Measuring Performance at the Workplace

A Time to Rethink

Dr. Frank Wolf

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MEASURING PERFORMANCE AT THE WORKPLACE

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ABOUT THE AUTHOR

Following a corporate career in Industrial Engineering with global US corporations, Dr. Wolf taught in the week-end MBA program at the H. Wayne Huizenga School of Business and Entrepreneurship, at NSU in Ft Lauderdale, Florida, for more than sixteen years until 2016. The courses were quantitatative such as Operations Management, Supply Chain Management, Best Practices and Business History, Quantitative Modeling, and Business Strategy. Currently, he is in private practice as an arbitrator/mediator for FINRA (Financial Markets Regulatory Autority) in the USA and pursues research in Artificial Intelligence related to society and ethics, and Board memberships as a public service.

Society Memberships

AAAI Association for the Advancement of Artificial Intelligence
APICS American Production and Inventory Control Society
FINRA Financial Industry Regulatory Authority (US), arbitrator, mediator
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FOREWORD

There is an often- quoted business folk wisdom "*if you can't or won't measure it, you can't control it"*. Let us further define "it" to apply to what we do with respect to the Internet, all matters digital, in human resources and relations, manufacturing and services, governments and the meaningfulness of our work lives.

This book is about re-examining the way we measure commerce and with it, our personal work as well. We all want to be efficient, effective, sustainable, and profitable with good values to boot. This book aims to re-examine our organizational and personal work-life considering modern technologies and methods that make many established measurements obsolete. Organizational and individual goals are unique. Hence, this book does not propose a nearly *one-fits-all solution*, instead the effort is to raise the issue of measurement shortcomings and to have the reader be motivated to invent their own personal solution.

This book is written with several audiences in mind, among which are (a) commercial organizations in search for better outcomes when technologies change, (b) individual workers to find congruence between their own values and the work they do.

If the reader can seriously be motivated to at least re-examine all corporate and individual measurements currently applied to work vs. meeting the objective of work itself, then the mission of this book as been accomplished. The time to start is now!

INTRODUCTION

If you can't measure it, you can't manage it.

– Business folklore

Let us start with simple logic exercise in stating that continuous learning is a necessity for humanity to improve its condition. Next, we can know that learning has taken place as soon as behavior has changed because of new insights. To observe actual behavioral change, we must take measurements that correctly deal with the issue at hand.

The general definition of measurement is that it describes size, dimension, capacity, proportion or judgment of something. This definition is then applied to length, weight, volume, time, mathematics and physics, music and law, and endless other endeavors. We live in a culture that is obsessed with seeking precision, and we use numbers to find it. Once we have it, we feel in control. If the numbers are what we expect, then we feel good and reward ourselves for having achieved it. Such numbers can represent our cholesterol, a test score for a professional certificate, calories of the last lunch, return on investment, price-earnings ratio, and the latest customer satisfaction survey done over the Internet. Of these, length is the oldest measure and it arose out of the need of surveying land. In fact, one can argue that all measurements have arisen out of a physical need to have them in the first place. For example, an inch is a thumb, a foot is self-explanatory, a yard is a human pace, and a mile one thousand paces, or what the Romans called *milie passus*.

In this book, we are restricting ourselves to measurements used mostly in the conduct of business in the 21st Century. Ultimately, those numbers make our reality visible. While graphs, charts, indices, and ratios are all forms of numbers, just having them does not guarantee that those fully describe what we need to know for continuous improvement in our lives and that of the organizations we toil for. The book has a payoff in that the reader may be motivated to invent new measurements for his or her personal job productivity. The reader should explore how current measurements describe, or not, his or her life – work and know precisely what these are, understand the context in which these are used, and understand a little bit of where those measurements came from and be able to answer the question of their adequacy. All economic measurements have a target and that usually is a beneficiary, such as health, income, growth, education etc.

1 MANAGEMENT AND MEASUREMENTS

Tell me how you are going to measure me, and I will tell you how I will behave.

– Eli Goldratt

What do managers really do? If we accept the textbook definition, then managers engaged in:

Planning, Organizing, Leading, and Controlling.

This is allegedly true for public, private-, for profit, not for profit organizations and for government as well. However, not everybody will agree with this definition, because if one took an hourly log from a large sample of managers and categorized their efforts, one may find that this is not how most managers spend their time. In the context of this book on measurements, we consider

Knowing what to change, what to change to, and being able to make changes.

For our purposes, we accept the planning, organizing, leading and controlling definition and look at the need for measurements changes in each of these categories.

Before we do this, let us look at the ecosystem managers operate in; it is known as "Business Culture". Every organization has a unique culture that has evolved over time, sometimes over a long time and thus is deeply engrained and hard to change. Have you ever noticed how some services are rendered efficiently by cheerful people, and others by down-trodden grumpy types? In the first category workers relate to their employers' mission and are empowered to make decisions like given a refund on the spot. In the latter, the opposite is true. That in a nut shell is one example of business culture.

Culture often starts with the CEO. The CEO can be an abusive dictator or an enlightened visionary, or anything in between. Signs of a poor culture are:

1. Dominant CEO personality, abusive
2. Arrogance in leadership
3. Silo-thinking
4. An ambition that exceeds the plausible
5. Misaligned incentives, such as a large distance between CEO compensation and lowest ranked worker
6. Ethics compromises, profit v quality.

There is no number between 0 and 100 to measure business culture. However, you can get an understanding of this issue by, for example:

1. Go mystery shopping relative to the products and services in question
2. Talk to the lowest ranking front-line worker
3. Engage a star performer away from their supervisors
4. Follow the paper work of customer complaints
5. Review litigation history with respect to ethics, who blinked first and why?

Armed with such information it is not difficult to come up with an assessment of how well a firms' culture is aligned with its strategy.

Planning

Planning involves searching for, and then identifying, the appropriate goals for an organization. How to get from here to there is a forward-looking activity called "strategizing". We do this in the belief that we can influence our own future, but we cannot leave this to chance because: "if you don't know where you are going, any road will take you there." Following a strategy is executing a cluster of decisions relative to the goals we are pursuing.

So, how does one measure planning activities?

- Time in hours, day, weeks and years, applied to project deadlines and milestones.
- Resources, dollars, people skills, service capacity as in ability to deliver a service over a period.
- Attainment of a quantifiable goal or planned steps leading to it.

For example, XYZ Corporation follows the strategy of being the low- cost producer in each market, and for this to actually happen, XYZ has to increase productivity, which is equivalent to saying it has to produce more with less. To measure productivity, we look at the ratio of output to input. It is not too difficult to understand that an increasing positive number over time means we are producing more with less, and that means we are a lower cost producer.

$$\text{Productivity} = (\text{Output}) / (\text{Input}) > 1$$

Now let's replace "XYZ Corporation" with "Mr. or Ms. XYZ" and observe the same principles in operation?

Organizing

Managers organize themselves in to execute a project, and we give it structure by determining who does what, and when and how. Ultimately, the aim is to have deliverables that a situation calls for.

- If we organize ourselves around a product, then our focus may be on raw materials, engineering and product design, product marketing, manufacturing and distribution.
- If we organize ourselves around a geographic market, we may think of markets such as the European Union, South America, etc.
- If we organize ourselves around the market place, we focus on various quantifiable needs of clients in markets such as government, textiles, automobiles, etc.

The term *organizational structure* refers to the reporting relationship to accomplish tasks and to the motivation for its members to do those tasks well.

The measurements we choose must meet the needs of managing a product, or a marketplace or geography. In the case of product measurements, one may think of meeting quality standards related to appearance, durability, functional excellence and original specifications. Quality programs like Six Sigma try to achieve near zero defect rate, or 1 in 3.4 per million, by measuring nearly everything continuously. In the case of market metrics, segmenting large customers from small customers, and government from commercial clients, may direct management to be properly focused on each segment with respect to profitability and client needs. In the case of geography, the need for designing the proper measurements may be found in complying with international trade agreements, standards for safety, culture, and packaging and marketing.

Leading

Leading involves the clear articulation of an organizational vision and energizing an organization to follow in that path. A leader encourages participants into an important level of performance and demands organizational commitment to follow that vision. Business leaders often have charisma, charm, influence, persuasion, and splendid communication skills to turn participants into passionate followers. Leaders come in all levels of merit, ranging from Mother Theresa to Joseph Stalin. In business, the leadership principles come in the form of a carefully worded corporate Vision Statement. These statements define who we are, what we do, for whom we do it, and why we are better than competitors in our field. Power is the ability to execute and is a key attribute to leadership. Power is executed by:

- Being in the position to dispense rewards in the form of promotions and salary increases (e.g., human resources chief).
- Being able to make or negotiate the rules and enforce their execution. In military leadership, this may be a necessity by the nature of their objectives, executed by commanding officers.
- Being an expert in a critical skill, like Werner von Braun in rocketry.
- Being in the key position to make decisions, or being the major shareholder, like Sumner Redstone of Viacom or Bill Gates at Microsoft, or Musk of Teslar.

Measurements for leadership are not all that precise. A common term used is "leadership effectiveness," which measure is usually an assessment tool. That tool is a psychographic scale derived from survey questions and easily observable characteristics. When good leaders prevail, the results can be remarkable, see Steve Jobs of Apple: Conversely, some leaders fail, in several cases even criminally.

- Leadership style; like the day-to-day actions, by which one can observe the leaders' emotional intelligence, like empathy, awareness, and handling of personal relationships.
- Leadership potential, like stress tolerance and treatment of fellow workers.
- Leadership values such as ethics, being an example for others to follow, aspirations, delegation of work and team spirit.

How would you assess your leadership potential, or that of your boss? why would you want to be a leader? Is not being a leader, that is a follower, OK?

Controlling

Controlling means critical evaluations of performance, usually on a continuing basis. If we want to control quality, we may look at control charts to observe a variable move within control limits over time. If we want to control the use of funds against a budget plan, we look at spending year to date. What all control systems have in common is *feedback*; for example, we receive an observation from the field and make appropriate adjustments to keep our effort on the right path.

We also need to consider the concepts of effectiveness and efficiency as control measures.

Effectiveness measures the appropriateness of the goal we are pursuing. For example, for McDonalds to introduce a breakfast service is effective because the meal lends itself to fast food service, there is a market for it, and the facilities are already in place. The effectiveness measure always pertains to the purpose of the organization itself.

Efficiency defines how productively we are in doing our work. We want to use as little as possible of labor, of raw material and time to do our work; in fact, we want to be productive, which stated earlier is defined as the ratio of output to input. In summary:

- Efficiency measurements for labor refer to cost per hour, skill level, and availability.
- Efficiency measurements for raw material can include its costs to buy and store, sustainability, its future cost, and inventory cost.
- Efficiency with respect to services is accomplishes something in the best possible manner.

Case 1: The Need to Invent Your Own Measurement

A small manufacturing company (<50 employees) operates under one roof in an industrial park. James oversees sales, and Charley is head of production. The company has a few very large clients who pay their bills in 60 days or more. It also has many small clients who are conscientious with respect to their financial obligations and pay 30 days of invoice. Christmas bonus payments are just three months from now, but Charley and James have a problem!

Charley's personal performance is evaluated by efficiency, that is # units produced per period, $-cost per hour and per unit, and standard cost. Standard cost in this case is defined as the best cost performance the plant ever achieved, measured by product cost and machine utilization. Machine utilization is the productive time of a machine, as compared to time not in use. Charley instinctively pushes for taking care of the largest customers first, because that implies he has long production runs. Long production runs have no set-up time

between jobs, in other words, high machine utilization, all of which makes his numbers favor a large bonus.

