Future Performance Measurements in the Age of AI

Dr. Frank Wolf

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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
The Chemist Club, New York

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FOREWORD

There is an often- quoted business folk wisdom "*if you can't measure it, you can't control it*". For the purposes of this book "it" applies to all matters material and digital in commerce today and in the future.

This book examines rapidly changing technologies and the corresponding adjustment to measurement regimes for purposes of control. The emphasis is on assuring meaningfulness of work for humans, control of artificial intelligence products and services, digital forms of business structures and happiness in the work place.

A companion book *Measuring Performance at the Place of Work*, similarly examines the need to adjust measurement regimes in manufacturing, services, governance and charitable organizations.

Both books are forward looking in making the point that measurement approaches must adjust to changes in industrial methods and must quantify that which drives an enterprise. In its absence, we will come to make erroneous decisions in addition to failing to see opportunities. Both books provide answers and suggestions for practitioners to engage in the process and contribute.

INTRODUCTION

If you can't measure it, you can't control 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 only know that learning has taken place if 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 in the conduct of business in the 21st Century. 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 seek new measurements for his or her personal job productivity. The reader should explore how current measurements describe, or not, his or her life, know exactly 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 MEANINGFUL WORK

> *It is very difficult to have a meaningful life without meaningful work...*
>
> *– Jim Collins*

Have you ever noticed that some service providers, say airlines for example and fast- food retailers, are friendlier than others are? That may be because their employees work in a culture that makes their labor meaningful. For a company with workers whose experiences are meaningful, this is an advantage. How can we plan for that; or even measure it?

This chapter starts this by defining "meaningful work" examining situations in which one suspects this may occur: If a person, you for instance, were to answer in the affirmatively to the question "is your job meaningful?", then said person most likely experienced either, or all, or some of the following:

1. Someone will have told that you did your job well. For example, a person worked on a road construction task and finished the assignment not only well, but also, on time and perhaps below budget.
2. You did something that was beneficial to another person. For example, you read a story to a child who was interested, smiled and asked lot of questions. No reward is required for you to experience a good feeling inside.
3. Let's say you worked yourself out of a tricky situation without doing harm. An example may be finding a creative solution to a conflict that ended a dispute between two parties at work.
4. You experienced an episode of great insight at work. Such a moment may not even be pleasant to qualify; it can in fact be stressful and painful. However, without it, this insight would not have occurred to you. For example, assume that somebody must be on the job on December 31st, and this time it is you! On this day you go to work disappointed about not being with your friends on New Years' eve. Instead, you see an awe- inspiring night sky that leads to all manner of thoughts and insights on peace and beauty. It was the so called painful experience that brought you to this insight, and it turned out to be meaningful and rewarding in the end.
5. Surprisingly, language also may influence how you perceive meaningfulness. In some languages the word for "work" implies duty, obligation, rigor and and pain. In other languages, the same word suggests accomplishing something. More meaningful are those whose language tell them to go to work to accomplish something, rather than just collect a paycheck after some pain.

Unfortunately, there is no known formula containing a handful of variables, that if you plug in the numbers, will leads to a result where 95 is very good and 65 not so good on the meaningfulness scale. However, there is hope! We can try to measure the opposite and then suggest guidance on what *not* to do. If we can avoid the pitfalls leading to *meaninglessness*, then perhaps we can achieve *meaningfulness* in the workplace by default. The place to start, as always, is with management facing new challenges and rapid technological advances.

1. **Ignore the values of the people** you work with or work for, and you may reach a state of going nowhere. Some examples may include a medical practitioner solely focused on income rather than the needs of patients; or an academic teaching a personal ideology more than a subject matter. Surveys taken from patients and students can sometimes measure such instances of incongruence and signal a need for corrective action.
2. **Lack of recognition** of workers by management is common. Such lack recognition may be attributed to managements' insensitivity, or just neglect or contempt or arrogance and ignorance. The other extreme is to stage artificial and insincere celebrations like serving free pizzas every Friday to celebrate Friday alone. Managers may be pushing for unrealistic sales quotas in the hope to achieve more than would be the case otherwise.
3. **Meaningless work assignments** can cause resentment. The military used to be notorious for assigning meaningless task to recruits to shape them for duty and conformity. Cleaning bathrooms with a toothbrush and picking up cigarette butts where there are none, are examples. Governments sometimes produce meaningless work to achieve a social objective. Examples are clearing a road that nobody uses or building a bridge to nowhere to achieve employment objectives. A test for quantifying meaningfulness includes linking work to the corporate mission.
4. **Being taken for- granted** is certainly a sign of managerial insensitivity and will eventually create a sense of meaninglessness. For example, good old Bob here in cubicle C promptly shows up before 09:00 every morning and never leaves before 17:00 in the afternoon. We can rely on him to be there for us while the rest of us move on. How many employees have been in the same job for how long? Asking that of everybody is an effective way to quantify potential problems of neglect and sources of resentment.
5. **Consistently overriding or ignoring the judgement of front-line staff** members by management can be fatal to morale. Front line workers are those with whom customers make contact first, and they make long lasting first impression customers have of the brand. They are sales agents, they are phone operators, flight attendants, and pizza deliverers. Actively soliciting their experiences and rewarding their engagement can make their work meaningful and can make the enterprise more successful in terms of customer relations. This is more than an old-fashioned suggestion box.

6. The final killer of meaningful work experiences is exposing workers to **unnecessarily risky** situations that place workers in conflict or harm. Such cases arise from efforts to save money on safety provisions, or on carelessly assigning monotonous jobs to people. Eventually everybody will ask the same question: "why, am I doing this job?"

