions are often violated due to personnel upheavals and interventionist management - the very aberrations TQM is designed to correct.

Unfortunately the actuary receives only episodic and anecdotal information about these aberrations Such information is very nearly useless since it comes without meaningful benchmarks and indices of variability. However, whenever there is a departure from uniformity and stability in, say, claim settlement patterns, actuarial models typically require reference to the fact situation in order to resolve large ambiguities. With the fact situation underspecified, the ambiguities carry through to financial management, engendering extra caution, which may or

may not be warranted, but which certainly blunts the company's competitive presence in the market.

A well-designed TQM system can be expected to rectify these shortcomings by providing meaningful statistics on the state of the operations to supplement the customary bulk totals. The most important of such statistics will be measures of variability - standard deviations, percentiles, *etc.*-which will make the numbers interpretable in real time, providing the means of filtering out noise and characterizing the signal without the usual recourse to averaging over long time periods. This development will also pose a significant challenge to the actuarial function, creating the need for formal, reliable, and - yes - statistically based actuarial models to utilize the newly improved information. Such models will not usurp the role of actuarial judgment but will transfer it more to the task of formulation and testing and less to dealing with individual cases. Since most insurance operations are computerized, or in the process of becoming so, data collection can be done unobtrusively, tapping the processing stream, extracting information, filtering the noise, and sending the signal to wherever it is needed. The alert reader may already have discerned that what we are discussing here is very much like a nervous system with the actuarial nexus serving as the central ganglion - brain, if you like, receiving inputs and providing feedback to all the principal areas of the company. One of the most important of these is underwriting.

Underwriting

Underwriting has traditionally been the central locus of authority in the P/C insurance company. The underwriter wields the "pen" and can commit the company's resources to a risk. Recent decades have seen erosion of this authority but without a corresponding reduction in accountability.

One reason for the reduction in authority is heavy reliance on unsupported judgment in the guidelines that govern underwriting decisions. The underwriter is often in the position of second-guessing an already elaborate rate structure. This is partly inevitable because the articles of underwriting judgment which are susceptible of empirical confirmation tend, over time, to be incorporated in the formal rate structure with a resulting diminution in the scope of underwriting judgment.

Recently, however, there has been a reversal of this trend with the advent, albeit tentative, of expert systems for underwriting and special, statistically based, models for such difficult lines as

Directors and Officers coverage. It is essential for the actuarial reserving and ratemaking functions to provide meaningful, statistical feedback to the underwriting function, just as it is essential for underwriters to provide critique on the operation of the ratemaking system.

It is in the vexed area of underwriting accountability that the need for well-designed statistical models is most urgent because the information used for evaluating underwriters is so full of noise that applying it without filtering is simply capricious and tyrannical. Cutting this accountability too fine is contrary to the risk-spreading philosophy that is central to the insurance mechanism and engenders such undesirable behaviors as excessive caution, too much reliance on reinsurance, and general lack of enterprise which belies the company's true financial capacity. This is an area where a cross-disciplinary solution in the spirit of TQM could be helpful. Actuarial credibility methods - with clearly stated assumptions and statistical tuning - could be used to filter the noise in the track records of individual underwriters, restoring some humanity to the process of tracking performance and driving out the fear that hobbles entrepreneurship in large organizations. There may be some companies where this is done now, but I am not aware of any. This is another aspect of the need for continuous improvement.

As more companies venture into international markets the need for swift and well-informed underwriting decisions will become critical to the success of the enterprise. Underwriting is the leading edge of the process of managing financial uncertainty that we call insurance, and underwriters need to work in an atmosphere where that uncertainty is managed rationally so that the insurance enterprise can accomplish its mission. I believe that appropriate application of TQM principles will provide the key to this goal.

Claims

The claims operation is where the P/C insurance company's end product is delivered - the "proof of the pudding." All assertions as to product quality are here either affirmed or denied. It is most important to have well-designed statistical monitoring systems to highlight the relatively few exceptional claims which fall outside routine and require special attention. Large loss reports are one approach to this problem but have the disadvantage of flagging only cases which have already gone sour. It should be possible to build predictive models, using qualitative information gathered by examiners, to flag claims which are at risk of future adverse development and need present action.

These monitoring systems, some of which probably already exist, can provide valuable information to the actuarial and financial functions, in addition to the usual claim data. As pointed out before, these functions rely heavily on the flow of information from the claim department. This flow is frequently, though unpredictably, disrupted by internal and external influences on the claim operation. Reserving actuaries are well acquainted with this problem. The list of disruptions is a long one: hiring freezes, hiring binges, changes in structured settlement policy, changes in case reserving policy, periodic claim reviews, sporadic claim reviews. monthly aggregate payment limits, the effect of new laws, regulations, and judicial rulings, invention of new legal doctrine by the judiciary and the plaintiff bar, and so on.