James' performance is a function of customer satisfaction. Long production runs favor large clients and result in small customers having to wait and, thus being unhappy. Short production runs permit small clients to receive timely deliveries. James' performance measurements come from customer satisfaction surveys in which large and small customer responses carry equal weight.

The question is to get to the root of the problem, whom would you favor or what measurement would you invent? Efficiency is about doing things right, while effectiveness is about doing the right thing.

Hint: Consider that the objective of the business is to make money. That is the whole business, not Charley or James alone. Sub-optimization in other words does not work. Consider "throughput" as a good measure! Let "throughput" be defined as all that which reaches the invoice stage as early as possible and with that payments.

Chapter 1 Questions

1. Presume you are a young person and wonder about life's work and a suitable career plan; asking yourself "is what I am doing today that is helpful to what I envision to do later in life"? The same applies to a middle-aged person because it is unlikely that one will be requiring today's skills when approach retirement. Let's say you are about 65 years old and face the good prospect of living another 25 + years, how can you remain relevant and healthy and measure that?
2. You would like to become a leader in your field. Apart from aspiring to have perks, also consider the responsibility like custodianship of assets and other peoples' money (OPM). How would you like to be judged? Discuss!
3. Can you articulate your current job objectives, and how these are congruent with the enterprise you work for? How do those objectives relate to your personal ones, like becoming financially independent? In answering those questions, what measurements come to mind?

2 CORPORATE STAFF FUNCTIONS

Good counselors lack no clients.

– Shakespeare

Corporate offices perform functions that are quite different from those of the production floors, laboratories, government offices, or non-profit organizations. Departments like human resources, information technology, finance, marketing, and legal services do not produce a physical product. In fact, they are called *functions*. In this chapter, we will investigate what these departments do, why they do it, and how they can be measured, and then ask ourselves whether the chosen measurements meet our needs? Below is an example of the elevated role of a Human Resources (HR) manager.

Time Line	Title	Function	Measure What	Measure Why
< 1980	Personnel Manager	Payroll. Benefits, Recruitment	Pay scale, skills Adherence to methods and procedures	Conformance Motivation control
1980–2000	VP. HR	Plus, outsourcing Contain benefits cost Appraisals, feedback Career paths	Plus, labor relations Compliance Labor Negotiations Employee health	Plus, Cost Global competition regulation
2000>	Chief	Plus corp. strategy Policy, succession plan Future skill needs	Plus, innovation training	Plus, technology, competition

Elaborating on the "Measure what" column, everybody knows that money motivates, but the relationship between amounts paid and actual performance are complex. We know that skilled workers like certified public accountants and engineers earn more money than workers who lack degrees and certification. Many corporations have a scale for salary payments recognizing skill levels and seniority. The gap between highest and lowest paid workers is a popular social theme. If it is too large, a revolution may come! Salaried v hourly compensation used to imply a class difference. Now that we life in a "gig" society in which free-lancers, remote workers and highly paid experts thrive.

For airline crewmembers pay scale is a function of accumulated flight hours, FAA licenses, training, complexity of aircraft, etc. For a US government worker, there are about 18 pay grades ranging from entry level to the top three being executive levels. Within these grades are "steps" that allow workers to be promoted in small increments. Other factors influencing pay scales are industry standards and geographic differences.

Those differences develop naturally resulting from demand and supply. Innovation is harder to measure, but here is an idea: Take the sales of any relatively large public company and determine how much of that revenue is the result of new products, that is, those introduced in the last five years? If the answer is zero, those folks are probably not very innovative. On the other hand, if that number is 40 percent, it can be a sign of healthy ongoing renewal.

The overarching goal of measurements in human resources is to meet the corporations' strategic objectives, today and in the future. Today HR leadership is a policy level undertaking and heavily dependent upon good measurements. These measurements must address strategy execution. For example, if a corporation is adopting a modern technology like digitalization of transactions, then it must assure that the right worker skills are in place, in the right place and at the right time. The measurement parameters are skill, time, number of people, and money, among others.

Information Technology

Information Technology (IT) is how we acquire, organize, store, arrange and transmit information. Data and information are not the same thing. Data is just a point of observation, like dollar sales last month; it is not summarized or analyzed. For example, a store manager wonders why product A occupies 4 ft of store shelf, while competing product B occupies only 2 feet. For products A and B, the store manager knows three items of data such as (a) the # of units sold per week, (b) the number of feet of shelf space dedicated to each, and (c) the profit per unit. Turning those pieces of data into useful information, the manager computes the profit per ft/week. Stores really sell access to products more than any product. Here, ownership of product often changes at the checkout counter. The game changing power of measurements in this example is that the market power has shifted from the manufacturer to the retailer.

We may measure IT in terms of quality, timeliness, completeness, and relevance.

1. ***Quality:*** Quality of information refers to accuracy and reliability. Inaccurate information leads to bad decisions, and if not reliable, customers will not use it. The nuclear meltdown of Three Mile Island in 1970 was caused by controlling computers indicating sufficiency in cooling water, when in fact that was not so.
2. ***Timeliness:*** This concept refers to the attribute of whether information is available when needed. Living in a world of real time access to data, we find that the airlines review ticket prices frequently, all based on demand and supply. Airlines and hotels make overbooking decisions based on the probability of no-shows. A technique called Yield Management balances the probability of no-shows with limits of overbooking.

3. ***Completeness:*** This concept implies that managers shall have all relevant information at their fingertips to make good decisions. This condition rarely exists, and in addition, one hardly knows what "all information" really means. Second, if all information could be presented, it may be too much to handle for our finite sized brains. Third, we don't have enough time to analyze all options before a decision has to be made. *Unknowns* in business are called risk factors, which also can be measured. Stress testing banks for maintaining adequate capital under adverse market conditions to make sure the local ATM keeps working, is an example of this.
4. ***Relevance:*** This measure answers the question of whether the information is useful and necessary. On a construction project with a given budget one need only consider those tasks that meet given constraints, are on the critical path and have no slack.

Marketing

In marketing, we deal with measurements that address efficiency and effectiveness of sales. These two concepts tell us how productively our resources are being used (**efficiency**), and the appropriateness of the goal the enterprise has in mind, (**effectiveness**).

Efficiency measurements focus on cost and profits by product line, geographic region, market segment, customer type, order size, and changes that have occurred over time. This is the dicing and slicing that analysts do to understand what is moving and what is not. We can do this by simply sorting raw data. A marketing measurement can be a composite of many other measurements. Take the *experience curve*, for example, which is closely related to the *learning curve*.

In the experience curve case, *cost* per unit falls a certain percentage point each time cumulative production doubles. For this to happen, sales obviously must double too. In the learning curve case, we reduce production *time* with successive repeats of a task. In other words, when you do something repeatedly you will find that it gets easier and takes less time with each attempt; not forever but up to a point. The learning curve applies equally well to individual – and organization learning.

For marketing purposes, we now can surmise the following logical sequence of events: (1) that a high-volume producer can have a low marginal cost due to experience, (2) which in turn influences the product price, and (3) the lowest price leads to higher market share and the best ROI for that producer. This is an example in which five measurements are serially linked, namely unit cost, production volume, price, market share, and ROI. The final measurement, ROI and market share, defines the goal of the business, why we take risk; and of course, measurements.

Effectiveness measurements answer the question of appropriateness of the goals. A goal that addresses the corporate mission or vision statement can be considered appropriate. A poorly stated marketing goal would be "let's find customers to buy our stuff". A better expression is to aim for 5 percent market share, based on attributes customers really want. Focus groups can be employed to measure attitude towards a new product, for example. Surveys by mail or the Internet similarly research attitudes towards products and services.

Measurements to justify the costs of television or print advertising are called impressions (viewings). The theory is that more impressions are better than are fewer impressions. For example, consider the cost to advertise on a Super Bowl game vs. a local football event. Marketers will carefully study their potential audience with respect to age and purchasing power, geography, to tailor a good fit for the pitch. In Internet marketing, clicks and banner ads have similar interpretations. Marketing is as much an art as it is a science. Election surveys are a function of who asks the questions and selects the audience, and there are some noteworthy US presidential election forecast failures on record, 1945 and 2016 for example.

Professional Services

Under the professional services rubric we include corporate law departments, medical and first aid departments, research and development laboratories, public relations, planners and the like. These folks may be hard to measure because they don't produce anything that is countable. However, that does not mean they are unimportant, because one can and should ask them the following questions: are they adding value, and how can we show that?

Most likely, a corporate attorney practices a specialty such as litigation, labor law, intellectual property, patents, etc. Measurements for such intangibles are KPIs, that is, key performance indicators. KPIs measure how well we service customers, what level of service we deliver and the impact on external clients, and efficiency. The KPIs are values that often range from 1–5 on a point scale, and they usually come from survey instruments.

In benchmarking, we compare ourselves to highly regarded peers. How well does our law department, for example, stack up against the best in the industry? An Electronics Industry survey determined that firms employ about eight attorneys for every billion dollars of revenue. To presume that employing fewer attorneys is better without first seeking additional information, is not necessarily sufficient. If one accepts 8/ $1B as a standard and finds deviation from that scale, then asking additional questions is called for. New benchmarks and KPIs can be invented to meet a new need for metrics. In doing so, one should keep in mind that those KPIs should be easy to understand and used by all, and they should not be self-serving. If a KPI is a ratio, it is best to let the denominator be a factor that reflects

operations, rather than one that reflects market performance. For example, ROA (return on assets) equals net income/assets. The denominator "assets" reflects internal operations. A different denominator, such as shareholder return, is not appropriate because it is subject to exogenous market-based considerations.

"Big Data" and Machine Learning (ML)

If we look around the traditional company offices and study what is being measured, and how it is being measured, we see obligatory efforts focused on daily, weekly, or monthly status data to feed into quarterly reports for public consumption and compliance. The metrics may pertain to revenue, margins, productivity and jobs.

The central idea behind Big Data, as it is called now, is that data will soon be captured in all forms that are digital, text, web blogs, music, pictures, video, and transaction data. The technologies so employed are data mining and cloud computing among others. Just consider Wal-Mart, it processes 1 million store transactions every business hour. Analytics applied to these data produce better forecasts, optimize operations by minimizing waste and cost, maximizing profit, plus improve quality, and render good customer service in terms of price and physical availability. These data may also very soon be publicly available and cheap. For example, new metrics will enable retailers to segment their customers into ever-finer slices and to serve them better through understanding their buying behavior. Retailers may then better serve a niche market and entrepreneurs capitalize on such discoveries.

Big Data is now a term in the business literature and it evokes the image of Big Brother. As a thinking exercise, consider the following questions:

1. Would near instant knowledge of all aspects of your business improve management decision making? Hint: Consider a managers' possible emotional reaction to a data spike, high or low! For further reading, investigate the subject of Industrial Dynamics.
2. In how many ways would a fashion house benefit if they could figure out what teen agers around the world consider to be cool clothes right now?
3. Since we are facing a Big Data skills shortage, what should a Human Resource department do right now to be prepared for a coming skill-shortage? List the skill sets needed in your company, now and through next few years!

