

## MEASURE AND MANAGE: INTANGIBLE ASSETS METRIC STANDARDS FOR SUSTAINABILITY

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### *Abstract*

*To be feasible as components of a business model, social and environmental sustainability practices must be accountable for their returns on investment. Sustainability hinges on the comprehensive, long-term management of all the forms of capital necessary for profitability. Management, in turn, depends heavily on standards—measurement, legal, and financial standards essential to common product definitions, to proving ownership, to pricing, to knowing the quantity and quality of what is traded, and to evaluating where the business stands, where it has been, and where it is going relative to its overall objective. Counts and percentages of events, assessment ratings, or survey responses are often treated as sufficient to the task of measuring sustainability performances and outcomes in business. These kinds of numbers are the obvious and natural place to start in conceiving and designing measures of the intangible assets, performances, and outcomes essential to sustainability. Multiple benefits accrue from building on these intuitively sound beginnings to calibrated tools and universally uniform standards better able to serve the needs of sustainable business practices. Foremost among these benefits is the fact that measures adaptable to the changing needs of business will better support stable profits sustainable over the long term than measures that require business to adapt to their needs.*

### INTRODUCTION

Standards work constantly behind the scenes making life safer and more convenient in nearly all areas of everyday existence. The role of

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standards in business is so fundamental that they may be described as the conditions for the possibility of economically profitable enterprises. Pidgin languages emerge in markets where different cultures interact and communications must be established. Archeology shows that the earliest forms of writing were business accounts (Ifrah, 1999). Beyond the standard forms of spoken and written language, everything from air, water, and food to buildings, clothing, automobiles, roads, appliances, and electricity are produced in conformity with voluntary consensus standards of various kinds. More than 100,000 standards in the United States specify product and system features and interconnections, making it possible for consumers to purchase products of all kinds with confidence. For instance, though few, if any, among us think about it at all, knowing that electrical appliances are configured to tap the power grid with the same results no matter where they are plugged in simplifies life significantly and in economically profitable ways. Sustainable business practices and profits will come into their own as institutions in their own right when the relevant classes of standardized measures and common product definitions are in place.

### Standards and Markets

Widely adopted standards expand the sizes of markets and make businesses more sustainable over the long term. Consider how complex and unpredictable appliance manufacturing would be if electrical power was not standardized at specific voltage and amperage levels. What if each producer had to choose between making appliances that would work across different standards, or that would work only within one particular standard? What if different voltages were sometimes delivered from the same shaped outlets, and sometimes the same voltage was delivered from differently shaped outlets? The configuration and assembly of motors, cables, wires, capacitors, plugs, and outlets would all be vastly more complex than they are now. Product failure would be more common, quality would suffer, there would be less variety, and customers would likely more often ruin their purchases by burning out motors. Further, some manufacturers could take unfair advantage of the situation, influencing *de facto* standards as a source of leverage for increasing market share and forcing competitors out of business.

Standards provide a sense of a shared history and a common vision of the future, both of which are needed for aligning and coordinating the investments of all stakeholders in any given industry. As described

by Miller and O'Leary (2007), the paradigmatic example of a technology roadmap is Moore's Law, which asserts that the number of transistors placed on computer microprocessor chips will double every two years, at no change in price and with associated increases in processing speed. Though estimates of the doubling period have changed over time, from one to two years to, most recently, three years, since 1965 Moore's Law has defined the expectations of computer industry manufacturers, suppliers, and customers.

In the same way knowledge of the ubiquitous availability and inexpensive pricing of standardized electrical power informs the appliance manufacturing industry, Moore's Law assures computer manufacturers of an ongoing trajectory of standardized new product innovations marketable to an identifiable customer base. To be viable, business innovations focused on social and environmental sustainability will require an array of new standards that can be relied on to structure expectations and inform the making of markets. How such standards might emerge can be illuminated by examining the origins and characteristics of existing standards more closely.