The imperative of TQM in this situation is to limit management changes affecting the claims workflow to those which are necessary and warranted by the evidence or which are simply unavoidable. This may free many claims executives to assume a strategic role with a much greater orientation to the environment. The challenge to the Actuary here is in learning to interpret and to use monitoring data coming from the claim department to improve the accuracy and dynamic responsiveness of actuarial estimates.

Marketing and Sales

This department has the prime responsibility for staying in touch with the customer and the sales force. It has the job of finding out what the customer wants, how well the customer's needs are being served, and devising products to meet those needs and finding ways to make them salable.

The marketing function has several methods. One is market research; another is analysis of customer complaints. In either case it is vital not to be satisfied with merely anecdotal information. Market research must be carried out on carefully designed samples and controlled for non-response and other distortions.

Customer (and agent) complaints are a very important source of information. It is in the company's interest to make the complaint process as convenient for the customer as possible. The fact is that most people are reluctant to complain, even for a manifestly valid cause, and most worthwhile complaints go unregistered. One might even make a case for actively soliciting complaints, perhaps as part of the renewal process. All complaints should be acted upon at the individual level, of course. But the process should never stop there. Complaints should be tallied, categorized and analyzed carefully to see whether they may be indicative of a serious defect of product or system design, on whether they might point the way to an important

improvement. This is an essential part of the TQM process, monitoring customer satisfaction, continually improving products and processes, and moving quality upstream to the design stage.

In some companies, marketing also has responsibility for pricing and new product development. We treat these areas elsewhere in this paper.

Information Processing

This function will provide the "nervous system" we considered earlier. Implementation of TQM in P/C insurance will cause a revolution in Information Processing which is already underway. The old emphasis on "throughput": mighty mainframes, tended by a dedicated priesthood, ingesting a myriad of keypunched transactions, and ejecting an equal volume of printed reports, is changing to an emphasis on systems which handle information in real time, giving users access to data on-line, as needed.

Information systems are evolving toward a condition where definitions of data items and the rules for managing them are not a collection of esoterica but a common language for the entire company. Fortunately this evolution is taking place at the time when it is most needed for the implementation of TQM.

There are several important aspects to this evolution. First, we can look for significant improvements in data quality as edit checks, underwriting rules, plausibility checks and other such are coded into the software and moved upstream. More and more primary data entry will be done by the professionals approving and executing the transactions, so that the clerical and supervisory roles will diminish in importance. This means that the insurance enterprise will become more professional and less managerial, more collegial and less hierarchical, all this in the nick of time. Emphasis will shift from oversight of non-professional personnel to software quality assurance; a problem not yet near solution but progressing.

New methods for system design and implementation have been developed based on the concepts of Information Engineering and informed with the wisdom of TQM(6). There are several such methodologies, but the one I am familiar with is the Ernst & Young Navigator Series. The point of such approaches is to treat the entire company and its environment as a system and to design subsystems in the context thus created These methods are promising enough that one can have realistic hopes going forward. Retrofitting is another problem, and, ironically enough, it is the large, established companies, which computerized early, and have a heavy investment in batch-

oriented hardware and software, who will have the greatest difficulty in bringing their systems - not to speak of the management habits they reflect - up to date. It may not be unrealistic to anticipate some dramatic changes in leadership in the industry on just this account. Some companies may have to resort to the unpalatable alternative of running two systems at once to avoid being left behind.

On the whole, trends and developments in this area are encouraging, and software technology may be coming out of a long, dark night. If all goes well, TQM and Information Processing support each other and feed off each other's advances. A cautious optimism seems to be in order. One final point is particular to insurance: It is clear from what we have said that actuarial participation in insurance systems design - now less usual than it should be - will, in future, need to become commonplace and routine. The use of *ad-hoc* attachments to existing systems to satisfy actuarial data needs is not a viable option for the future.

Research and Development (R&D)

We have already made note of the fact that a chief goal of TQM is to move quality upstream to the design stage. This means that all the research and development activities of the company: actuarial research, systems development, new product development, financial modeling, investment research must be involved. Here numbers and throughput are less important, and the emphasis is on communication in terms of concepts and ideas. The key is to identify the stakeholders in of a particular project, put them in close and reliable communication, and keep them there until the project is successfully completed.