Part of the solution towards more meaningful work is in reskilling the present workforce. Surveys have shown that workers in many large companies have embraced reskilling themselves to qualify for new assignments. Corporate managers are painfully aware that for digital workers to meet the needs for the artificial intelligence, virtual reality, cloud computing, instant communications, robotic surgeries and self-driving automobiles, many new skills do not exist in the open market. Re-training workers is the only rational solution to employment imbalances and meaningful work. In addition, one cannot automatically assume that management is skillful enough to make good policy decisions themselves.

A holistic approach to measuring meaningfulness is composed of the degree to which all these above factors come together in each situation. Meaningfulness in work is highly individual and varies from culture to culture and is therefore difficult to generalize. We do however know what kills it. Therefore, we should reasonably try to quantify *meaninglessness* in the workplace.

For supplementary readings consult the works of Herzberg and Maslow on the hierarchy of needs (1943), as well as the literature on the classic Hawthorne case (Western Electric, 1920), plus Theory X and Y on control (MIT McGregor 1957) on rewards and punishment.

Case 1

Imagine yourself as an investigative reporter for a mid-sized town's main daily newspaper. The town is highly industrialized composed of 50% older manufacturing firms and the rest of service companies in fields like digital marketing, automation, and government services. It has a university with funded research programs.

You are thinking of writing a series of reports on work engagement, jobs satisfaction among all levels of the town's working population.

From national statistics you already know:

1. Job satisfaction for the entire country stands at 81%, down from 86% three years ago. Job satisfaction is measured by career prospects, compensation packages, management/labor relations, work conditions and other criteria for which you have statistics to bench-mark your town against.

2. Engagement is measured by the relationships to co-workers, getting the work done and having the right skills to do so, and possibly congruence with employer organization mission. Congruence may be expressed in working to produce quality food for the world an issue you believe in. Engagement has not changed much in the last three years and is only marginally better now.

Your job is to organize the series of articles you are about to write on this subject. How are you going to collect data, what data are you going to look at to benchmark your town with the rest of the country, and what thematic/objectives are you going to strive for? Will you will consider demographics like gender, age, tenure on the job, industry, race and education?

As thematic objective you are considering rapidly changing technologies and worker skills to maintain engagement and satisfaction, appropriate compensation packages, job security now and the near future and the worldwide shrinking class-gap between management and skilled workers.

Plan your article and consider what measurement are appropriate!

Chapter 1 Questions

1. In some languages the word "work" conjures up an image of duty, obligation and even pain plus exhaustion. In other languages the same world implies "to achieve something". Do you think that language influences productivity of nations on the nation level? Check out a few nations statistics!
2. The industrial age started with large populations shifts from rural living to taking factory jobs in cities. Factory jobs then shifted from simple manual labor to skilled labor in the form of lathe operators to now robot supervisors. With AI now potentially replacing repetitive middle management jobs too, how can one keep work meaningful and measurable in the future? Should we give up on the subject?
3. Will the expression "meaningful work" have the same definition twenty years from now, or did it mean the same twenty years ago? If the answer is "no", what does that imply with respect to the meaning of *meaningful work*?

2 MEASURING ARTIFICIAL INTELLIGENCE (AI) PROJECTS

"He who owns the robots will rule the world"

– Richard B. Freeman

In this chapter we start by considering:

- The little of AI history from which to derive clues for evaluating AI projects
- Seven bad attitudes to avoid when started AI projects
- What to aspire to in AI undertakings
- Ethics dos and don'ts.

The field of modern AI is relatively new and accepted measurements are few. AI applies to robotics, human engineering, machine learning, game playing, mathematical proofs, imaging, disease treatments, and all matter of classifications. Certainly, one measure clearly will not fit all. Let's at least get some definitions straight. What is billed as artificial intelligence in the media, often is no more than conventional analytics. The two points below define AI:

1. AI tries to build artifacts that *think* like humans and are simultaneously rational. That means (a) make decisions and (b) perceive reasons for those decisions. An artifact can be an algorithmic process or smart robot.
2. AI tries to build artifacts that *act* like humans and are simultaneously rational. This means performing functions people are still better at, but display intelligent behavior.

Historically one could argue that AI goes back to 324 – 322 BC when Aristotle stipulated that rule-based reasoning is the basis for drawing valid conclusions. Today, this leads to philosophical questions, such as how does the mind arise from the brain's endless layers of neurons passing, or not passing, signals between themselves, forward and backward? where does knowledge come from? how is data stored? and how do we deduce knowledge from data, the outcomes of which can be either wonderful or hideous?

Primitive AI started towards the end of World War II with the idea that networks can learn. Dartmouth, Princeton and MIT became the leading research institutions and IBM the leading corporation in this field. During the period 1950's to roughly 1970's AI generated excitement and hype with primitive software like the General Problem Solver (GPS) that displayed modest intelligent behavior. High-level list processing languages like LISP on

pattern recognition helped in classification problems. Today the language Python leads in processing large data sets in variety of formats like digits, text, videos and graphics. Python is an opensource language and easily shared. Recently, AI regained attention as the game of Chess was solved, translations between English and Russian have improved as the result of being a Cold War priority. Earlier efforts humorously translated the English phrase of "the spirit is willing, but the flesh is weak" into Russian as "vodka is good, but the meat is rotten." Revolutionary modern technologies tend go through stages, like discovery, followed by exuberance in expectations, then disappointment, and finally a more balanced approach at the right time. Similar patterns have been observed in genome sequencing and solar energy.