### Standards, Private Property, and Measurement

Firms voluntarily engage in consensus standards processes facilitated by groups such as the American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM) International, the Association of Home Appliance Manufacturers, and many others. They do so because of the value standards confer on products and because the expense involved in developing effective standards would outstrip the resources available in even the largest companies. Currently, common product definitions and standard weights and measures pertain exclusively to manufactured goods and property, which includes patents and copyrights. In these domains, management focuses closely on the measured characteristics that make products what they are. More efficiently managing the length, weight, volume, voltage, resistance, BTUs, horsepower, kilowatts, color, and so on of every individual product in the context of universally uniform standards is often the crux of the innovations that make products profitable and drive an industry forward.

This is a key point. Individual manufactured products and privately owned properties each exhibit characteristic measured amounts of key components that are expressed in standard terms. The location and dimensions of a real estate parcel define it in a way that sets it apart from all other real estate parcels. The geometric coordinates

identifying a piece of property are incorporated into the legal title in such a way as to make ownership of that property defensible in court and financially leverageable. Serial numbers, patents, and copyrights provide similar degrees of proof of ownership for other kinds of property. Measurement standards and common product definitions like these *systematically* make individual investments and trade possible by reducing market frictions, facilitating communication, and generally greasing the wheels of commerce (Ashworth, 2004; Barzel, 1982; Benham & Benham, 2000).

Capitalism relies fundamentally on individual-level proof of ownership—both of private property and of the profits that may be reaped from investments in it. This is true at both the level of the entrepreneur starting a new venture and the level of the nation desiring economic prosperity (Bernstein, 2004; De Soto, 2000). The fall of the Soviet Union shows that collective ownership with no private interest or profit provides no incentive to enterprise, and so fails as an economic system as badly as systems offering no form of private ownership at all, which has effectively been the case in many emerging economies until recently.

#### SUSTAINABILITY AS A FUNCTION OF COMPREHENSIVE CAPITAL MEASUREMENT AND MANAGEMENT

Manufactured goods and property, however, are just one of the four major forms of capital necessary to a functional economy (Ekins, 1992; Ekins, Hillman, & Hutchison, 1992). A comprehensive look at the total volume of all capital under management must include the resources, living systems, and ecosystem services in nature; human abilities, motivations, and health; and the social sphere of trust, loyalty, and commitment. These forms of human, social, and natural capital are absolutely essential to economic productivity but are not measured or managed with the same universal uniformity and accessibility that manufactured capital and property are.

Considered in terms of the total volume of resources necessary to economic productivity, it would appear that less than 10 percent of the capital under management is associated with satisfactory measurement standards and common product definitions—that is we lack the standards needed for certified and defensible individual-level ownership and pricing for over 90 percent of the capital under management. It may be that the economic crises of the early twenty-first century have been caused largely by the lack of scientific, legal, and

financial standards for managing the vast majority of the resources at risk. When those standards are lacking, and, worse, when few are even aware of the need for and viability of such standards, inefficiencies, confusion, fraud, and missed opportunities are the inevitable result. This unfortunately is the case for the various forms of human, social, and natural capital (Fisher, 2009a, 2009b), as recent history shows.

The question is, could scientific, legal, and financial standards related to universally uniform quantitative measures of amount for these forms of capital reduce frictions in these markets and create an environment in which supply and demand are matched more efficiently? Is it possible that the basic principle of capitalism, that the improvement of the social welfare is more systematically accomplished by harnessing the energy of the profit motive, might be more effectively realized if all the forms of capital essential to a functional economy were put on the books? Instead of homogenizing individual differences in group-level statistics in the name of top-down impositions of policy, what if individual differences were themselves quantified so as to inform a grassroots-level process of collective decision making? Though these questions may sound audacious, what if there are good answers to them? What would be worse, failure due to insufficiently bold vision, or failure in the wake of subjecting wild hypotheses to careful tests?

#### Evidence of a Basis for a New Class of Standards

Measurement theory and practice (Andrich, 1988, 2010; Bond & Fox, 2007; Rasch, 1960; Wilson, 2005; Wright, 1977, 1999) have, however, advanced in recent decades to positions from which one can envision standard measures and common definitions for the outcome products of industries such as education, health care, social services, human resource management, environmental management, hospitality, and so on (Fisher, 2009a, 2009b, 2011a, 2011b; Fisher & Stenner, 2011a, 2011b). It is a mistake to think that universally uniform measurement of abilities, health, motivations, trust, performance, and so on, is impossible. Though “you manage what you measure,” measurement, instrument calibration, and traceability to metrological standards are not generally well understood outside of relatively small technical communities. Superior, relevant, and accessible scientific methods of instrument calibration and standards development are commonly left unnoticed and unexplored when business managers seek some way of quantifying a process, performance, or outcome.