Case 2 Mini case on Human Resources on-boarding

New employee orientation in large companies, and small ones, is a classic staff function of ever increasing necessity. Picture yourself working for a global IT provider that has successfully survived economic peaks and troughs. Now is peak time and the company is expecting several thousand new employees to join their ranks within the next 12 months.

Your task is to meet the following objectives

- Make new workers feel engaged and accepted from day One onward.
- Inform new workers on company history, culture and direction in a two-day training session.
- Create a company support network beyond the next cubicle.
- Invest in talent retention in the form of compensation, promotions, training etc.
- Get professional staff to voluntarily conduct training sessions, in which case you must train the trainers.

1. Suppose you need to measure leadership buy-in for this program. How would you do this?
2. You need post-course feedback from attendees and track it linked to the trainer. How would you do this, a survey perhaps? What questions to ask?
3. In training the volunteer trainers, how would you express appreciation for their effort and balance that with their regular work?

Chapter 2 Questions:

1. If you are not solely motivated by money, what other measurements would you suggest for yourself in your business? Investigate the Human Development Index (HDI from UNDP) and see if there is something transferable to your firm?
2. In working to achieve your long-term goals in life, have you ever considered intermediate steps? Let's call them KPIs, do you know what they are, should be, or when you have reached them? What experience must I get today to do X five years from now?
3. Do you have a career or business role model? If so, do those role models have a common denominator such as leadership qualities, diversified experiences, speak foreign languages, members of privileged families?

3 ON SERVICES

Design is not what it looks like and feels like, design is how it works.

– Steve Jobs

In this chapter, we address measurements most suitable for the Service sector, which is about ⅔ of GDP of the U.S. economy. In Chapter 4 we will focus on measurements that are more suitable for the Manufacturing sector, fully recognizing that both manufacturing – and service sectors share common approaches to measuring. For example, assume a company makes vacuum cleaners. That is, it creates a product, sells it and transfers ownership for a consideration of money. However, if that vacuum cleaner comes with a performance warranty and an 800-help telephone line, that part is clearly Service and the two are hard to separate. In fact, there is a direct relationship between the quality of the product and the cost of the service warranty. Generally, the better the quality of the product, the lower will be the cost of the warranty.

The Service sector covers retail, health, transportation and many others. Service can be characterized by:

1) the fact that in services both the provider and the customers share in the act of rendering services, and
2) that the services are instantly consumed. Services are mostly intangible, which means that one cannot pick them up or drop them on the floor.

The assessment of Services takes place during the delivery process with an emphasis on the Service Gap. The Service Gap measures the perception of the service received with the desired expectation by the client. Gap-analysis is done by surveys immediately following a transaction. Any service provider aims to narrow that "gap" and to find remedies through market research, better communication between management and front-line workers to establish target values for future performance standards. One popular instrument is a multi-item scale called SERVQUAL. It addresses reliability, responsiveness, assurance, empathy and tangibles.

In this chapter, we will shine some light on the measurement approaches relative to quality and sustainability.

Service Quality

Great business thinkers, now called *thought leaders*, have pondered the question of what constitutes quality and how to measure it for over one hundred years, and they all have come up with different answers. The early work of Walter Shewardt, Edward Deming, Joseph Juran, Philip Crosby and Armand Feigenbaum are covered in Chapter 4.

The attributes of service quality are reliability, responsiveness, caring for the customer, and the physical appearance of the place at which services are performed, which is called the Servicescape. For example, a management "walk-through audit" can pinpoint worn carpets and bad wall paint, all of which affects the quality perception in hospitality establishments. Quality practices in the 21st Century have come a long way, dominated by comprehensive programs like Six Sigma and ISO. The name Six Sigma implies a quality standard covered by six standard deviations under a normal curve, or about four errors in one million opportunities, which most likely nobody has ever achieved. The Six Sigma process is defined as designing, measuring, analyzing, improving, and controlling, or DMAIC. In other words, it's the execution of this process that leads to quality. Workers so trained in this process are the advocates of product and service quality in major corporations worldwide. Their job titles are Black Belt or Master Black Belt and they are certified for this work. The measuring portion of Six Sigma includes standard techniques like:

- Flow charts to visually connect inputs into process, and process to outputs, and then to customers. Flow charts are graphics to explain and improve a process.
- Run charts to show quality measurements taken at regular intervals over time, like meeting the service response time in a busy restaurant. (restrooms).
- Pareto charts reveal common 80:20 relationships, in which many quality variations are linked to only a few potential causes. Pareto was an Italian economist who discovered that roughly 20% of Italy's population accounts for 80% of the country's income. The approximate 80:20 ratio is evident in many other natural situations.
- Check sheets, which are used in small volume data collection. An example may be counting how many times pieces of mail are undeliverable due to a wrong Zip Code in a mass mailing to solicit a new credit card.
- Cause-and-Effect diagrams, which are visual tools for identifying potential problems in a process. They are also called Fishbone Diagrams, because the diagram looks like that discussed in Chapter 7.
- Opportunity flow diagrams that separate value-adding activities from those that don't add value, and thereby identify opportunities for waste reduction. For example, a retail inventory may not add value, but gift wrapping may.
- Control charts measure process variations over time. They have a statistically computed upper and lower control limit into which range all observations must

fit to be considered superior quality. An example may be a call-center service time goal between 2 and 5 minutes.

- Poka Yoki is a Japanese expression that means fool proofing, which expression has entered the Western business lexicon. It is a simple quality concept that makes mistakes nearly impossible, by design. Two electrical connectors that should never be connected, are designed to not fit, for example.
- Six Sigma techniques are applicable to both the service sector and operations sector, like hospital operations and assembly lines.
- ISO is an international quality standard that measures the process rather than the product. The implication is that if a company has an audited quality process using lots of measurements and data, then the product is probably all right too. The presumption is that an enterprise so certified *says what it does and does what it says.* ISO certifications serve the primary purpose of building trust among global trading partners. The program is administered by the Organization for International Standards. The word "*iso*" means *equal*, as in an isosceles equal sided triangle, implying an equal global trading platform. ISO 9000 series applies all kinds of business, while the ISO 14000 series address environmental issues such as resource reduction, recycling and others.

Sustainability

Sustainability is a popular subject in the current business literature. Before one can attempt to measure it, one must have a clear idea what it is. To overcome this hurdle, the following is a brief history of sustainability:

1. 1972, Club of Rome published *The Limits of Growth*. The Club is a global think tank, headquartered in Winterthur, Switzerland. The report addresses worldwide resource constraints linked to growth.
2. 1987, the United Nations published *Our Common Future,* which is also known as "Bruntland Report." It defines sustainability, paraphrased here, as *meeting the needs of our current generation, but not at the expense of the next generation.*
3. 1992, the United Nations sponsored the Earth Summit conference in Rio de Janeiro, and it resulted in "Agenda 21," which is a blue print for sustainable development. The Kyoto Agreement (1997) followed, which addressed carbon emission among global warming concerns, and instituted carbon pollution trading for companies to meet national limits.

For our discussion here, we accept the Bruntland definition of sustainability. Table 3.1 illustrated different measurement approaches to achieve a certifiable level of sustainability in different service industries: Organizational motivation for doing this is to show corporate citizenship, to promote good will, to keep and win customers and yes, to save money and make profit because of resource savings.

Sector/Category	*Sector Definition*	*Sustainability Ideas*	*Example Enterprise*
22/Utilities	Electric power, water, natural gas, steam and sewage	Conservation, resource reduction, teaching	Con Edition
42/Wholesale Trade	Merchandize without product transformation, agriculture, mining, publishing	None	Kole Import Consortium
44–45/Retail Trade	Last step in consumption, no product transformation, distribution and stores	Eco-labeling, index development, getting greener	Walmart, Amazon
48–49/Warehousing and Transportation	Passenger and cargo services and support functions	Substitute jet fuel and green warehousing	Continental/United

Sector/Category	*Sector Definition*	*Sustainability Ideas*	*Example Enterprise*
51/Information	Production and distribution of information products, includes music and culture	Financial stability, technology, resource reduction, teaching	Harvard, MIT, Chicago Orchestra
52/Finance, Insurance	Fund transactions	Environmental, social	The Hartford
54/Professional and scientific	Services for others, law, accounting, veterinary	Communication, benchmarking	Deloitte, IEEE
61/Education	Instruction from elementary school to graduate degree	Environment, social, financial, activism	U of California, New York City
62/Health	Health services production for individuals and groups	LEEDS building, Triple Bottom Line, farmer markets,	Cleveland Clinic, Kaiser Permanente
71/Arts and Entertainment	Production-Promotion, participation in cultural events	Charitable giving	Metropolitan Opera New York, Time-Warner
72/Accommodation and Food	Hotel, lodging, food consumption	LEED and Green Seal, ethics, conflict resolution	Hilton, Omni Bretton Woods, Eat N Park Hospitality
92/Public Administration	Federal, State and Local legislative bodies, judicial	Resource reduction	EPA Vermont

Table 3.1 Selected US Service Sector Approaches to Sustainability

Concurrent with the public sustainability debate come proposed modifications of public accounting to improve transparency. This new accounting concept is called the *Triple Bottom Line,* which covers profit, people and planet, all of which cry out for improved measurements. The subject is too new for there to be any sort of universal agreement on measurements, but the Triple Bottom Line Sustainability Measurements Table 3.2 is an attempt to come to grips with the issue. These measurements define sustainability as a moving target of continuously getting better, rather than a fixed point to be achieved.

Domain	*Purpose*	*Benchmark in Year0 Actual Value*	*Measurement 1*	*Measurement 2*
Profit	Solvency	Current ratio current assets/current liabilities	%change from Last year,+	%change From $Year_0$
	Profit	Net profit margin Net income/net operating rev.	%change from Last year, +	%change From $Year_0$
	Leverage	Debt ratio Total debt/total assets	%change from Last year, -	%change From $Year_0$
	Market value	PE ratio Price per share/earnings	%change from Last year, +	%change From $Year_0$
	Growth	Δ S(sales) = $S_s - S_0$	%change from Last year, +	%change From $Year_0$
People	wages	Lowest annual wage as a percent of the official poverty level	%change from Last year, +	%change From $Year_0$
	Health	Percent of full and part-time employees covered by insurance	%change from Last year, +	%change From $Year_0$
	Learning	Corporate training expense, incl. tuition refund, as a % of revenue	%change from Last year, +	%change From $Year_0$
	Equity	Lowest annual employee personal total income, as a % of highest, including bonus payments	%change from Last year, -	%change From $Year_0$
	Society	Financial support for non-PAC Community projects, % of net profit	%change from Last year, +	%change From $Year_0$
Planet	CO_2	Tons emitted in operations	%change from Last year, -	%change From $Year_0$
	H_2O	Gal/year water used in operations	%change from Last year +	%change From $Year_0$
	H_2O	Gal/year water reclaimed, recycled	%change from Last year, +	%change From $Year_0$

Domain	*Purpose*	*Benchmark in Year0 Actual Value*	*Measurement 1*	*Measurement 2*
	Energy	∑(kwh, fleet gasoline, diesel, heating Oil, coal etc.) used, in BTUs	%change from Last year, -	%change From $Year_0$
	Remediation, Dump site clean- up, wetland restoration	Investments in alternative energy count towards carbon neutrality, est. BTU value, as % of current use, land-use	%change from Last year, +	%change From $Year_0$

Table 3.2 – Triple Bottom Line Sustainability
Ref: Wolf (2013)

While those suggested measurements do not provide a single number of what is either perfect or lagging, they do identify what works and what needs attention.