The following tableau is a list of applications and possible approaches on metrics:

AI Application	AI technology	Measurement Guidance
Autonomous cars and trucks	Logic, reasoning, perception, electronics	Rules of the road, safety, imposed ethics standards and law, effect on urban re-design with fewer personal cars but more delivery vehicles, development progress from cruise control to lane-keeping to supervised selfdriving to full autonomy.
Machine language translation	Neural networks reasoning, grammar, ambiguity, culture and dialect	Learning from inaccurate data can lead to the old saying *garbage in – garbage out*, No human in the decision loop is dangerous for now at least
Game playing	Searching network for options	Constraints in data storage, processing nodes in a network, volume, time to results
Robotics	Learning, perception, logic, reasoning, pysical execution	Endowed with physical effectors, robots can learn from errors, applied to vacuum cleaners, part assembly, picking, warfare
logistics	Networks, constraint optimization, warehouse automation	Military logistics, inventory and supply chain rules
Classification	Seach, neural network	Plants, self-learning algorithms predict crop failures, efficacy of medications
Rogue intentions	Neural networks, searching	Internet $1x10^9$ messages/day, Finance security, credit card fraud detection and prevention
Speech recognition	Learning syntax, searching, ambiguity, dialects	Access security, recognized accent, speech-text transcription

AI Application	AI technology	Measurement Guidance
Maching Learning	Perception, learning,pattern recognition	Adapts to new circumstances, learing the right thing, right sources, ethics and law
Voice-powered assistant	Searching and learning	Siri and Alexa are operational in cell phones, evoling and getting better
Vision	Neural network, pattern recognition, searching	Facial recognition, interpretation from space photography, security, military, self-flying aircrafts (not just drones)
Credit	Fraud detection via neural networks, pattern recognition	Findings may lead to discrimination, the law

Table 2.1 Guidance on AI Metrics

For each of the above application areas there are custom approaches. Some features of the approaches to measuring can be common to all, like starting out with an Objective Statement, stating in both English and Mathematical terms that which is to be achieved. Examples are reducing cost, making profit, gaining market share. cornering the market. One must next address the issue of whether this project is even feasible? Is the cost too high, the compute time too long, the computer storage capacity too small, and does the likely answer shed light on a meaningful insight, or is it legal?

In searching, we have to address operational questions whether the problem is memory-bound or time-bound and do-able? In a search- tree for example, the number of nodes grows quickly to make an application time – bound. At level 16, there can be 10^{16} nodes the computer has to search. Some authors have estimated that to take 350 years on a conventional PC computer.

The probability of failure must be put side-by-side with the probability of success on a continuous basis. For example, if an algorithm is deployed to pick securities in the stock market in real time, it may not work well if everybody else is using the same approach. Ethics should enter into the measuremet regime early in the project. For example, does a self driving car protect itself in favor of another party on the road? Is the our projects' objective statement intent on causing harm. Guidelines are at the end of this chapter.

- What is the probability that managers don't understand the underlying technology while charging ahead?
- What is the likelihood of drawing the wrong conclusion from the results, or rejecting the right one?
- What to believe when an AI algorithm presents an answer for which there is no good explanation?
- Since good people also live in bad neighborhoods, would the good ones be burdened with the same statistics of the neighborhood when granting of credit?

Another AI measuring problem is when dealing with non-numeric values. For example, considering a restaurant review stating that the Beef Wellington was delicious and the sunset beautiful. How to deal with those ambiguities is not to assign numeric values to "beautiful" and "delicious", but to rank them in order of preference.

AI outcome measures should be developed in accordance with rational user preferences. For example:

- An algorithmic English language tutors' performance measure should be its student score on a subsequent test.
- A part-picking robot may be judged by percent correct picks.
- An AI-based image analysis procedure can be measured by correctly identifying the number of cars in a Walmart parking lot, if that is the objective.
- A medical algorithm may be judged by how well it reduces the cost of prescribing patient-specific dosages, correctly!
- A chemical plant's AI algorithms may improve purity of the end product, plus safety and yield.

Bad Attitudes to avoid when measusring AI projects

1. *Over- and under estimating your AI projects' outcomes*: Technogies are traditionally over-estmated in the short run, and under- estimated in the long run. This pattern has been evident in wind power, solar power, genome sequencing; here society experienced revolutionary promises in the beginning only to find big disappointments. After confidence building, the redemption occurred later. It is too early to see if this pattern holds for AI as well.
2. *AI is magic*. Some AI technologies are presumed to produce magical results solely evidenced by an elder statesman of science just saying so. For instance, Long Term Capital, a hedgefund managed by Nobel Laureates Scholes and Merton, went bankrupt in 2008 with a portfolio of $126B. If a project promises to somehow be magical, one will never be able to estimate its limit. This is a wishful thinking argument, not a scientific one. Caution is advised.

3. *Draw generalized conclusions from a particlar AI result*. Let us say that an AI project has performed a task very well, and we then conclude that competence exists to perform slightly different task in similar circumstances. Not so fast! AI is very narrow in what can be done. The illogic goes something like this: (a) make an observation from which a cause-effect relationship is implied, (b) believe that this is probably true, (c) because you believe it is probably true, it is true, (d) now act on it.
4. *Language*. Nearly every technology develops its insider lingo to obfuscate the uninitiated, but also to define new concepts that emerge. That can be both good and bad. In AI we have a relatively well defined concept of machine learning, ML for short. The problem is that the word "learning" can relate from many difference sources. AI advocates will use the term losely and readers will rarely question it. But learning from inappropriate data sources leads to the old data processing GIGO concept. (garbage in, garbage out).
5. *Exaggeration*. Descriptions of AI technolgy in public media often use the term "exponential" in connection with growth of business or speed of answers. What is meant is that the AI will grow rapidly; how rapidly remains unknown unless the exponent is also stated, which it rarely is. It also implies that growth will come like clockwork, which we humans relate to by witnessing sun, moon and seasonal changes in predictable fashions. In the AI project context, rapid growth is reasonable to presume until your project hits the wall. The wall may be the fininte memory in your personal computer, meaningful data etc.The suggestion is never to used the word "exponential" without the exponent, just for clarity.
6. *AI will take over the world* and the machines we create will become malevanent and kill us all, which is the end of the world as we know it. That is the likely movie version that should easily be discarded and preferably not even mentioned. We humans will adjust to change and there will be no sudden acapolyps. This advice is in addition to the unlikely event of a "singularity", under which artificial intelligent agents develop independent feelings and emotions. However, at the United Nations, autonomous lethal weapons systems are being discussed with an eye on banning them. There is a long precedence in the ban of chemical weapons that are still being used.