A firm basis for implementing these methods has, however, been established in many substantively well-informed measurement efforts mounted in response to the needs for better measurement. Such efforts include proposals for genuine progress or happiness indexes as alternatives to GNP/GDP (Anielski, 2007), the Sustainability Impact Assessments developed in response to the World Trade Organization's policies (Ekins & Voituriez, 2009), or the United Nations Millennium Development Goals (IMF Staff, 2002). These major projects, like the vast majority of smaller-scale measurement projects mounted within various firms and industries, take the first steps toward satisfactorily addressing the technical demands of instrument calibration, metrological standards, and the assessment of conformity to common product definitions.

These initial steps are based in valid intuitions but stop with group-level statistical treatments insufficient to the tasks of establishing private ownership of human, social, and natural capital stocks, and of facilitating sustainability as a function of comprehensive capital measurement and management. Instead of statistical models of nonlinear group-level associations among variables, what are needed are measurement models of linear individual-level associations within single variables. In business management terms, the difference between statistics and measurement is analogous to the contrast between multi-valued and single-valued corporate objective functions.

### The Corporate Objective Function

What is a single-valued corporate objective function? Jensen (2001) contrasts it with multiple-valued functions, as represented by diverse stakeholder interests, double- and triple-bottom-line accounting, and the balanced scorecard. In a reframing of the problem of balancing mission and margin, Jensen recognizes that "it is logically impossible to maximize in more than one dimension at the same time unless the dimensions are what are known as 'monotonic transformations' of one another" (pp. 10–11). Of course, if different variables are nothing but linear transformations of one another, they are, in effect, a single dimension that could be measured in a common unit. Evaluating monotonicity and unidimensionality can be very complex. Data from multiple indicators that appear uncorrelated, inconsistent and multi-dimensional from one point of view may seem monotonic and invariant from another (Andrich & Styles, 1998).

Fundamental measurement theory sets the stage for an alternative to the unilateral imposition of an ultimately arbitrary definition

specifying how trade-offs among various dimensions are to be decided. Probabilistic measurement models based in principles of invariance, statistical sufficiency, parameter separation, and so on. (Andrich, 1988; Bond & Fox, 2007; Rasch, 1960; Wright & Stone, 1999) facilitate balanced and mutually informative mediations of the relations of theory, data, and instruments (Ackermann, 1985). Instead of legislating trade-offs in ways that pit the interests of different stakeholder interests against each other, factual, theoretically tractable, and instrumentally mediated information might show the way to new opportunities for consensus on efficient, consistent, and sufficient trade-offs.

### Standardized Mass Customization

In the history of capitalism, scientific rationalism stands alongside private property, capital availability, and communications and transportation networks as one of the four structural prerequisites to prosperity (Bernstein, 2004). Probabilistic models for fundamental measurement (Andrich, 1988; Bond & Fox, 2007; Rasch, 1960; Wright, 1999) provide a framework in which forms of universally uniform, standardized quantitative information can be conceived, designed, evaluated, and implemented. These models offer a wide range of important advantages to measurement, including individualized measures, item calibrations, uncertainty estimates, and model fit indices; linear units, the equating of different instruments measuring the same thing, the conjoint scaling of different facets (such as the persons measured, the items scaled, rating categories, judges varying in leniency or harshness, etc.), and the mapping of a substantive, qualitative ratio amount on a number line. But for the purposes of defining and implementing a single-valued corporate objective function, perhaps no other feature of these models will ultimately prove more important than their capacity for mass customization.