Too often, this sort of activity consists of specifying the project, putting the R&D people to work on it, and coming back six months later to discover that the specifications were flawed or sufficiently vague and ambiguous to lead to a finished product with no resemblance to the intended result. Manufacturing companies which have successfully implemented TQM have, in effect, integrated R&D into operations, putting operations people on the design team to ensure that the product, besides being "right" is also usable.

This central protocol for managing project R&D: bring all concerned parties together and keep them in active communication until the project is brought to a successful conclusion, is also essential to the implementation of TQM. TQM implementation will require creation of an R&D function if none existed before. In-house R&D is best understood as an internal consultancy whose customers are within the company and which has the job of marketing its services and

managing its projects to completion, as well as utilizing external consultants and helping the company to appropriate their expertise.

One of the most important examples of such activity is new product development, the quintessential cross-functional activity. To get a new product off the blocks without mishap requires carefully coordinated participation by all functional areas of the company plus potential customers, agents, and sometimes regulatory authorities. Many marketing professionals can attest, for instance, to the folly of launching a new product without the necessary data processing support. I have seen an integrated, cross-functional approach work in a conventionally organized company at the cost of extra bureaucratic machinery. The TQM approach to managing the company and deploying its resources makes such an approach to new product development an easy, natural outgrowth of the basic organization.

Financial Management, Reinsurance, Investments

The job of financial management is to interpret all the monetary information received from operations and the actuarial function, to evaluate the company's financial performance, and to marshal the operating and reserve funds to ensure day-to-day liquidity and long-term solvency. Integral to this is the chore of estimating the uncertainties in the company's financial needs and judging whether surplus funds are an adequate cushion against these uncertainties. When the answer is "maybe not", the question of reinsurance arises.

Reinsurance is often purchased as a financial convenience or as a means of exploiting quirks of the tax code. Its essential function, however, is to control the company's risk position and stabilize financial results against random fluctuations. In this guise, it is central to the issue of product quality. However, optimality for this purpose is usually a secondary consideration in reinsurance plan design mainly because the concepts - second order statistics again - are too unfamiliar and the numbers themselves not generally available.

I would maintain that financial management needs and deserves better information than it has been getting to support these decisions. The management of financial risk is the central function of insurance, and the consistent, rational conduct of the enterprise depends on the ability to characterize and quantify that risk in a way that will support clear-headed decision-making. I submit that the TQM program we have considered can supply such information almost as a by-product since it implies characterizing and controlling variability in all the company's functions.

Reinsurance purchases are among the most intricate financial decisions, and they are not always well executed. This is partly due to market fluctuations, driven by the same uncontrolled, uncharacterized uncertainty we have been fretting about all along, which make the reinsurance market an extremely volatile one. But is also because the internal information needed to support the decisions is not available. The task and challenge of supplying information to support reinsurance decisions, I think we agree, is primarily an actuarial responsibility.

One function of financial management that does not receive enough attention is cost accounting. This vital and neglected function is also soft-pedaled in most texts and monographs on TQM. In fact, the fruits of TQM cannot be measured and made manifest without a well-designed cost accounting system. Insofar as possible, the system should be automated and unobtrusive, feeding off the information systems through the same channels used for quality control information. It should distinguish clearly between first entry and error correction activity so that the true costs of rework can be known, and it should provide line of business detail for ratemaking. A well-designed cost accounting system is also essential for rational treatment of expenses in product pricing and for accurate valuation of expense reserves.

It is likely that most insurance company cost accounting systems need a sound overhaul. The time is ripe for such activity since companies will soon have to cope with rating bureau loss cost implementation and will need to know and understand their costs better than they ever have. A final remark: cost accounting numbers are like all others; a noisy data stream from which the useful signal must be filtered. This is especially true because cost accounting systems dice the numbers up very finely indeed. To get the company's money's worth from the redesign, it is important to design the system to make it amenable to statistical interpretation.

The investment function is, I think, best viewed as a banking operation with a single customer, the underwriting operation. The underwriting operation holds a demand deposit account plus an unlimited letter of credit. In order to serve its customer well, the banker must understand its needs. We have heard much about matching maturities of liabilities and assets. Actually, this is only important when a closed book of liabilities is running off at a fairly predictable rate. In an ongoing insurance operation, liquidity matching is much more important. In order to serve the underwriting operation, the banker must understand the volatility of cash needs for claim payments and other obligations so as to judge what cash funds should be kept ready for payout - whether or not required in the actual event - in order to avoid distress sales of assets to meet underwriting needs. Here again this is the kind of information that the actuary, meeting the requirements of TQM, should be able to supply.