Measuring Problem	*Approach*	*Measure*
Hospital Waiting Room	Segment patients by health issue	Staff skill, capacity, office layout, time internal
Ideal office location	Minimize travel distance and cost from service source to client	Client location, distance, time coordinate point on map
Airline no-shows	Balance overbooking with probability and cost of no-shows	A technique called Yield Management
Compare self to industry standard	Benchmarking	5-point scale ranging from strong to weak
The Service encounter	Customer meets service provider. Service Blueprinting	Process gaps, probability of errors, bottlenecks, resources, waiting time
waiting lines	Queuing Theory provides simple formulae for the state the line is in.	Arrival rate λ and service rate μ for each service station
Social Media	To have a clear objective for understanding customer/ company interaction	#pass-on, chatter-traffic, buys, #subscriber attitude
Project control-performance	Microsoft PROJECT software plus other software vendors	Cost, time, resource availability, constraints

Table 3.3 Measuring Services

Measuring Social Media – a mini-case

Picture yourself working for a large family owned restaurant with several establishments in one State and serving a community, rather than having transient clients. The owner, your boss, not only graduated from a culinary institute, but also has a degree in business management and is a savvy businessperson. The restaurants' appeal is the freshness of its locally procured food that growers deliver daily, fresh milk comes in recyclable containers. Herbs grow on the restaurants' rooftops and leafy greens are hydroponically grown on site in some cases. In other words, the place is "sustainable," and that appeals to its patrons which differentiates this restaurant from the competition.

Your boss asks you about social media, which you understand to mean an ongoing web-and mobile technology – based dialogue, with customers often creating the content. The question is whether social media could increase traffic for the restaurants. Since such a project would cost real money, your boss also wants a measurement of success. He speaks of ROI, which you know stands for Return on Investment and is means:

$$\text{ROI} = \frac{\text{(Gains from investments) - (Cost of Investments)}}{\text{(Cost of Investment)}}$$

His last words before leaving were "stop by my office tomorrow afternoon and let me know what your approach would be!"

Your head is spinning with ideas relative to search engine optimization (SEO), segmentation of diners by age, income and education if possible, cost of monitoring this project, and especially on coming up with an ROI based on ideas, rather than numbers. Your initial sketch looks like this:

Assuming that this restaurant chain has about US $6 million revenue per year, and this is a 1-year project, you may attempt the following exercise:

1. Elaborate on the additional cost and benefit from social media as defined:
   a. List the specific benefits from current clients, new clients reached by social media.
   b. List the specific costs of content, campaign, and new engagements.

2. Make reasonable dollar assumptions
   a. Value from revenue gained, better margin, cost avoidance, etc.
   b. Sum of costs $\sum$ (all costs)

3. Compute a hypothetical Social Media ROI

Chapter 3 – Questions

1. Can you describe the service you perform on your current job? Who are your internal or external clients, what do you do for those clients, what do the clients expect; and then can you define "your" service gap?
2. In order to narrow "your service gap", what would you specifically have to do and how much would that cost? Does this have an ROI?
3. Can you make a case and propose a Service improvement program for your company that both makes clients more content and is profitable in the long run, and can you make that point with real numbers?

4 WORKPLACE MEASUREMENTS IN MANUFACTURING OPERATIONS

The most efficient way to produce anything is to bring together under one management as many as possible of the activities needed to turn out the product.

– Peter Drucker

In the chapter 3 on Service Sector discussion, we focused mostly on intangibles; but in the Manufacturing Sector we deal predominantly with things that are countable and defined as tangible. The distinction between the two are not always that clear; as mentioned earlier, because a product like a refrigerator (tangible) may come with a maintenance agreement to make it more attractive to the buyer, which agreement itself is pure service and thus intangible. To put it simply: the measurement objectives in manufacturing are intended to deliver "fast, cheap and good," whatever the output is. The term "good" here refers to product quality about which definition there is also no absolute agreement.

Flow, does it matter?

One way to achieve fast, cheap plus quality is to pay attention to flow, that is, how things move through a process from raw material to finished product. The reader may have noticed that pre-1950s factory buildings tended to have many floors, while contemporary ones are large and level. The cost of moving material up and down has something to do with that.

Just-In-Time (JIT), is the best flow management approach for mass production. It meets the fast, cheap, quality criterion. Rather than *pushing* product out of the factory, JIT *pulls.* If there is no demand, there is no production and hence no inventory accumulation. Inventory for purposes other than buffering or hedging is a waste! JIT combines the genius of Henry Ford's assembly lines and U.S. supermarkets into a new manufacturing philosophy attributed to Toyota Motor Company. As the name implies, parts arrive just in time as needed. But JIT is also a philosophy and hence much more than meets the eye. In-process inventory is constrained by *Kanban,* (a measure*)* which can take the form of painted squares on the factory floor, or buckets limiting size. Size and location of *Kanban* are computed to optimize smooth flow. JIT is a cultural phenomenon that relies on worker teams to achieve quality and competitive advantage. Its measurement focus is on waste reduction, smooth flow, low inventory, among others.

All work is project-work

Broadly speaking, any project is the sum of related work steps, which, when completed in sequence, produce a major output such as a building. A project is unique, and a one-time event. Projects require measurements for planning and controlling resources such as workers, equipment and material. To measure progress towards the goal of completion, managers use Gantt charts, flow charts, a bit of statistics and probability theory, etc. for estimating the critical path of events through the project. The critical path method (CPM) computes the longest path through a network to complete the project. The longest possible path defines the project duration, while the remaining activities have slack. For managing a large project like assembling an oil-drilling platform, software packages like *Microsoft Project* contain all the essential measurement and decision-making components. These metrics pertain to cost, timing and resource availability, among others.

Financial Operations, show me the money

Every-day corporate life is wrapped up in measuring money in some way. Over the decades, standard measurements have evolved which pretty much define the economic game. Take items like variable cost, fixed cost, sunk cost, and opportunity costs for example. As the names imply, variable costs are proportional to volume of production, while fixed costs are constants and may represent rent, interest payments etc. Sunk costs represent past investments that most likely have no recovery value today, while opportunity cost means a foregone benefit of choices not taken. Common financial ratios have been introduced in Table 3.2.

A substantial number financial measurement deal with the time value of money, the idea that a dollar today is worth more than a dollar next year at this time, modified by an interest rate. With this basic idea one can compute the net present value of a future stream of expenses and income, or the value of an annuity, or breakeven point of an investment. Another group of measurements are financial indices that are designed to mimic the market behavior, or an index like "personal ability to pay" which infers meaning from data like age, gender, years in residence, marital status, number of years in current job. See Chapter 7 for an introduction to indices.

Concept	Description
Business Process Reengineering. (BPR)	Work processes can and do become stale over time. The concept is to restart with a radical innovative approach to get a given task done and achieve dramatic results in productivity gains. (See chapter 2 on productivity). Has produced mixed results.
Surveys	To capture manufacturing performance perceptions via mail, email, or face-to-face, as viewed from clients. A lot depends on who asks the question and who answers.
Five Forces Model	The model tries to measure the market power of suppliers, customers, new entrants, rivals and product substitution (Creative Destruction). Approach can be expanded to include new factors.
Balanced Score Card	This is a model on how a company meets stakeholder needs such as stockholders for dividends, employees for careers, investors for capital gains, civil society for cultural participation, customers for quality and price, etc.
Process Dashboard	A collection of company-wide performance measures from internal and external sources and centrally displayed in real time via software.

Table 4.1 New Measurement Concepts in Operations

Forecasting

One can accurately predict the mean time-to-failure (MTF) of a light bulb based on its design, how it was built and how it is being used. One may even extend the availability of light with redundancy of light bulbs. Many of us casually accept the rule that the past is likely to repeat itself by saying: we will probably sell the same products at the same volume in the next three months as we did in the last three months. Forecasting is a measurement, because based on forecasts we decide to build factories, roads, hire people, buy materials, etc. Forecast methods can be either qualitative, that is leaning towards judgment, or quantitative, that is based on data and analytics. Forecasts are often wrong, yet everybody wants one of those?

Qualitative Forecasting Methods:

Delphi Method: Ask a panel of experts to forecast a future event about which there is no history, like predicting the probability that an innovative technology such as 3-D Printing will replace batch manufacture. Then tabulate the panel's responses that lead to new questions.

Repeat this process at least three times to arrive at a consensus about 3-D Printing replacing batch manufacturing. The method is named after The Oracle of Delphi.

Event Correlation: This method presumes that a future event will be like a past event. For example, the price of gasoline increases in the summer as it has most summers in the past. Or conversely, the increasing cost of owning a car in densely populated urban areas will lead to ride-share firms.

Historical Analogy: Presumes that growth of a new product will mimic a similar product in the past for which data exists. Example, the sales forecast for a new Italian cookbook, will display comparable sales pattern as an earlier Italian cookbook did in the same market.

Simple Quantitative Forecasting Methods:

Moving Average: This method applies to non-seasonal trends. It assumes that next months' sales will be the average of the last n-months sales. The computed value can be weighted where 0< w <1 if more recent observations are more valuable.

Exponential Smoothing: This methodology takes the error of the last forecast (actual-forecasted value) and then makes an appropriate adjustment to the next forecast.

Regression: Regression defines the relationship between 2 or more correlated variables, like beer sales and football games. It takes past observations and then fits a line through observed values in x-y coordinates. The result is a line in the form of $y = a + bx$, where "*b*" is the slope of the line and *"a*" the *y*-axis intercept. The mathematics is built into most spreadsheet programs like Excel.

In practice forecasting is often more complicated and mathematically advanced without necessarily adding to the accuracy. Simplicity implies a robust approach to the subject of measuring the future. Machine Learning, robotics, and artificial intelligence agents can lead to new insights and pattern recognition to make better predictions.

Distribution, Warehousing and simple supply chain metrics

A supply chain is a network of firms voluntarily linked via technology, information, physical resources and people, who are intent on efficiently moving product from their origin to the end customers. "United we stand, divided we fall", "one for all and all for one", are phases that come to mind in the ideal world. Enabled by e-commerce technologies such as enterprise resource software (ERP) and the Internet, digitalization and communications, supply chains are truly "systems" with information feedback and constraints. Systems, by definition, react to their surroundings' information signals, such as customer preference changes or supply disruptions due to earthquakes and labor unrest. Historically, Henry Ford was probably the first modern supply chain manager as he owned the process from iron ore mining to car dealerships. Today, such a concentration of power is not possible for a variety of reasons, money being only one. Currently, supply chains span the globe and are a huge business focused on collaboration, learning, and efficiencies to benefit the end consumer. Obvious measurement questions are these:

have deliveries been made on-time?
are the orders complete?
is the quality good?
is the customer happy and re-ordering?
are the invoices correct?

ERP (Enterprise Resource Planning) inventory management must address the whole chain collaboratively, rather than just one company. With each firm in the chain being independently owned and operated and possibly member of other supply chains, this is often difficult to achieve.

Given that the last stage in a supply chain contains the highest value in most cases, it may be prudent to hold most inventory in earlier stages, a process called "postponement." To have value accumulate at that stage may be prudent with respect to cost, but not so prudent with respect to customer response time. Product value at each stage of the chain, and time to reach customers, are metrics to shine some light on to promote rational decisions.