In tailored testing, also known as computer adaptive testing, test questions are selected from a precalibrated bank in a way designed to produce the optimal measure. Tailored tests and item banking date to the 1960s (Choppin, 1968, 1976; Wright & Bell, 1984; Wright & Douglas, 1975). In the last two decades, item banking and adaptive instrument administration have been incorporated in applications across a wide range of fields (Bergstrom & Lunz, 1994, 1999; Haley, et al., 2009; Linacre, 1999; Riley, et al., 2007; Velozo, et al., 2008; Wendt & Tatum, 2005; Wouters, et al., 2009). Given a large bank of previously calibrated items, test, survey, or assessment

administration can be individualized by basing item selection on the increasing amount of information provided by the examinee in each response to a new question. Measures are estimated as a function of the difference between the examinee's measure and the difficulties of the particular questions answered. Thus, when those questions are calibrated relative to hundreds of other, unasked questions, the comparability of the resulting measures is not compromised by the fact that the same count of correct answers might be obtained by examinees of very different abilities responding to items of very different difficulties.

Subsequent to its origins in educational measurement, this principle was applied in the context of functional assessments and patient surveys in health care (Veloza, et al., 2008; Wouters, et al., 2009). Further extensions of the principle can be imagined as unifying all of the various domains implied in the definition of an overarching corporate objective function. Managerial accountability would be strengthened in the way that the calibration order of assessment items on the ruler delineates a hierarchy of tasks associated with increasing probabilities of successful value-creating behaviors. This formative inference and application of the measure is made in the context of reading tests, for instance, which obtain diagnostic value when measures are interpreted as indicating where on the item hierarchy a student's measure falls, and what lesson content could next be most productively addressed (Stenner, et al., 2006).

The relevance of any particular item in the measured hierarchy is in no way compromised by its absence from the test actually administered to a given student. This is because the continuum of less to more is not defined in a way that is dependent on the actual content of the particular items administered. The measurement continuum is instead defined by the way all items consistently represent the abstract meaning of the construct as it manifests itself up and down the scale.

Similarly, a unitary corporate objective function might combine information from a wide range of interlinked assessments, such as those already included on the balanced scorecard or in double- and triple-bottom-line accounting. Before proceeding in this direction, care must be taken to design the instrument in accord with those principles most likely to result in successful calibration of the desired tool (Meijer & Nering, 1999; Wright & Stone, 1999). In all likelihood, though much of value could be learned from existing data gathered using instruments not designed to measure in one common

dimension, assuming that these data tell the whole truth would be a mistake. One of the major shortcomings of most approaches to social scientific measurement is that validity is primarily determined in terms of the content or face validity of the questions asked (Cherryholmes, 1988). Expert status is elevated at the expense of entering into a closer dialogue with those measured and with the consequence that complex statistical models describing ephemeral data-dependent intervariable interactions are favored over simple measurement models prescribing invariant intravariability. Thus, existing double- and triple-bottom-line data, or balanced scorecard data, might be useful in identifying both promising starts at and violations of the needed unidimensional consistencies, but it would not likely be sufficient to the ultimate task of delineating a unitary corporate objective function.

Of vital importance in arriving at a single-valued corporate objective function are the distinctions between true and false individualism (Hayek, 1948), and between measurement and statistics (Andrich, 1989, 2002). Measurement mathematically models the processes of socially contextualized individuals at the individual level *within* variables, whereas statistical models are concerned with individuals only as unexamined and wholly interchangeable components within processes taking place at group or population levels *between* variables. When data fit a measurement model prescribing the quality of the observations needed for the meaningful definition of a unit of comparison that remains constant across the particulars of the questions asked and responses given, what has in effect occurred is that the metric functions as a common currency for the exchange of value within this particular locally defined market.

### Stakeholder Theory and Efficient Value Seeking

Where Jensen (2001, p. 21) sees stakeholder theory playing "into the hands of special interests that wish to use the resources of corporations for their own ends," the failure of corporate interests to put externalities on the books as forms of fungible, accountable, and manageable capital—or even to make credible efforts at doing so—prompts a different take on the situation. The failure to create scientific, legal, and financial standards systematically prevents market forces from acting efficiently on the supply of and demand for human, social, and natural capital. The lack of relevant instruments for representing and exchanging the value of these forms of capital, the lack of prices for

standardized unit amounts of them, and the lack of relevant property rights together condemn human, social, and natural capital transactions to highly inefficient markets external to the primary capital markets. Stakeholders, then, have had little they can do but to employ nonmarket mechanisms and the best local information they can marshal to reallocate wealth. In other words, as long as corporations act as externalizing machines, social justice demands the reinternalization, to some degree, somewhere and somehow, of what is externalized. Perhaps the time will soon be upon us when all stakeholders can represent their interests together relative to standards designed to facilitate comprehensive management of all the forms of capital essential to market functioning.