First Summation: Deming's "Fourteen Points"

As we found earlier the discipline of Statistical Quality Control has evolved into an entire philosophy of Quality Management which varies at many points from the conventional wisdom, and is gradually supplanting it through a Darwinian process wherein only the fittest survive. One prominent summation of this philosophy is contained in W. Edwards Deming's "Fourteen Points." These were devised in the context of manufacturing industries but intended to apply to any enterprise. After Dr. Deming's manner, they are stated as bold imperatives and addressed to top management. I will cite them here as they appear in *Out of the Crisis* (7) and provide whatever commentary is necessary (sometimes none) to draw the connection with P/C insurance.

1. **Create constancy of purpose toward improvement of product and services, with the aim to become competitive, and to stay in business, and to provide jobs.**

2. **Adopt the new philosophy. We are in a new economic age;...management must awaken to the challenge, must learn their responsibilities and take on leadership for change.**

3. **Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.**

   This insight applies to many aspects of data management, and points the way to changes some of which are already taking place. Error-prone batch processing with downstream edits should give way to on-line data entry with front-end edits. Paper backlogs should be closely monitored. Rekeying of data should be avoided wherever possible, particularly in error correction. Companies should strive to build clarity and consistency into the insurance product. Anyone who has read one of the recent plain language policy forms can see that plain language doesn't help much: the logical structure of the coverage provisions themselves is obscure and difficult. Language is only the beginning of clarity.

4. **End the practice of awarding business on the basis of price tag. Instead minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust.**

This is a challenge to think purchase decisions through to their consequences. Pennies saved from the office-supply budget may cost dollars down the road. This applies to everything from paper clips to data processing equipment. On a broader scale, it applies to reinsurance purchases and even, surprisingly, to agency relations. Agency companies determined to make a go of the system have found that it pays to limit the agency force to the more productive agencies and to draw them into a closer relationship. Reinsurers and agents are in partnership with the company for good or ill, and the more clearly that is recognized the healthier the relationship.

5. **Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.**

This has been a guiding thread of our discourse. It is worth remarking that quality always precedes productivity. Attention to quality leads to the process stability needed to increase productivity without compromising quality. Trying it the other way round is always futile, resulting in expensive rework and lowering employee morale. (People know when they are being forced to do a bad job, and they resent it.)

6. **Institute training on the job.**

The insurance industry needs no instruction on this point. The vast majority of insurance professionals are trained on the job, although companies bear the burden rather unequally, some acting as training grounds, others hiring professionals away as they top out in rigid management hierarchies. Even lower echelon jobs require substantial training in many cases as companies struggle to employ and utilize the product of bankrupt educational systems.

7. **Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job.**

We have remarked that current trends in the insurance markets will lead insurance executives to become more professional and less managerial, more environmentally oriented and with less time to spend on internal matters. The nature of management tasks will change also with less emphasis on riding herd and enforcing compliance with management *fiat*. Instead, managers will spend much more time communicating with employees, helping them to understand what is going on, making sure they have what is needed to do the job, creating a sense of mission and enthusiasm, and carrying workers' comments and ideas back up the line.

8. **Drive out fear, so that everyone may work effectively for the company.**

9. **Break down barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service.**

   We have dealt with this, but emphasis does no harm. Implementation of TQM to make available the quality information needed in a competitive environment requires that top management exert leadership to break down narrow, defensive, turf-conscious attitudes which hinder the effective flow of information. There is no other solution.

10. **Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the work force.**

    Employees cannot be blamed for errors when the procedures themselves are ill-devised and error-prone, *e. g.* for miscodes when the corporate coding guide is itself radically unintelligible. We have already seen that pushing for productivity without attention to quality and without effort to improve the system serve only to increase costs and to lower morale.

11. a. **Eliminate work standards (quotas)...Substitute leadership.**

    b. **Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.**

Here, if you like, are some bitter pills. But they follow from what has been said already. It is essential to put first things first, and quality precedes productivity. It avails little to meet a huge premium quota at the cost of writing low quality business or discounting rates to the point that the company loses money in the long run. It is of little use to process an enormous volume of transactions in a short time if many are in error and have to be redone, or even worse escape detection and cause worse mischief downstream. Leadership creates an atmosphere in which everyone knows what should be done next and is not afraid to get on with it.

12. a. **Remove barriers that rob the...workers of their right to pride of workmanship. The responsibility of supervisors must be changed from sheer numbers to quality.**

    b. **Remove barriers that rob managers and professionals of the pride of workmanship. This means, *inter alia*, abolishment of the annual or merit rating and of management by objective.**

13. **Institute a vigorous program of education and self-improvement.**

This is an extension of the sixth point, but it gives us a chance to emphasize the transformation of the insurance enterprise about to occur due to new technology in the workplace. The fortunes of the company will depend on its ability to train workers up to professional status, to give them portable credentials, and the pride of workmanship necessary to produce quality work. As we saw earlier, many companies are well aware of this and are ready for the change.