We are entering a new era of technological measuremens and the following are issue to think about vis a vis appropriate metrics:

Is it really AI?

Based on the earlier definition in this chapter, we should ask ourselves two questions. First, does the artifact, robot, algorithm think and act rationally like a human? If the answer is a resounding "yes", and human control is part of the deployed process, then we are on

good grounds. Second question is, is our proposed artifact, algorithm or robot more like a Data Science application which cleverly combines internal- and external digital data and even include video, pictures, news feeds and financials? In other words, no "thinking like a human" is taking place, nor has it an "autonomous decision" to make. In this instance we better call it something other than AI!

To further elaborate on the first instance of what is genuine AI, a self-driving automobile receives signals about its surroundings and acts accordingly. Based on that it can make autonomous decisions that on balance are better than that of the human variety for reasons such as it does not get sleepy, drinks beer and it reacts faster.

On the other hand, the accounting profession attempts to hijack AI into its repertoire of offerings by wanting to get away from the annual ritual of closing corporate books and year-end auditing. The industry wants to evolve towards a continuous audit to facilitate to speed up human decision making, spotting trends, forecasting, and a real time capacity for analytics. As noble as that may be, at the end of the day, it is data processing and not artificial intelligence! But, by calling it AI, accountants may get more attention and hopefully justify higher billing rates. This effort may even suggest a hidden fear of partial obsolesce as repetitive work is subject to AI review?

Failures in AI may never see the day of light to prevent embarrassment, and some successes may be kept hidden for commercial and competitive reasons. For instance, an investment broker-dealer's "quant", (analyst) may have an algorithm that predicts impending bankruptcy of publicly traded firms based on financial ratios and forecasting models. Said quant then advised clients to short those positions. The advisor won't talk about if successful, and certainly will keep quiet if the clients loses a great deal of money.

Purpose

Ask whether your AI project is motivated by illegal or undesirable ends? If illegal, consult with your company's law department. If undesirable, one may ask from whose perspective? Monopoly may be desirable form the monopolist point of view, but undesirable for others, and it may not even be illegal. One evolving characteristic of AI is that the field lacks contextual awareness by focusing on only one target. A military robot may not be able to distinguish between enemy and civilians and may cause, what is euphemistically called, a lot of collateral damage. A government may become over-confident in its AI capabilities and decide to close options for a non-military conflict resolution. We can substitute the term "military commander" with "corporate chieftain" and not change much. If AI projects are motivated by innovation, increases in productivity, greener products, protection of natural life, customer service, human and animal health, and a higher standard of living, then we are on the right track.

Confidence

Over the last decade AI has come out of the labs and garages and is now ready for business. But the question is, is business ready for AI? For commercial firms and supply chains, being ready for AI means to be physically and culturally ready for what is now called the digital frontier. For an enterprise to be "ready", a digital transformation must be in place for workers, suppliers, customers, stakeholders to deal with new methods. In most companies today, this is not the case. Overconfidence can lead to spectacular crashes and under-confidence can lead to loss of competitiveness. Management must therefore develop a healthy balance when it comes to AI. That balance can be achieved via continuous education in methods, procedures, culture and ethics and quantification review.

Accountability

Ask the question of whether your AI project can lead to a loss of accountability? Loss of accountability occurs when an intelligent decision- making agent acts and a human being is responsible for the outcome. Such a question arises when decision-theoretic models are used for both diagnosis and prescription by a medical doctor? What is the doctors' liability for (a) ignoring the decisions or (b) following it with bad results showing up later?

Who is accountable when money changes hands in investment accounts run by algorithms, often referred robotic trading? Buying and selling liabilities are covered by trading agreements, but if these actions result in debt? Relax, an algorithm or robot, is not a person and therefore cannot own assets. However, have you met Sophia yet? Sophia is a robot in Saudi Arabia who was declared a "citizen" of that country with perhaps a greater freedom than its human variety. In the US, corporations are "persons" enjoying first amendment rights as well. Legal experts in the UK are contemplating "personhood" for robots to deal with liability.

Employment/Collaboration

Justified by cost savings alone, AI will cause havoc in employment. Throughout industrial history waves of automations have created more jobs than were replaced, albeit neither at the same skill level nor at the same time, which can be a problem for AI itself; think modern Luddite truck drivers hacking autonomous trucks! The Spinning Jenny in the 1770s made it possible to create yarn with more than one spindle at a time, Ford's assembly line auto production (1920s) made it possible for citizens to have a car and it created middle class jobs. AI is different in many respects, one of which is that it may replace middle class jobs rather than just those at the bottom of the food chain. The new job category are so-called digital workers which come with specialized skills. Facebook and Twitter are now concerned about commercial misuse of technology as in the form of fake news, pornography and theft of data. Thousands upon thousands of jobs are being created to manually filter those elements out of existence because AI can't handle that yet by itself. While this is an example of losing jobs on one side and unexpected replacement on the other, it is safe to say that major shifts are bound to occur.