### CONCLUDING COMMENTS: REINVENTING CAPITALISM

The failed communist and socialist experiments of the twentieth century teach us that the ownership of personal property and the rewards that accrue from its proper management are essential foundations of successful value-seeking behavior (De Soto, 2000). Private property is essential to making markets function as well as they do, and to the processes that have raised standards of living for billions globally.

That said, as Jensen rightly points out, the current system is so wildly inefficient as to make stakeholder theory ultimately self-defeating. Others doing related work have estimated that, at the typically realized rates of value creation, most philanthropic efforts, for instance, will take thousands of years to reach their goals (Goldberg, 2009, pp. 11–12). But what would happen if tax-supported social welfare institutions were replaced by minimum social and natural capitalization requirements? What if human, social, and natural capital markets were made more efficient by measurement systems that dramatically reduced transaction costs and provided a basis for new property rights? What if the ongoing debates over financial accounting standards were augmented with (a) experimental comparisons of adaptively configured principle-based measurement approaches versus rule-based statistical approaches to human, social, and natural capital, and (b) standards networks embodying collective intentions in efficient markets (Okamoto, 2011; Robson, 1992) for these forms of capital? What if investments in all forms of capital could be balanced and traded off in ways that prevent anyone from profiting too exclusively in just one area?

The business case for measurement standards is as old as capitalism itself. Adam Smith pointed out how important uniform measurement systems are to obtaining the information needed for fair trade (Ashworth, 2004, p. 1314). More recently, Berk (2009) described three core areas in need of formal measurement processes, and cited research showing “that a group of companies with high learning and development measurement acumen outperformed the Standard & Poor’s 500 Index in terms of share price appreciation by more than 15 percent.”

But when it comes to human, social, and natural capital, it seems that value seekers in business need to learn this lesson of private property as much as stakeholder theorists do. Jensen speaks of preventing managers and directors from taking advantage of stakeholder theory to minimize their own accountability, but he stops short of the logical consequences of this position. If maximizing the value of private property is the best way to maximize social welfare, why is it that almost no one anywhere has the slightest clue as to how many shares they own of health, literacy, community, or environmental capital stocks, or what their current market values are? If value seekers are to continue expanding their supposed boon to humankind, when will capitalism represent all forms of capital in the fungible and transferable currencies of scientifically calibrated instruments? There are indeed numerous “difficult issues associated with specifying the trade-offs among multiple goods and bads that determine the overall score for an organization’s success” (Jensen, 2001, p. 21).

In the same way that the business world has not taken advantage of tools of longstanding availability, so, too, have social scientists failed to prioritize standards and to create links with commercial enterprises. This latter situation may be changing as social measurement research presentations increase at the meetings of groups like the International Measurement Confederation (IMEKO), a society of metrology engineers, physicists, chemists, and biomedical laboratorians (Conference note, 2011), and as organizations such as the National Institute for Standards and Technology (NIST), the National Science Foundation (NSF), and the Society for Standards Professionals publish papers advocating the establishment of new standards programs (Fisher, 2009b, 2012; Fisher & Stenner, 2011a).

With that start at a new dialogue between the natural and social sciences, the United States and international standards development communities have shown their interest in exploring possibilities for a new array of standard units of measurement, standardized outcome

product definitions, standard conformity assessment procedures, and outcome product quality standards. Ultimately, however, the creation of voluntary consensus standards is the concern of those who stand to benefit most from them, the virtually 100 percent of us who care about making economic prosperity contingent on the realization of human potential, the coherence of community life, and the quality of the natural environment. Reiterating once again Rasch's (1960, p. xx) insight concerning measurement, we can acknowledge with him that "this is a huge challenge, but once the problem has been formulated it does seem possible to meet it."