Inventory turnover is defined as (cost of goods sold)/(average aggregate inventory value); it is a measure of efficiency. It measures the number of times corporate inventory has been sold in a period. Standard guidelines vary by industry, for example a retail stores' number can be as high as 100, and for a manufacturing entity as low as 6 in twelve months.

Weeks of supply at hand = (average aggregate inventory value)/((cost of goods sold)*(52)), a useful measure when inventory is considered an investment rather than a hedge. A modern auto assembly plant operating under JIT however may open Monday morning with two hours of inventory at hand, which is intentionally super "lean" and presumes that the supply chain will start cranking output first thing in the morning for certain.

Supply chain velocity measures the elapsed time from raw material acquisition to end-product delivery. Like so many other aspects of life on this planet, increased process speed is considered good as it implies reduced cost. However, a making a good wine still takes its own time, or does it?

The last chapter on supply chain measurements is far from having been written; in fact, it is a wide-open research field influenced by M&A activities, natural disasters, digital communications, more collaboration, and more opportunistic behavior of supply chain partners.

Score	Objective	Metric	Management Target	Initiative
Financial	Pay bills promptly Visibility Trust	$ ratios	20% improvement	monthly review
Customers Satisfaction Responsiveness Order fulfillment	Loyalty	Repeat sales	Pass > 4:5	quarterly
Process bottlenecks	Smooth flow	Capacity Speed Constraint	Velocity increase	daily

Score	Objective	Metric	Management Target	Initiative
Learning Individual Organizational Digital records	Revenue from new products < 5 years old, dynamics	Percent automated	15 percent	quarterly
New products derived from customer needs, New methodologies to manufacture	Innovation, collaboration	Revenue from products < 5 years old	Long term increase	annually

Table 4.2 Supply Chain Score Card

Manufacturing Quality, what exactly is it?

The early 20th Century works of Walter Shewardt, Edward Deming, Joseph Juran, Philip Corsby and Armand Feigenbaum, all pondered the question of what quality really means; they all had a tangible product in mind in tackling the issue.

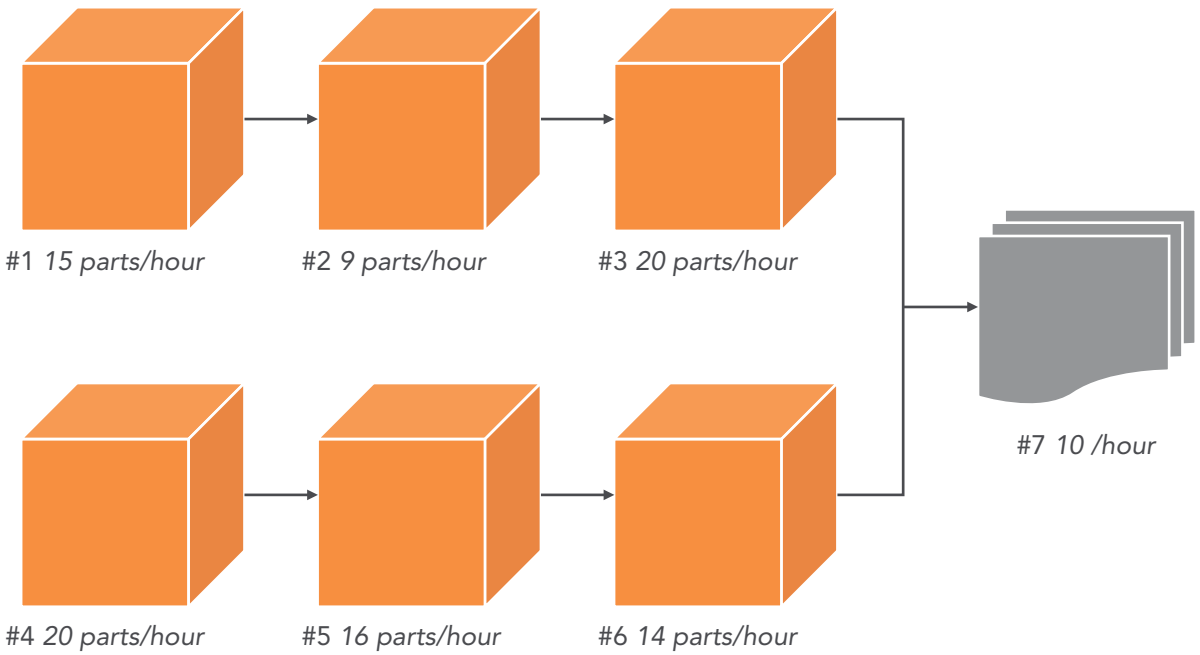
1. Walter Shewardt in the early 1900s measured product quality attributes by conventional statistics, admitting that some variables, like tolerances, could be controlled while others could not.
2. W. Edward Deming in the 1950s was no doubt the most influential leader in quality. He focused his measurement efforts on the process of product creation, and above all on continuous improvement, for which the Japanese word *kaizen* is now part of the global business lingo.
3. Joseph M. Juran in roughly the same period as Deming, focused on measuring output with respect to fitness of use and product design. If the product works as intended, then this is quality. If a radio could be turned on and play music, that is quality.
4. Philip Crosby in the mid-20th Century tried to achieve zero-defect in products. He wrote, *Quality is Free*, in which book he proves that returns, repairs, warranty claims, and loss of reputation, are costlier than doing work correctly from the start.
5. Armand Feigenbaum, who is also credited with the TQM (Total Quality Management) movement, studied the manufacturability of product through design, and was concerned with the cost of quality itself.

After the mid 1970s, global leadership in the quality movement was taken over by Japanese business leaders, mainly because quality was a competitive advantage and means to market share. Around that period the JIT (Toyota) movement took hold worldwide with various local adaptions.

Case 4: Mini-manufacturing case to find system constraints.

Picture yourself as the owner/manager of a small manufacturing and assembly operation in a mid-sized town. You inherited this operation from your parents and you employ more than 50 fellow townspeople. Your firm manufactures for the outdoor recreation market electronic components such as pedometers, compasses, temperature gauges, optional additions to GPS devices, etc. Your firm is marginally solvent, that is, you meet nearly all your financial obligations on time, but you cannot always take your own paycheck on time.

Prospects for the near future, however, are not too bad. In fact, you may not be able to meet demand for a certain product because of capacity constraints. You need to increase capacity, but the question is where? The factory is made up of seven workstations where 1 through 3 assemble electronics, and 4 through 6 relate to housing for the product. The last station #7 connects the wires and tests the product. Graphically, the layout looks like the following with respect to capacity:



The case questions are these:

1. How many units/hour can this layout produce?
2. If you had to make an investment to increase capacity, where would you invest?

#2 is critical. It is the slowest workstation, and the "constraint". The entire system cannot produce more than its slowest part. #2 is also the only point in the system to look for capacity improvement, for the same reason. Investing in workstation #6, for example, would do nothing to the total capacity.

Chapter 4 Questions

1. Take a fresh look at new governmental regulation imposed on your company. These may relate to solvency if your company is a financial institution, or to the environment if you manufacture something, or wages and benefits such as health mandates. What new measurements are needed?
2. How exactly does your employer measure production or services? When was the last time these were changed or reviewed?
3. What is your company's personal product, brand or service?

5 ON WORKPLACE MEASUREMENTS IN THE PUBLIC SECTOR

One of the great mistakes is to judge policies and programs by their intention, and not their results.

– Milton Friedman

Measurements of the public sector, from GDP to Prosperity

The term "public sector" includes government at all levels from municipal, to county, to state/province and federal agencies. How these organizations are measured matters a great deal as it affects everything from social welfare to the nations' growth. However, the regulatory and redistributive powers of governments are a function of political considerations, and the policies-of-the-month's fashion, rather than evidence. Hence, the answer to the questions of what constitutes the best measurement needs re-evaluation.

Nothing explains the inadequacy of public measurements more than reports of an anemic US economy and the presumed declining standard of living, as reported by GDP around 2008 and later.

- Wages were not really growing
- Prices were increasing faster than wages
- The next generation will experience a lower standard of living than their parents

This pessimistic view was the result of giving an insufficient weight to what present day earned income can buy in terms of improved quality in products and services. Government does not even try to measure that. For example, if there is no increase in the cost of production of goods and services, we wrongly conclude there is no increase in value because that feature is ignored in the GDP.

Take any pharmaceutical product that is effective in preventing a disease. That value to patients' health and contribution to employers' productivity does not enter the picture, other than in the nominal GDP. In a similar vein, take an electronic product like your cellphone which services include phone calls, calculators, clocks, text, Internet and camera for instance; but also enables free services like LinkedIn or Facebook. These are unaccounted values that improve our standard of living.

The GDP is a loved and hated shorthand for material wellbeing. US GDP's forecasts are routinely subject to revisions and its underlying assumptions are flawed, or at least questionable. The problem is not so much of what it does measure, but what it does not. For example, there is no mention of improvements in sanitation, health in terms of longevity and infant mortality. Just as the measurements your employer is using are subject to redesign, the GDP should include the following:

Healthcare in terms of outcomes like longer lives
Service improvements in terms of higher quality like public transportation
New products that have reached commercial acceptance, 3D printing, electric vehicles,
Spending patterns by top- middle-lower wage earners
Government wealth in terms of infrastructure
Private wealth in terms of net value of assets per household year to year
Intangibles, such as skills, brand values, the network effect and intellectual property.

GDP as a measure is a relic form the 1930s when manufacturing was king. Consider the difference between now and then:

Email	post office, messenger services
Self-driving electric cars	350 hp. gas guzzlers weighing 5 tons
Music streaming	vinyl records

Going back to 1776 when "The Wealth of Nations" was published, the only economic measurements consisted of land, labor and capital (Adam Smith).

The first US Census took place in 1790 when Thomas Jefferson was Secretary of State. The Constitution (Article 1, Section 2) mandates that there be one every ten years. Local marshals used to hire deputies to get the information for their districts. Courts did this work in the early days as well. By1810 data on Fisheries and by 1840 issues like crime, religion, taxation and other social issues became part of the US Census. It was not until 1902 that a separate Bureau of the Census came to be under Theodore Roosevelt. The immediate consequence of the population counts was the apportionment of electoral districts for the House of Representatives, and ultimately electors in the Electoral College. That can get touchy as the Census counts people in places, citizens or not. Another statistical agency, the BLS (Bureau of Labor Statistics) measures unemployment with the following definition:

a) employed	people with jobs or working for compensation
b) unemployed	not having a job, looking for work and being available to work
c) neither a) nor b)	not in the labor force, not counted as unemployed

The US Government's focus is on measuring eight broad areas of service as described next:

Public Finance/Economics

- This rubric includes all government revenues derived from taxes and fees, all expenses to operate government, and all debt for investments, grants, and aid, general fund balances, the purpose being transparency and democracy.
- Defense, public safety, and infrastructure all address the public good. Health, education and social benefits address the individual good.
- Revenue per person measures the size of government, tax burden and tax capacity. A governments' fiscal position is explainable by fund balance and liquidity, fiscal flexibility by income sources, like aid from the Federal government to the State government.
- International debt comparisons are subject to currency fluctuations governed by a measurement called purchase power parity. The PPP is the cost of a basket of goods and services in country A, and then estimated for country (B) at the current exchange rate.