In measuring a new AI project, it is wise to take a longer view with respect to social outcomes and return on investments. Plan on retaining displaced workers for better opportunities, accept project failures as learning, award risk takers, promote collaboration with industry partners for mutual benefit, and support workers with continuous retraining.

Feasibility

While material, labor and capital are considered elements of conventional projects; for AI applications we have additional aspects to consider, components like algorithm- and machine learning (ML) effectiveness. Most AI applications have human supervisors constantly monitoring autonomous decisions. Keep them! This is required to establish confidence in the application and is a cost element. Computer capacity to handle sorting and selection

of huge combinations of possibilities, the process must be executable. New data sources are required for machine learning to maintain the validity of AI decisions, and the quantity and quality of these data are critical. Staff to handling this work must be skilled and refreshed on a continuous basis.

Risk

A thorough look at the risks of failure is always useful when starting a new undertaking. For AI projects, there are special considerations to add to what is customary analysis. An autonomous AI agent, or robot, may cause unintended damages to others as well as to its creator. Every industry has experienced spectacular failures. A large chemical company in the early data processing days sent tank cars of chemicals to clients on the West Coast who did not order them, and billed others on the East Coast who ordered but did not get their orders delivered, only to find out that replacement chemicals were not available in time. Those were the early days of data processing. AI may now experience similar growth pain.

Some advanced AI applications employ vision technologies to perceive objects, followed by a language to describe what they just saw. Combining two or more technologies in one application is complex and can reach computational limits very quickly. Complexity must be considered before charging ahead.

Grand Ethics Rules for Artificial Intelligence (AI)

The AAAI/ACM New Orleans conference on Artificial Intelligence in February 2018 focused in part on coming to grips with the subject of ethics and society in Artificial Intelligence. The conference delivered several different ideas for consideration, among which are: (a) we are in the early stages and please don't expect too much (b) any standards that may be adopted are voluntary and therefore limited, (c), alignment of values among parties is ultimately necessary, (d) not all standards fit all cases, and (e) moral codes vary greatly around the planet and are hard to enforce anyway. Where do we go from here?

One can start with the observation that nature creates and recreates by trial and error and then accepts that which works and continuously moves on. One can further observe that we the people are part and parcel of nature and endowed with a wonderful brain of very finite size, only a small portion of what we do use. Said brain Artificial Intelligence is trying to understand and then augment. The objective to develop Grand Ethics Rules is to address our fear of the unknown and prevent intentional and unintentional dreadful things from happening. In fact, we want to achieve good things to happen.

For each ten guidelines, the somewhat lighthearted suggestions are twofold, *what not to do*, and *what to do* instead in that order.

1. Do not pursue a science fiction singularity, that is, trying to invent an algorithm or agent that is supposed to trigger uncontrolled successive improvements, leading to a super intelligence having its own conscience, self-awareness, and a bad attitude as well. In the belief that humans can't create anything bigger than themselves, one should not fear this from happening any time soon.

   Instead pursue incremental progress that measures positive in terms of people, profit and planet, a concept known as the Triple Bottom Line. For people increase life expectancy with quality, for the planet turn swords into ploughshares, and for profit invent systems that produce free and fair trade, financial stability, existential security and relative prosperity for all.

2. Do not even think about getting a Nobel Laureate for artificial intelligence, even if there were such a category. For the still trustworthy under- thirties, by the time they would receive a tax-free check for 1 million dollars, they will be in your 80s and its purchasing power will be one third of what it is now, if all goes well.

   Instead, recognize Aristotle's (384 BC) hypothetical copyright for having stipulated rule-based-reasoning as rational. That is exactly what we are still trying to do in Artificial Intelligence today. Also recognize Turing for defining what a computing machine is, and all the innovators in data processing since the mid 1950s who brought us from mainframes to quantum machines. Be content being one contributor among many, share new discoveries, and only coincidentally allow yourself to become rich. In the end one may achieve what Maslow called self-actualization, or the pinnacle of the human work experience.

3. Do not pursue Artificial Intelligence to promote negative values. In Artificial Intelligence terms, do not make it your work- life goal to create agents that destroy nature, animals, plant life, our society. Don't pursue machine (ML) learning based on faulty data for opportunistic reasons or blindly accept AI results that can't be explained.

   Instead, develop AI methodologies that help clean up the Internet from offensive material, like hate, spam and fraud.

4. Do not (corporate managers) exploit exuberant AI workers! The world's largest corporations working in AI create work environments that encourage collaboration and innovation, all of which is good. Their mechanism however is to provide open work spaces, unlimited tasty food and high octane caffeinated beverages, ping-pong tables, swimming pools and free health clinics on site. No wonder many millennials never leave their workspace and have no life experiences other than work. It is like cage-free chickens which never leave the open barn. In the limit, one can imagine when the best of them create super intelligent robots who (not which) eat AI workers right at their desk.

   Instead, hire gifted interns or apprentices that come to work while simultaneously getting a classic education that includes history, languages, literature, chemistry, physics, music and art, mathematics, economics and ethics among others. This could reduce the risk of a zombie humanoid being in the loop of an artificial intelligence agent gone out of control. Think train operator playing video games.

5. Do not act like you invented Artificial Intelligence. That applies to politicians, governments and their defense apparatus, public and private corporations, workers in institutions of higher learning.

   Instead, give some credit to your parents who paid for college, institutions that gave you a break, great teachers who inspired you and be thankful to work on interesting stuff while getting paid well.

6. Do not let Artificial Intelligence algorithms become malevolent. The temptation of doing harm to human beings, to a competitor, to democratic institutions, intentionally or accidentally harming nature, etc. is understandable but not defensible. Wars, having occurred since the beginning of human history, are a special case in that soldiers of opposing armies can legally kill one another. In AI, can combat robots of army (A) kill a combat robots of army (B)? Can a combat robot of any army kill indiscriminately, combatants or not?