14. **Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job.**

We should make a final point of our own. The central thrust of all this wisdom is the understanding, control, and reduction of variability in the **business** process. It is this variability, coupled to the inevitable volatility of the **insurance** process itself, which makes the Actuary's pricing and valuation responsibilities, and custody of the bottom line, more difficult. This is the most compelling reason why the Actuary should be a prime stakeholder and an enthusiastic participant in any TQM initiative.

I hope that my elliptical presentation of these points has left you with an appetite for more. The book, *Out of the Crisis* is more than recommended reading; it is a must, even though it was written explicitly for application in manufacturing. If you wait for someone to write the book on insurance, it will be too late.

Final Summation: The Baldrige Award

Even the Congress and President of the United States have recognized the importance of Quality Management to the future of American enterprise and, in 1987, instituted by law a most important examination and award system, the Malcolm Baldrige National Quality Award, to stimulate quality improvement and to recognize companies which have made significant progress toward achieving it. The award has generated enormous enthusiasm in the manufacturing community, a market less sheltered than our own; but the program is designed to apply to the service sector as well. In fact, some insurance companies have already set their sights on the award. I submit that those who win it will be the companies to watch in the future.

Examination for the award, in fact a valuable consulting service, is conducted by accredited examiners and addresses seven major categories, each consisting of several items. These are shown in the attached table as they appear in the *1990 Application Guidelines* (8).

Your inspection of this table will show that the implied definition of product quality does not extend as far as the one I proposed for P/C insurance, centering on the financial stability of the company itself. This is something that is unique to the financial sector and that our industry will have to handle for itself. Also not clear is the central role of the actuary in insurance quality improvement - nobody else has actuaries.

I would say that the Baldrige Award and the attendant Process is a long first step toward what needs to be achieved in our industry to put it in trim for increased competition. Beyond it lies

yet a profound challenge to the industry and the profession, rich rewards for those who meet it and a grim future for those who fail.

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(4) Kreps, Rodney, "Reinsurer Risk Loads from Marginal Surplus Requirements", *Proceedings of the Casualty Actuarial Society* LXXVII, 1990, p. 196.

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(6) An example is the Ernst & Young Navigator Series based in part on writings of James Martin and Clive Finklestein.

(7) Deming. *op. cit.* p. 23.

(8) National Institute of Standards and Technology. *Malcolm Baldrige National Quality Award: 1990 Application Guidelines.* (Gaithersburg, MD, 1990).

Malcolm Baldrige National Quality Award

1990 Examination Categories/Items

1.0 Leadership
- 1.1 *Senior Executive Leadership*
- 1.2 Quality Values
- 1.3 Management for Quality
- 1.4 Public Responsibility

2.0 Information and Analysis
- 2.1 Scope and Management of Quality Data and Information
- 2.2 Analysis of Quality Data and Information

3.0 Strategic Quality Planning
- 3.1 Strategic Quality Planning Process
- 3.2 Quality Leadership Indicators in Planning
- 3.3 Quality Priorities

4.0 Human Resource Utilization
- 4.1 Human Resource Management
- 4.2 Employee Involvement
- 4.3 Quality Education and Training
- 4.4 Employee Recognition and Performance Measurement
- 4.5 Employee Wellbeing and Morale

5.0 Quality Assurance of Products and Services
- 5.1 Design and Introduction of Quality Products and Services
- 5.2 Process and Quality Control
- 5.3 Continuous Improvement of Processes, Products and Services
- 5.4 Quality Assessment
- 5.5 Documentation
- 5.6 Quality Assurance, Quality Assessment and Quality Improvement of Support Services and Business Processes
- 5.7 Quality Assurance, Quality Assessment and Quality Improvement of Suppliers

6.0 Quality Results
- 6.1 Quality of Products and Services
- 6.2 Comparison of Quality Results
- 6.3 Business Process, Operational and Support Service Quality Improvement

7.0 Customer Satisfaction
- 7.1 Knowledge of Customer Requirements and Expectations
- 7.2 Customer Relationship Management
- 7.3 Customer Service Standards
- 7.4 Commitment to Customers
- 7.5 Complaint Resolution for Quality Improvement
- 7.6 Customer Satisfaction Determination
- 7.7 Customer Satisfaction Results
- 7.8 Customer Satisfaction Comparison