Strategic foresight and leadership

- Included in this rubric are concerns for fiscal sustainability and strategic resource management. Measurements related to balanced budgets may be appropriate here.
- The ability to be engaged in two simultaneous wars is a strategic policy that requires planning and funding, for which economic factors matter in addition to military ones.
- Measurement related to macro-economic trends such as watching increases in government debt that may lead to lower growth and a downhill spiral after that. Debt as a percent of GDP is an accepted unit of measurement across nations worldwide; i.e. Japan is 200%, Estonia less than 20% and the US in the middle with about 105%. Following WWII, the number was 118% and in 1981 about 32% for the US.
- The North American Industry Classification System (NAIC) replaced the Standard Industrial Classification (SIS) system in 1997. It is the basis for the publication of analyzing and publishing US statistical and economic data.

Employment

- Employment concerns focus on a healthier ageing population working more years, educating the young for skillsets that industry needs, industry changing skill needs.
- The proportion of government employment to total employment is an indicator of how services are delivered in both public and in private.
- Measuring workers' age and skill over a period time, in relation to demand is another consideration. The over 50-year old group is now 26% if the workforce.

Compensation in public sector employment

- Applies to teachers, some doctors and nurses, and non-uniformed government workers
- What is being measured are changes over time, attractiveness of the professions
- Measurements address impact of policies and quality, retirement packages, wage competitiveness with the private sector of the economy.

Human Resource Management

- Performance data in the professions such as industrial relations, and the delegation of work.
- Motivation assessment indicators across departments by State and Federal governments.
- Output measures relate to meritorious progress and productivity, college graduation rate by academic major to forecast critical skills in engineering, and apprenticeships for the trades.
- Private sector Human Resources measurements are similar their public cousins, the difference is that private enterprise is profit motivated, while the public sector is service oriented.

Governmental transparency

- Proactive disclosure by agencies, open budget process, freedom of information access.
- Look-see concerns are for legislative budget oversight, freedom of information filings.
- Measurements in transparency are more qualitative than quantitative.

Public procurement

- The actual volume of governmental purchases of products and services is very large, it is segmented by nature and impact, competition, transparency and fairness, among other categories.
- One measurement objective is the beneficial impact of procurements on states, counties and cities and political subdivisions, often meaningful for elected officials in election years. Units are percent of GDP in total government purchases, and proportions by State and region.

Regulatory governance

- This subject addresses the oversight framework, regulation and compliance enforcement.
- Agencies like FAA (aviation) and SEC (securities) are examples of regulation-driven public functions.
- Actual measurements are both qualitative and quantitative in nature; for example, environmental impact assessments prior to enforcing a new regulation. Poorly written regulations can lead to non-compliance and unintended consequences.
- Consumer protection regulation is concerned with measuring sales practices, intentional product misrepresentation and labelling. The units of measurement can be qualitative and quantitative.

The new measurement of GO

Here is a shining example of the need to change measurements every now and then. Starting in the Spring of 2014, the US Bureau of Economic Analysis will publish a new statistic on a quarterly basis. That measurement is called GO, which stands for *Gross Output.* GO measures the total sales volume at all stages of production, and it will be a much larger

number than GDP. In comparison, GDP only measures the total goods and services the US produces in a given year.

A good question is why do people change measurements? The general answer is because the old measurements provide less meaningful information at the current point in time. In the GDP instance, it was easy to conclude that consumer spending is the driving force in the US economy. It showed, for example, that consumer spending was 70% of the economy, followed by 20% government itself. This insight lead to the decision that when the driving force of retail sales is down, an economic stimulus is justified! Under GO however, consumer spending may only amount to 40% of the economy and the conclusions we draw may be rather different. The difference between GDP and GO is in counting investments, technology advancements, savings etc. GO is likely to be more sensitive to the business cycle.

It is highly unlikely that GO will replace GDP. However, by having both measures, a more meaningful analysis of our economy is possible. This is an example in which the measurement itself can have such a profound influence on decisions and outcomes.

Politics is never far from government spending. Constituents simultaneously demand more services and lower taxes, which is not sustainable and contradictory. Elected representatives pride themselves for bringing free money to their districts and hope to get re-elected on that basis, which is also not sustainable. Measurements can be gamed to avoid accountability, such as promising municipal pension increases that are far into the future, a procedure that contributed to the city of Detroit becoming bankrupt under Chapter 9 of the US Bankruptcy Code.

Some public services come in the form of a public-private partnership under contract, in which case the contract becomes the instrument that measures performance. One can think of the delivery of such public services as a private sector – public sector co-production. Examples are public housing, health care in special situations, infrastructure investments like private toll roads.

Measuring Prosperity

Nowadays GDP is often used as a measurement of prosperity, which is clearly not useful for that purpose. If GDP growth in each year is >3%, then we conclude that all is well. Not so fast! Well-being in the 1930s, when GDP was invented, had a different meaning than well-being does now. As current income inequality between the poor and the rich widens, the average value between the rich and poor becomes less meaningful. This is like saying that by placing your feet into a hot stove and your head in an icebox, that on average you

are just fine. Therefore, the use of GDP as a short-hand for prosperity is inappropriate because comparisons from one period to another can't be made with any statistical or rational validity. In the 1930s the economic engine was defined by the production of goods. Today, almost three-fourth of what we produce are services. Originally GDP defined capacity to produce; cars for example. However, the definition of a *car* then and now is not the same either. Think of a 4-cylinder internal combustion engine vs a hybrid model. Also, GDP does not measure value added to the economy, it is not a benchmark for welfare. In fact, it is time to find better measurements, recognizing also that GDP is consistently wrong and undergoes endless revisions as soon as it is published. All the above good arguments notwithstanding, GDP not about to be replaced as too many interested parties are hooked on it. Making policy decisions on GDP can be dangerous and therefore lead to wrong conclusions. That is true to all measurements considered in this book.

So, what is the answer to augmenting, if not replacing, GDP? To (a) address the issue of inaccuracy, one should look for improvement of data collection and data reporting. More and different data should be included such as credit card information and tax-databases for example. To (b) recognize our present services-oriented industry, new measurement addressing well-being in terms of quality of life and products and personal health are appropriate. Finally, (c) it may become desirable to add intangible benchmarks like labor skills, brands, designs, patents, communications and the network-effect to a GDP number, before it can be used as an indicator of prosperity in a society. The network effect is defined by the increase in value of a product as its use increases. A good example is the United Nations' Human Development Index (HDI) focused on:

1. Long Life, measured by infant mortality and life expectancy.
2. Knowledge, is measured by years of schooling.
3. Living, standards measured by GNI, a per capita gross national income in PPP, which stands for purchase power parity.

Case 5 Is our Good *Olde* Town going Belly up?

Imagine yourself to be in Jane Schröder's position, who is the appointed city manager of Schnappsville, a 236,000-soul town in the northern US Midwest. The town is just large enough to share all the big city problems, and yet small enough for her to deal with problems directly. All town departments request her attention daily. These are police, teacher unions, firemen, medical emergency, homeless shelters and food banks, subsidized housing, endless public meetings, requests to fund projects for historic preservation and remodeling an old factory building into an arts center and shopping mall, road maintenance and snow removal, plus opportunities to fund projects with State and Federal grant programs, to name a few. Given so many demands, you are concerned about solvency!

The Town's books are balanced and audited. Jane has all the data on past and present payments and sources of income. She also reads the Wall Street Journal and knows that towns can become insolvent. Big cities like Detroit, San Diego, San Francisco and smaller ones like Schnappsville in Alabama, Rhode Island already experienced insolvency very publicly.

On the assumption that municipal insolvency does not happen overnight, what information should she ask for now to prevent insolvency later? What should be her new metrics? Excluded from the current budget is a potential contract with the police two years from now, the Firemen are asking for wage parity with the police and the teachers seek to reach a national salary average; and by the way, the town postponed paying pension contributions this fiscal year to pay for repairs due to a local flood.

Question: Being city manager, what measurement questions should you ask for to address the solvency concern?

Answer: One way to put your arms around the problem is to focus on three specific domains:

A Fiscal Position, addressing fund balance and liquidity
1. Fund balance as a percent of general fund revenue, last few years.
2. Quick ratio, (cash + investments)/(operating loans and liabilities).
3. Unfunded pension liability as a percent of general fund balances, last few years.

B Fiscal Flexibility, addressing debt service and state aid
4. State aid as a percent of municipal budget, last few FYs, benchmarked to similar towns.
5. Growth in education budget.
6. Debt service as a percent of revenues, last few years.

C Tax Capacity, addressing per capita tax levies, exemptions by not-for-profits
7. Median family income, from last Census, projected forward.
8. Per capita tax levied.
9. Commercial property tax rate current FY compared to other regional towns.

The astute reader may have noticed that all these measurements allow for comparisons to previous years. That in turn permits the development of trend lines. If all, or many of those trend lines move in the same negative direction, then it is high time for managers to swing into radical action.

Chapter 5 Question

1. Think of possible ways in which you personally benefit from governmental measurements, such as receiving a Social Security pension that is inflation indexed to the Consumer Price. Nearly all pensions are government regulated in some form.
2. Governments know quite a bit about you from tax filings, from real estate purchases, from driver licenses and passport applications and border crossings etc. The question is where do you draw the line? How would you feel about a database containing your phone calls, your Internet searches to measure you as a potential national security risk?
3. Try to think of possible governmental rules under which your need for privacy is balanced with a government's need to know for it to function!

6 NOT-FOR-PROFIT ORGANIZATIONS

Never doubt that a small group of thoughtful, committed citizens can change the world, indeed, it's the only thing that ever will.

– Margaret Mead

Prior to defining how to measure not-for-profit organizations, let's start with defining what a not-for-profit organization (NPO) is. While this analysis is based on US firms, other industrialized nations are not all that different in format.

- NPOs are corporations in the legal sense. They have income, expenses, and balance sheets. NPOs are systems (with feedback) and as such are measurable, run by managers.
- NPOs exist to serve a narrow interest of social good. If NPOs did not exist, a government would have to provide it. Think Red Cross and natural disasters! Because of that fact, government has given those entities an income tax exemption.
- NPOs are exempt from paying sales- and income tax; they do pay taxes related to employment, such as wage withholdings like Social Security. NPOs are often listed as (501)(c), which designation refers to a section of the US Internal Revenue code.
- US NPOs are usually incorporated under State law.
- NPOs traditionally cling to their narrow cause; The NPO market is not nationally or globally organized into united force for change.
- NGOs are non-governmental organizations that often function on the periphery of the body politic. Those accredited to the United Nations for example are there to influence international policy. NGOs are also NPOs, but NPOs are not necessarily NGOs.
- NPOs cover the gamut of human misery and interests and may be strong in their narrow field, but as a sector of the US economy, neither NGOs nor NPOs are well organized, or well represented in the halls of government for purposes of lobbying. The following table of well-known NPOs will illustrate the point of narrow focus.

Not-for-profit US organizations paid 9.2% of all US wages and salaries.

Not-for-profit organizations business accounts for 5.5% if US GDP.

According to the Internal Revenue Service, there are more than 1.4 million tax exempt organizations of which the Kaiser Family Foundation (health services) is the largest with a spending budget of over US $37 Billion.

In the aggregate this is a big and significant market.