   Instead, always keep healthy and mentally balanced humans in the AI decision loop. Legislation may eventually emerge to regulate AI, although innovation is likely to be far ahead of the law. For military AI, the United Nations may create a mechanism like the Geneva Convention which was observed by most parties during WWII. Criminals and dictators are unlikely to observe any constraints ever.

7. Do not use Artificial Intelligence to lower quality, safety or value. Many studies in AI are motivated by cost reduction that also affect safety. As when a thunderstorm turns all traffic lights green or off. Here an autonomous vehicle responds differently than a human would. A human being can bend the rules and cross the yellow line or go against traffic under unusual circumstances. Think through all possible unintended consequences. Outlaw sloppy research.

   Instead, align programmed AI decision capabilities with human values while being alert to opportunistic efforts.

8. Do not use Artificial Intelligence to acquire properties you do not own, for example, degrading the functionality of a working AI algorithm, or reverse engineer a working one for different purposes to facilitate fraud, manipulations, identity theft, bias etc. the list is endless.

   Instead, build agents for fraud detection via (ML) machine- learning and neural networks to be ahead of the opposition, and even better, remove the incentives for dishonesty.

9. Do not contribute to Artificial Intelligence hype. AI hype takes at least two forms. One, is called exponential-ism which is predicting rapid growth without stating the exponent or supporting data. The other form is inferring a general conclusion from a particular successful AI event elsewhere.

   Instead check the exuberance in AI forecasting. Industries tend to over-predict in the short term and under-predict in the long term. This pattern has been demonstrated in genome sequencing and solar energy production. Instances of this started with revolutionary promises being just around the corner, followed by disappointment in the delivery of the goods, and subsequent redemption much later. This pattern may repeat itself in AI.

10. Do not use AI solely as a means for personal wealth, fame, authority, or egocentric purposes. Hollow claims tend not to stick. Examples in business history are endless.

    Instead, and this is counterintuitive, give all your AI innovations away for free! These can be opensource algorithms, codes, or machine learning methods. You may find that the AI business is not a zero-sum game.

Ref: (4)

Case 2

For this chapter case study, please refer to the table 2.1 and identify with one of the eleven AI Applications. For the one you are most familiar with, do the following:

- For background, define the work environment you find yourself in
- Define the application objective that drives your effort for the next two years
- Work out a detailed measurement regime for your selected field
- How would you know if the objective has been achieved?
- What negative and unintended results are possible?
- What could be surprise findings that top your hopes?
- Establish ethics rules for your case that comply with the ten guidelines, and answer the question of where those guidelines come from.

Question 2

1. Assume it is 2030 and there are 30% fewer privately owned cars on the road in the cities of developed nations than there were in 2018. Electric robo-taxis have taken over much of city public transportation. How would life in cities change with respect to traffic, parking garages, gas stations, open space, accidents, quality of life?
2. Same assumption as in question 1, presume a group of citizens really get mad and hack trucks sending them into ditches, or just stand in front of several robo-taxis that are programmed not to hit people in order to cause traffic jams. What else could happen? Would you invest in automobile manufacturers today anticipating a 30% decline in private sales, but understanding that electric robo-taxis must be replaced more often to compensate for lower private car ownership of cars that are idle 95% of the time? Consider new needs for grocery delivery vehicles, for packages and pizzas. How about oil companies, parking garages, would you invest here?
3. Given the known applications listed in table 2.1, how could AI technologies compromise the constitutional guarantees of a country? and how on the other hand could AI in general help guarantee constitutional provisions? For example, more freedoms of movement for physically impaired- and older persons because of ride-sharing plus more social contacts, vs less freedom because of government surveillance. What if military applications leak into criminal hands?

3 MEASUREMENTS FOR WEB-BASED- AND PLATFORM BUSINESSES

Our deepest fear is not that we are inadequate; our deepest fear is that we are powerful beyond measure.

– Marianne Williamson

There are several reasons why this chapter cannot be an exhaustive treatment of web-based business. First, the subject is barely two decades old and moving fast and subject to change. Second, technologists look at data to optimize network performance, while commercial practitioners want to increase sales channels to their customers in the hope to create value. **Web-based** firms conduct commerce via the Internet and may, or may not, have a physical presence on the ground. These entities share web-based information and are prominent in retailing. There are subtle differences in terminology. **Platform firms** create value facilitating the exchanges between independent groups like producers and consumers. Web-based businesses share Internet information, as in Internet retailing. The Internet is the ideal product for the 21st century because it uses few natural resources to speak of, and it constantly renews itself. Value measurements used to be limited to land, labor and capital only. In our time, we can add to these measures information and intellectual property like patents and copyrights, brands; mostly enabled by the Internet itself.

Web-based businesses have developed their own language. As a result, this chapters starts with defining a few terms related to measuring performance:

1. **The World Wide Web**, also known as www or W3, is an information superhighway system of interlinked and accessible hypertext documents.
2. **Hypertext**: is composed of text, pictures, and tables displayed on a screen. It may also contain references to other pages. Those connections are **hyperlinks**.
3. **A web-browser** is software that allows the viewing of web pages.
4. **"Web analytics"** pertain to the measurement and collection of Internet data. Now who would want to measure these data and why? Merchants certainly are interested parties to find out who their customers are, and Information Technology engineers may want to optimize network performance to meet future performance criteria. By the way, those parties who take the measurements and sell the data, do not necessarily ask for permission. Virtually all governments snoop on each other

without ever having agreed to a code of conduct. It is also safe to say that Internet data collection relative to traffic and content is neither benign nor beneficial. Our own personal Internet access is generally free because we routinely and voluntarily make all sorts of data about ourselves available that the providers want more than our money. Therefore, the argument goes, we do not individually own the data about ourselves, traffic data included.