Organization	Purpose/Cause	Measurement/Outcome
Amnesty International	Expose, prevent global human rights abuse	#of cases, prisoner releases, consciousness raising
Rotary International	Community service and Good Will world-wide	Local Rotary- Club level projects, international, humanitarian, entrepreneurial
Carnegie Endowment for International Peace	Commentary on global issues, think tank	policy discussions, programs
Teach America	Addresses problems in child education in USA	Low income family children, teacher recruitment
American Red Cross	Emergency response preparedness	4 million blood donations, 70 disasters, 9000 people trained
Oxfam	Injustice, poverty prevention, internationally	Annual governance report, "Promises to keep", global conscience
IEEE	Global technology association, engineering	conferences, papers, ethics code, technology standards

Table 6.1 Sample of large and diverse Not-for-Profit Organizations

Performance measures in the NPO market can be elusive. Management often makes decisions on anecdotal evidence (disappearance of persons) or on social science research (causes of homelessness). Such research itself may not be current by the time it is published, and has perhaps only limited predictive value, and may be biased in the direction of who funded it, or to illustrate a cause. Each organization should take a close look at its own measurements to ascertain that these measurements meet the following conditions listed in Table 6.2.

Attribute	Guideline
Specific	Specific to the NPOs reason for being, raison d'etre, unambiguous and unique
Observable	Based on data that is practical and can be collected, is verifiable, repeatable
Understandable	Managers are responsible for spending that must be explained to donors, accountability
Timely	Define a slice of time, a quarter for example, and then make it comparable to other such time periods for trend analyses, share and publish data with supporters
Valid	Accurate data, replication of results by other researchers

Table 6.2 NPO Organizational Measurement Attributes

For some situations we must find a proxy measure. If, for example, the mission is to reduce smoking marijuana by educating the public about its dangers, the program success measurements must show that such knowledge leads to reduced marijuana smoking. An example of how to avoid ambiguity is the following: Suppose you feel that handling of pesticides is dangerous. You then institute a labeling regime that explains these dangers. A year later, you collect data and find out that nobody suffered from chemical pesticide related injuries. Was your labeling program a success? At best, one cannot be certain. See chapter 7 on "cause and effect".

Managers must control outcomes! Outcomes measure the big picture; outcomes are defined as the results of a program. Since outcomes are of importance, its beneficiaries must be counted. We look for indicators that drive the mission. In a program of providing food and shelter for people in need, it is the outcome what we want to capture; and that may be the number of meals served for a homeless shelter. General rules evaluating NPO outcomes includes the following ideas:

1. Identify useful indicators for success in your mission and organization, a realistic justification for a cause.
2. Collect performance data from your operation and then benchmark against known NPO measures from similar or competing fields of endeavor. To achieve a culture of continuous improvement, measurements must be re-designed (see quality discussion in chapter 4, Deming et al).
3. Based on benchmarks, defined as reference points for judgment, allocate available resources and design, or redesign, the programs.
4. Write an Impact Analysis of your work relative to efficiency, appeal to donors to be able to continue the excellent work and justify it by outcome measures related to needs and benefits for the targeted audience.

It may be clear by now that no single measure fits all NPOs. Therefore, the reader should consider a generalized measurement framework from which to develop correct outcome indicators.

Outcome centered on	Indicators	Measures
Program	Participation, realistic need, Satisfaction	% of relevant total population participating in program Level of satisfaction on a 5-point scale
Management	Knowledge/learning/ attitude Behavior Condition and status	Skill, % score increase, % improvement as reported By participants, teachers. Incidence rate, relapse rate,% that achieved goal, % promoted to next level, improved relationship % graduating, % avoiding undesirables,
Community	Policy Public health Safety Economics Environment Social	Resources obtained or re-allocated Before and after statistics Incident rate comparisons with peers, best in the area Index of economic activity before and after program Species survival rate in an eco-system Civility, dispute resolution, index of neighborhood quality
Organization	Financial Management Governance	Corporate financial ratios, donation growth/decline Program administration cost v program spending succession plan, board skill/talent for the mission, social connection, ethics code, reporting structure, departments, committees, % fund-raising cost.

Table 6.3 Not-for-Profit Organizational Outcome Measuring Framework

For all practical purposes, an existing nonprofit organization has established its funding and service constituency. Drill down into specifics of a human services not-for-profit organization, and you may find emphases on:

- *Youth mentoring and tutoring*
- *Adult literacy*
- *Performing arts, crafts, and art in general*
- *Business assistance and support for commerce*
- *Advocacy for Cause*

For each outcome measure, there must be in place a documented data collection process that is approved by the Board, monitored by management, and meeting tax guidelines.

Case 6 Is this Food Bank making Progress?

You have just been appointed Operations Chief of a 501(c)3 nonprofit community organization whose mission is to address local homelessness and hunger. The Board that hired you expects you to continue the good works and operate more efficiently and effectively.

Background

The community you serve was prosperous in the 1960s, but now is old, economically uncompetitive and littered with abandoned factory sites. This now poor community is also wedged between two very well-off towns. The 502(c)3 provides temporary (30+days) housing for individuals and families suffering from chronic conditions. That service is bundled with a 24/7 counseling services. The organization also runs a nearly all-day soup kitchen that serves 3,000 meals a day. All foods are donated by high end grocery chains giving food items a few days prior to expiration data.

The organization had $1.9 million income and spent $2.1 million for operations last year. Income came from fundraising in the neighboring two towns, grants, fees, rental income and interest. Program costs were 71% of the income, 17% were administrative costs, while fundraising came to 12%. It takes a permanent staff of 10 plus 400 volunteers to run this operation. Founded in 1984, for the first several years everything was based on volunteerism, used cars, used office furniture, even used file folders etc. The organization can now actually pay for most services. For example, a fulltime grant writer has a competitive salary and is expected to produce many times her salary and benefits.

Your Assignment

To be more efficient you will have to do more with less; and to be more effective you must take a larger bite out of the homeless and hunger problem in that community. The organization is currently well managed and yours is a hard act to follow. The accounting system gives you monthly numbers of income and expenses and the numbers are presumed correct. Your mission is this:

a) Develop new yardsticks that are helpful in measuring effectiveness and efficiency. Going back to 100% volunteerism is not an option.
b) Here is a "think-piece": How would you define success for this organization? Shrink homelessness, prevent hunger, and then go out of business? Or does your organization need homelessness to exist?

Guidelines for developing answers with respect to effectiveness (doing the right thing) and efficiency (doing it right) are the following:

Effectiveness: (doing the right thing)

- Survey what donors expect to see to assure continued funding, involve donors in the debate.
- Interview visitors receiving meals to find the cause of their need and publish a research paper on perhaps mental health?
- Estimate the market size of homelessness, rate of change, %market served, to plan capacity.
- Draw a process diagram for the operation to identify constraints and possibly increase capacity to serve.

Efficiency: (doing it right)

- You can either raise more money, or reduce cost of operations, or both. Use your imagination and try to be specific.
- Benchmark against other similar organizations in the State, with respect to fundraising cost etc.
- Collect transaction data daily and make statistics available to management, daily
- Apply accepted financial ratios for this field and find trends, donation growth etc.

Chapter 6 questions

1. If the tax laws did not permit not-for-profit organizations to exist, how much larger would government have to be to fill the void of social need? Do you think that government is better organized than are NOPs to fill these needs, and that therefore private charity has no place in society anymore?
2. Consider a charitable cause you can personally relate to and go back to Table 6.2 and fill in the blanks.
3. Is there a dark side to NOP organizations in terms of money, causes served, effectiveness serving causes, lose organizational structures that lead to abuse in the field of operations?

7 HAPPINESS, CAUSE & EFFECT, INDEXING AND EMPLOYEE SELF-MEASUREMENT

Doing what you like is freedom, liking what you do is happiness.

– Frank Tygar

Happiness

To be happy is equal to being social, engaged and active. Bosses, who do not gauge their workers' happiness, are missing important opportunities for better stewardship of the workforce. If one could get agreement on a universal definition of happiness, it would be possible to find a metric that works. However, different scholars focus on different approaches. Economists measure happiness by what people value in money terms, while neuroscience measures happiness to rewards by scanning brain activity in spheres related to pleasure, and psychologists look at how people feel in terms of mood. More conventional happiness indicators are some of the following:

1. A person with many positive experiences, as opposed to another person with only one major event like winning a lottery ticket, tends to be happier, according to the Harvard Business Review of January 2012. Frequency of positive feelings is a better predictor of happiness than is magnitude.
2. Couples with small children tend to be less happy than couple without children.
3. Winning an election, getting a promotion does not lead to happiness, nor does failing an examination automatically lead to unhappiness.
4. A management style based on fear, like saying get this done by Wednesday or you are fired, undermine the work environment and leads to workers themselves undermining the work place intentionally or unintentionally.
5. Living a difficult life (cause) does not automatically lead to creativity (effect), as was once believed considering Beethoven's and van Gogh's backgrounds.
6. As can be expected, rich people are happier than poor ones, people in a romantic relationship are happier than those who are not, and healthy people are happier than sick ones.

Translating these findings into a management policy to help workers help themselves include:

- Providing decision making discretion for workers, called empowerment.
- Sharing information about the state of the enterprise, so workers can see their jobs related to the company mission.
- Minimizing incivility in business interactions; one can disagree without being disagreeable.
- Offering individual and group performance feedbacks; reinforce superior performance frequently, celebrate often.

Workers can help themselves to thrive by doing the following, while management should encourage and permit it:

- Taking frequent breaks and doing something else to clear the air. Frederick Taylor, father of Scientific Management, proved this concept in the early 1900s.
- Making the existing job more meaningful is achievable by searching for opportunities of improvement in how to do the job. Nearly every job becomes better in this way, and the quest for continuous improvements can be gratifying. Many successful enterprises allow employees time and space to search for new opportunities. To measure this concept, one need only search for the percentage of earnings are from employee initiatives.
- Form and support relationships that energize, and then benefit from those relationships. An introverted employee should socialize with successful sales people for positive dynamics to take place.
- Taking insights that come from the work place into family life. Take sustainability for example, families can become more sustainable too.

Cause and Effect

Deep Thinkers have been trying to figure out what event causes (A) to occur, given another event (B) having occurred, since the time of David Hume (1711–1776). This is very hard to prove in the field of Law where not much can be left to unreasonable doubt. Often people resort to the counterfactual approach to conclude that event (A) is the cause of event (B) because, if (A) had not happened then (B) could not have happened. That too can lead to fuzzy conclusions. Since 2001 mathematicians have been working on this logic by writing structural equations to model counterfactuals. Until that problem is really solved, in everyday life we can argue in terms of "responsibility for…" Or "blame for…" causes.

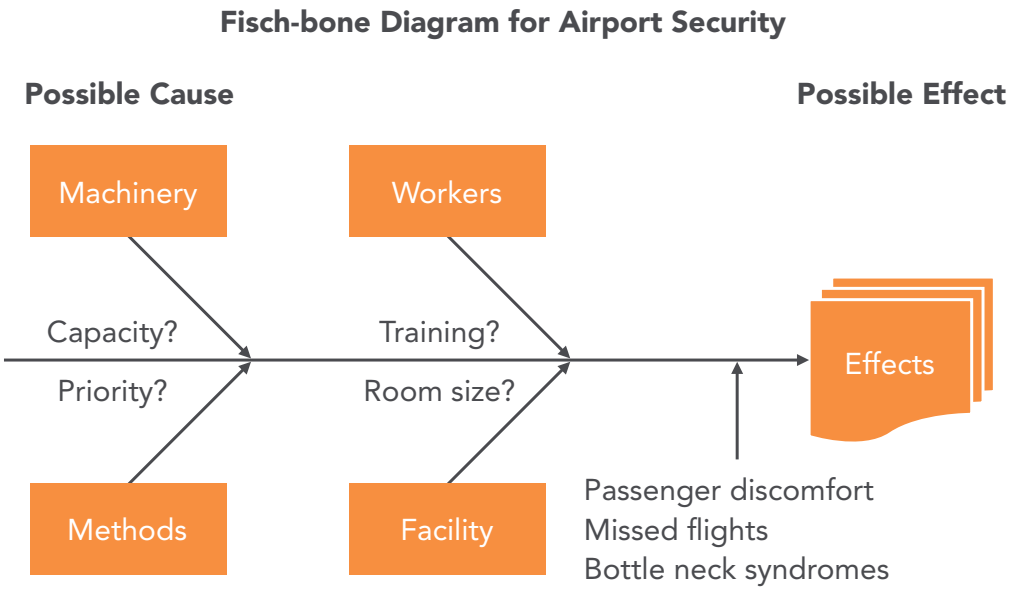
The average person on the street can be confused about how to handle cause and effect situations. For example, say a tabloid reports that teenagers who read at least one book a month tend to wind up earning more money at age 30, than those who read less or not at all. The implication is that reading causes higher income. That would be a stretch. More likely, growing up in a literate family is a stronger argument than reading alone.

Causality is a relationship between a set of factors called "causes" that either alone, or in combination, result in an "effect". If (A) causes (B), then we know that (A) exists and that it comes first. Even a categorical statement like smoking tobacco causes cancer, it not entirely accurate because people who do not smoke can get cancer as well, and that some people who do smoke do not get cancer, other smokers may die of natural causes before they would have died of cancer. To handle the logic in this case, we use probability and state that cause (A) has a high probability of resulting in effect (B).

To refine the argument, we must deal with necessary and sufficient conditions.

For a condition to be both necessary and sufficient, statement A and statement B must both be either true or false. An example for the necessary condition for passing a college course, is writing a term paper; without which the course cannot be passed. While meeting the sufficient condition means arriving on time requires the trains to run on time. However, there may be other ways of arriving on time as well. Although, without the train arriving on time it would not be possible.

For our purposes let us be practical and look at what is called a Cause and Effect Diagram, attributed to a Japanese business scholar named Ishikawa. The technique is part of Six Sigma bag of tricks in chapter 4. It helps us identify probable causes after we have identified an effect for which there is no apparent cause. In addition to that, the fishbone diagram is a wonderful communications aid. Let us say the effect you observe is that people wait too long at an airport security check. To find an answer, you ask all the TSA associates into a room and brainstorm for probable causes. The wisdom of workers, or crowds, is important to consider. The objective is to narrow the possible cause.



This type of graphic, when presented to a group of workers, is a powerful framework to discuss the problem of long waiting lines. If the goal is to reduce waiting time from an average of 20 minutes to 10 minutes, changes will have to be made based on data and simple calculations

Indexing

In the context of this book, an index qualifies as a measure all by itself. Specifically, an index is a formula that expresses the relationship of one dimension to another dimension, where the dimensions can be prices, production, or wages, among others. An index often measures the percentage change from a past point in time, when the index was set at an arbitrary reference value of 100. Indices are constructed, invented and redefined to fit a given need at the time. We have already mentioned the United Nations HDI, which includes a Gender Equality Index. That index measures three dimensions across the globe, namely reproductive health, empowerment and labor market participation. The United Nations monitors member nations annually, with respect to progress along those lines.

An index nearly everybody is familiar with is the CPI, Consumer Price Index. It has two dimensions, which are prices and weights. It answers the question of how much a consumer would have to earn, or spend, to maintain a standard of living defined by an earlier point in time. The general formula looks like this:

$$CPI = \sum_{i=1}^{n} CPI_i * weight_i$$

The US CPI is composed from 95,000 items at 22,000 stores and 35,000 rental units. The weights, the sum of which is 1.00, are the following: .414 housing; 0.174 for beverages; 0.170 for transportation; 0.069 for health care; 0.06 for apparel; 0.044 for entertainment; and other categories are weighted 0.069. Taxes are not included in the CPI. Since wages, prices and pensions are a function of this index, it is a very influential measurement.

The literature on indices is very extensive, and naturally, statistical considerations loom large. Related indices measure core inflation, cost of living, higher education prices, inflation, personal consumption etc. They are too numerous to count.

Employee Self-Measurement

Would not nearly every working person want to know

a) If good sleep results in more productive work the next day?
b) How much time is wasted with distractions or Internet cruising?
c) Does a rough day at the office affect blood pressure?

The trouble is the boss would like to know also, and the fear of Big Brother is a real issue, legally and ethically. Wearable technology may provide answers. There are two software approaches to employee self-measurement.

Knowledge Workload Tracking, is a computer-based software package that keeps track of how much idle time a computer experiences during the day, how long the worker stays on the same screen, how much time is chatting interactively etc. All of this can be benign, if chatting with customers promotes collaboration and work.

Cognitive Mapping, is also software based. For example, an office worker will get a software-generated email at the end of the day asking to report how time was spent? At month-end, the resulting statistics help workers understand themselves better and improve their own productivity. On the principle that working on a variety of projects during a day helps renew and prevent boredom and discouragement, another software program may send workers messages to change the pace and do something else. In the same vein, yet another software program may occasionally send puzzles to help sharpen mental acuity during the workday. Cognitive Mapping can easily become part of a corporate wellness program, which about one-third of US corporations already provide through third party contractors.

Workers can initiate these measurements for their own benefit; sharing findings voluntarily with other workers and even with management, which is the way to address privacy and boss issues. Abuse of new methods is always a possibility.

Case 7 Bet you our staff is happier than yours!

Background:

You have a wonderful job in Human Resources with Company A, located in an industrial park in a neighborhood of many large and small factories. Every workday you have lunch at a local diner, and over the years you have befriended another person who also works in Human Resources for Company B. You both thought that your respective employer has the happier employees. The only way out of this dilemma was for you to agree on inventing a measurement, which you called the Hypothetical Happiness Index (HHI). The bet was for the winner to buy the loser a tuna fish on rye, chips and coffee. Both companies are in the same industrial classification, work with similar technologies, and both are mid-sized firms with similar corporate cultures. Your core data comes from each company's' last years' public- and audited annual reports and similar internal surveys Human Resources departments normally undertake. You both have read studies that indicate that happy employees, and company success, are statistically correlated and can be measured in terms of

1. Greater productivity that leads to increased profit.
2. Better personal health, that leads to lower insurance premiums and fewer sick days.
3. More loyalty, which leads to better customer service and greater innovation.
4. Improved job satisfaction, leading to lower turn-over.

Objective:

Complete a given HHI index template for those two companies, in which case the larger the index value, the happier the company is implied. Use last years' yearly data from annual reports and survey results,

$$HHI = \Sigma \text{ (value)*(weight)}$$

Basic Data:

HHI	Definition	Company A	Company B	Weight	Company A Value	Company B Value
Productivity	Output/ Input Net Sales Cost of Sales	 112MM 87MM	 226MM 195MM	0.3		
Health	Avg. sick days Per employee/ year If <= 10 weight = 0.1 If >10 weight = 0	15	7	0.1		
Loyalty	Customer survey Satisfaction From 1 to 5 5 = best	2	3	0.4		
Job Satisfaction	% enjoy %frustrated %boring (from surveys)	.48 .12 .40	.10 .52 .38	+ 0.2 - 0.2 - 0.2		
Totals				Max = 1.0	HHI =	HHI =

Answer:

HHI Measure	Definition	CompanyA	CompanyB	Weight	Company A Value	Company B Value
Productivity	Output/ Input Net Sales Cost of Sales	112MM 87MM	226MM 195MM	0.3	(112)/(87)*0.3 0.39	(226)/(195)*0.3 0.35
Health	Avg. sick days Per employee/ year If <= 10 weight = 0.1 If >10 weight = 0	15	7	0.1	0	0.1
Loyalty	Customer Satisfaction From 1 to 5 5 = best	2	3	0.4	(2)*(0.4)=0.8	(3)*(0.4)=1.2
Job Satisfaction	% enjoy %frustrated %boring	.48 .12 .40	.10 .52 .38	+ 0.2 - 0.2 - 0.2	(0.48)*(0.2)=0.1 (0.12)*(-.2)= -0.02 (0.4)*(-0.2)= -0.08	(0.1)*(0.2)=0.02 (0.52)*(-0.2)= -0.1 (0.38)*(-0.2)= -0.08
Totals				Max = 1.0	HHI 0.47	HHI 1.49

Condolences are in order! Your friends' employees in Company (B) are more than three times happier, than your employees are. Principally this is the case because they do a better job on customer service, and because the rubric of loyalty was assigned a heavy weight. You owe your friend a tuna fish on rye with chips and a cup of coffee. Tell your friend it may be taxable income. Also observe that the assignment of weights should be based on unquestionable evidence. Once you are "happy" with your index's workings, try to make the index 100 for the current year, and measure progress in the years to come.

SUMMARY

Let us review the key points this book addressed.

To the average person business measurements are a given, they are presumed fixed in usage and time and universally accepted. As our surroundings change, so our measurements must change with it. The time to rethink performance measures in business and in private life is now!

For measurements to be appropriate, they must support the organization to which these measurements are applied. Accordingly, this book addresses major measurement ideas for corporate management, for the office environment, for the service government and manufacturing sectors of the economy, the not-for-profit market place, wrapping up with indexing, and happiness at work.

Taking measurements precedes decision making. Decisions on the other hand, should be based on converting raw data into information, and a rigorous process of logic.

IT (Information Technology) measurements focus on the acquisition of data, the transformation of data into information, data transmission, data sharing and security. The quality of information is based on accuracy, timeliness, completeness and relevance.

Benchmarks are useful for establishing best of breed guideposts for an organization to aspire to.

Key Performance Indicators (KPIs) are customized measurements for special applications in consulting and supply chain management, for example.

Sustainability in any commercial operations is a continuous process of improvements with the ultimate goal of meeting the needs this generation without compromising the needs of the next generation, *applied* to resource use, cost, and environment.

Before we can measure quality, we must first define what quality means in the context of a given situation.

Measuring the public sector is to control the nations' infrastructure such as pensions, public health, border safety at sea and in the air, to name a few. It is an ever-increasing percent of public spending and an increasing portion of GDP. Categories discussed were public finance, strategic leadership, government employment, public procurement, regulatory governance issues.

The not-for-profit sector is composed of organizations that are like corporations, except that major measurements focus on narrowly defined outcomes, like animal rights in a town; in contrasts with profit for corporations focused on income, or government on public service.

New on the horizon is the Word Wide Web. Here the focus is on reaching out and connecting by measuring clicks, visitors, downloads and paths to purchase. It is a great field for innovative measurements that may become a competitive advantage.

Trying to establish what caused an observable effect is risky without some rigorous methods.

Next Steps

1. Do a literature search on measurements specific to an enterprise near and dear to you!
2. Sprinkle the literature search with trade sources, academic articles, of domestic and foreign origins.
3. Get friends, customers and suppliers involved in the ensuing discussion.
4. Propose a research project that asks, if we measured XYZ differently, what conclusions would be draw from that?
5. Would our understanding of cause & effect be altered?

Above all, have fun learning more about the nature of measuring your work place, your career, and become more successful in achieving a meaningful work experience, however you elect to define that!

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