5. An **individual's web page** information is an intangible asset. Unlike intellectual properties such as copy right, web data are intangible assets and cannot be owned.

Now we get to the point of addressing web measurements, most of which fall into the category of on-site analytics like web site content, as opposed to off-site analytics that cover such items as online comments (buzz) and website potential (opportunity). As the name "on-site" implies, the measuring starts when a client connects with a web page. The driving force behind these measurements is the website owner's commercial interest. For example, the website owner wants to know what page(s) triggers sales, or the correlation between website traffic and a parallel marketing campaign. Other data sources may be email campaigns and their response rates, direct e- mail campaigns, lead generations, and click heat mapping. Heat mapping? That is the expression used for software that captures customer key strokes, website path, and tells the website owner where on a website customer can't find what they are looking for, or at what point on the webpage they abandon the shopping cart altogether.

Looking at the Internet in broad and sweeping terms, we can break down our onsite measurements into two aspects, **Log Files** and **Page Tags**. Log Files capture data routinely and are produced by the server. These data reside in the clients' computer, are dependable, and the analytics are performed by the company's web master. Page Tags on the other hand exist to identify the source of Internet traffic, an example of which is the placement of those famous cookies by which one can identify a unique user. Another data source to segment traffic is called *Internet Protocol Intelligence*, by which IP addresses' parameters identify a source by geo-locations, such as country, state, city and postal code. To all those things marketers already know, one adds the following web measurements for easy analytics:

1. **Hits**: A hit is a request for a file. Hits are considered when measuring popularity; the more hits the better! Since most websites contain numerous pages, the measure can be misleading and often overstated as each page request counts individually as a hit. It is not the best measure for counting visitors.
2. **Page Views:** A request for a file is a page in the log analysis. It may give rise to multiple hits as that page looks for pictures, for example.
3. **Sessions**: This is equal to visits. It counts the hits and page requests from one uniquely identified client within 30 minutes or less.

4. **Visitor**: A visitor is the same as a customer, or at least potential customer, hence it is very important. Visitors can be unique in that they have not made any prior visit. Repeat visitors have made at least one prior visit, identified by a cookie mentioned earlier. The same person visiting via two or more devices will count as first visit each. Customers should routinely remove cookies from their devices to maintain a decorum of privacy, although some cookies deliver a convenience. Some hotels and airlines may alter their offering by detecting repeated inquiries by one party indicating strong interest by that party.
5. **Impressions**: Each time an advertisement loads on a visitor's screen it counts as one impression, just as all ads in a newspaper count when a copy is sold, or when it is passed on. The higher the impression rate, the higher the advertising rate and it is not hard to figure out who the interested parties are in this form of commerce.
6. **Time**: Session Duration is the time a visitor spends on a website, and Page Duration is an average time a visitor spends on a page.
7. **Click Path**: This refers to the sequence of hyperlinks visitors follow on a given site, and it may imply consumer interests. A simple click is the single event of an activated hyperlink.
8. **Ratings**: Ratings are the often a trusted source of consumer confidence in e-commerce. Ratings are consumer reviews of movies or restaurants. However, ratings are easily manipulated by commercial blog writers to create buzz or online commentary.

Measuring the Internet and drawing conclusions from it is an evolving field of study and not yet precise or mature. The effort to systematically count traffic only started as late as the mid- 1990s. The matter is further complicated by the fact that cookies on personal computers can be deleted by users and that browsing can be set "in private" to make identification nearly impossible. The sum of all visitors ought to be all new visitors plus all repeat visitors, and often it is not, because a visitor is more of an Internet event than a true customer.

Given the immaturity and speed of the Internet, we are now living in a world where a 15- minute meeting is an in-depth discussion, and where the distant future covers less than 24 months. There are all manners of attempts to measure and game Internet traffic. Some researchers will attempt to capture all digital message traffic content, then classify by key word frequency, categorize as much as possible and correlate this to almost anything and then call it "brand value", and try to sell such services in the name of market intelligence. Others will design digital marketing programs to find the sales resulting from the last clicks across highly fragmented channels and then piece together a picture of customer behavior. Still other may want to compute a "Return of Influence" score from Face Book and Twitter posts. The quest is to find out who is influencing whom through prolific blogging, and how much influence those being influenced have themselves. The influence measure can be a "score", typically from 1 to 100. Measurements are not only for control of work, but also for opportunities for new information products.

Case 3

The Do-it-yourself Hospital Patients.

Presume that you are the webmaster for a community hospital in a mid- sized town. The hospital is a well- respected institution and loosely linked to 13 other hospitals, which in total employ 36,000 workers and serve a 1.6 million population. The current website has existed for years and years and it is purely informational. The site says here we are, this is what we do, come and get it! It has a nice mission statement, a letter from the CEO who has an MD degree, and whose benign picture appears on the front page.

Your job is to comply with a new directive from the Board. The mission is to change the website from being an information warehouse, to becoming a patient empowering tool. You are asked to apply web analytics and measurements towards this effort.

Ugh, web analytics? Yes, that normally means understanding how your website is being used to improve performance. While web analytics may tell you *what* is happening, they rarely shed light on *why* something is happening. Your principal job is to promote patient self-service to reduce costs by this redesigned website. By the way, you are to measure this as you report progress over the development period. The emphasis on self-service is a characteristic of the Service Industry. Self-service reduces costs for the service provider, and in this case, it promotes individual responsibility for ones' own health. Your role models are the Kaiser Family Foundation with respect to sustainable private funding, some Veteran Administration Hospital with respect to public service, and the Mayo Clinic for quality diagnostics.

Case 3 assignment questions: Benchmark relevant websites on how they do this!

1. Reduce health care cost for chronic diseases for your employer! Industry experience data indicates that for each $1.00 spent on asthma education, it is estimated that treatment costs is lowered by $17.00.
2. How well does your new website provide answers to medical questions? When people can't find answers, they may call the hospital. Your role model is WebMD.com.
3. How well is your website integrated with this hospitals' internal IT (Information Technology) system? IT after all its about automation or removing repetitive work from jobs. Can patients form peer-to-peer interest groups on chronic diseases and thereby communicate, meet and support each other? Can patients make mobile phone appointments or refill medications?

Chapter/Case- 3 Questions

1. Make video downloads available for a specific list of medical problems, education on causes and remedies, dosage on medications, conflicts with other medications and side effects. Answer the question of whether the educational content addresses the medical needs of the region! (black lung disease in West Virginia coal mines.)
2. Websites must have good subject specific contact information. Design and execute a survey to find out the top ten reasons why patients call the hospital and then provide FAQs, frequently asked questions.
3. Form private discussion groups for patients to share their experience, from the patient care system to pharmacy, to discussion groups, to video conferences, webinars for patients. Maintain a data base of valuable blogs from former patients.

4 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 in relation to rewards by scanning brain activity in spheres related to pleasure, and psychologists look at how people feel in terms of mood. Business oriented 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, undermines 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.

For translating these findings into a management-and measurement policy to help workers help themselves, consider these points:

- 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. 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 from employee initiatives.
- Form relationships that energize, and then benefit from those relationships. An introverted employee should socialize with successful sales people for positive dynamics to take place. New employees should enter a mentoring relationship with a more established person.
- Taking insights from the work place into family life, 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, 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.

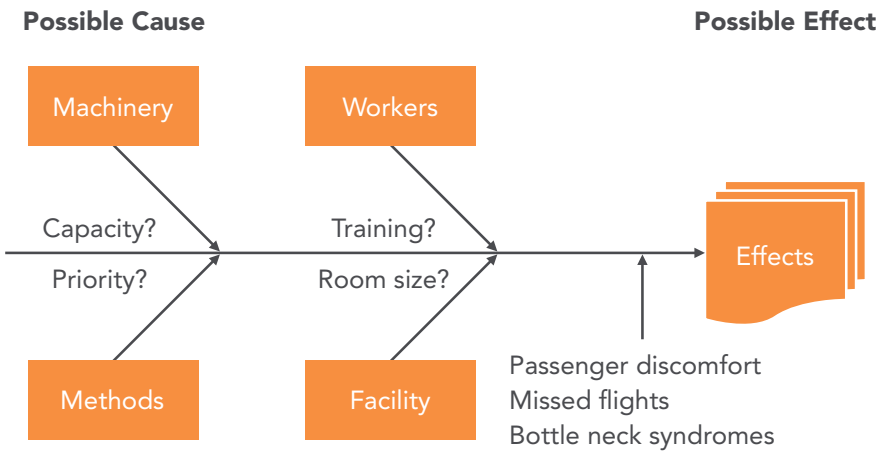
The average person on the street can be confused about how to handle cause and effect situations. For example, say a tabloid reports that teenagers who read at least one book a month tend to wind up earning more money at age 30, than those who read less or not at all. The implication is that reading 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 in their life time. 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 consider **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. For example, 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 running on schedule, arriving on time it would be difficult.

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, a business approach to achieve quality. It helps us identify probable causes after we have identified an effect which cause is not apparent. 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 for consideration. The objective is to narrow the possible cause.

Fisch-bone Diagram for Airport Security



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 calculations.

Indexing

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 is set at an arbitrary reference value of 100. Indices are constructed, invented and redefined to fit a given need. The United Nations Human Development Index (H.H.I.), 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:

$$\text{CPI} = \sum_{i=1}^{n} \text{CPI}_i \ * \ \text{weight}_i$$

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, 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 of the day 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 is always a possibility.

Case 4

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 enterprises. 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 workers. 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 loser to buy the winner 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 = $\sum$ (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	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	(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. That is the case principally 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 tangible 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

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 must our measurements. The time to rethink performance measures in business and in private life is now!

For measurements to be appropriate, they must be support the organization to which these measurements are applied.

Taking measurements should come before making decisions. 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.

Experiencing a meaningful work-life is easier to achieve than believed by the public. It is the sum of frequent positive life experiences rather than a rare good luck event. It can be understood by the opposite, that is, defining what is not meaningful. The rest will fall in place

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

Relatively 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.

For artificial intelligence measurements to have been established, the time is too early.
For artificial intelligence measurements to think about, the time is now.
Ethics and governance in artificial intelligence are important

Absence of ethics and governance in artificial intelligence can be a huge problem.
Principles to guide AI project ethics are offered for consideration in this book.

New is the field of social media where the movement is away from capturing "eye balls" to paths to purchase in a social medium. It is about how people virtually connect in a social medium and then affect outcomes in the real world.

Next Steps

1. Everybody everywhere is now talking, writing and thinking about Artificial Intelligence.
2. The thoughtful reader should start talking, writing and thinking too.
3. Plan to do both well and good in defining your next great ambition.
4. Zero-in on one or more outcome objectives for the enterprise, and yourself.
5. List possible measurement criteria, sources of data for right now and then later, process analytics like machine learning, possible insights to augment better decisions, human control to remain human.
6. Contemplate what could go wrong.
7. Get a blank piece of paper and start writing.
8. Be serious without taking yourself too seriously.

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