### CHAPTER SUMMARY

- Standards of various kinds, from common languages to technical specifications to legal ownership rights and financial norms, are essential to the creation and efficient functioning of markets.
- Private property is fundamental to capitalism. History shows that economies flounder unless investors can own returns on their investments. Scientific, legal, and financial standards are essential to market-wide proofs of ownership and comparisons of value.
- Sustainability is a function of comprehensive capital management and measurement. The long-term sustainability of profits requires standards for the measurement and management of all four of the forms of capital essential to a functional economy.
- Scientific research conducted over the last 50 years has established the viability of a new class of uniform measurement standards relevant to the management of intangible assets, such as human, social, and natural forms of capital.
- The advantage of the single-valued corporate objective function over multivalued forms of that function (balanced scorecards, double- and triple-bottom lines, etc.) lies in its capacity to focus managers' attention on clearly defined responsibilities.
- Standardized mass customization measurement methods, like tailored testing and computer adaptive instrument administration, offer a superior technical means of testing the viability of, and possibly implementing, single-valued corporate objective functions.
- Capitalism may be less in need of reinvention than of completion. Applying known principles of private property, scientific rationalism, capital availability, and networked communications and transportation to those forms of capital lacking uniform standards of measurement and ownership may be essential to resolving outstanding economic issues.

### CASE STUDY

When all instruments measuring the same thing are equated to a shared reference standard, local markets are generalized to contexts far larger than those defined by the administration of individual tests, surveys, or assessments. The Lexile Framework for Reading, a measure of literacy capital (Stenner, 2001; Stenner, et al., 2006; <http://www.lexile.com>), is an example of how social measurement methods have informed the creation of a new market within the education industry. Because we do not typically systematically test for general market contexts in research on intangible assets, apparently irreconcilable differences arise between different stakeholders invested in different aspects of the returns produced as the outcomes of managerial enterprises.

The Lexile Framework is the first example of an efficient market for human capital, though it is still in an early phase of development notable for its lack of individual rights to the ownership of the measured property. The Lexile unit of measurement is, however, functioning as a mediating instrument or object informing "those practices that frame the capital spending decisions of individual firms and agencies, and that help to align them with investments made by other firms and agencies in the same or related industries" (Miller & O'Leary, 2007, p. 701). An analogy with Moore's Law can be made, on the basis of the increasing numbers of reading tests measuring in Lexiles and of students whose reading abilities are measured in Lexiles, and which are matched by teachers to books and articles with known reading complexities.

The predictability of a trajectory for the emergence of increasing numbers of precision measures allows the specification of a law capable of shaping fundamental expectations as to increases in the power and complexity of psychosocial measurement technology, and the timing of those increases. This practical law is applicable to business relationships in a manner analogous to the way the basic law describes scientific relationships. For instance, the definition of work in engineering mechanics is of little immediate interest in gauging the economic value of labor. But despite the lack of immediate relevance, the practical utility of the widely used horsepower measure of engine pulling capacity depends on the scientific validity of the proportionate relations between mass, force, and acceleration in Newton's laws. Improvements in engine performance invariably conform to those laws, making them highly useful in projecting the consequences of changes in engine design.



The same simultaneous instantiation of scientific and economic value must be possible for instruments in any industry to mediate relationships in ways that can effectively and efficiently coordinate capital budgeting decisions. Thus, the Rasch Reading Law defines literacy capital in a form amenable to both scientific theorizing and to down-to-earth decisions about effective resource allocations in the classroom. In scientific terms, this law describes invariantly proportionate ratios between reading comprehension, text complexity, and reader ability (Burdick, Stone, & Stenner, 2006; Stenner, et al., 2006). As text complexity increases (the words used become less commonly encountered, and sentence length increases), reading comprehension rates decrease relative to a fixed reading ability measure. Conversely, given a fixed text complexity, reading comprehension rates increase as reading ability increases.

The practical value of this law is realized insofar as it then becomes possible to employ it productively in both (a) representing students' reading abilities in summative accountability measures and (b) intervening in ways likely to change those measures in formative instructional applications (Alonzo & Steedle, 2009; Chang & Chan, 1995; Kennedy & Wilson, 2007; Leclercq, 1980). Concerning the latter, it is well understood that learning is inherently a matter of leveraging what is already known (the alphabet, numbers, words, grammar, arithmetical operations, etc.) to frame and understand what is not yet known (new vocabulary, constructions, specific problems, etc.). It is therefore vitally important to target instruction at the sweet spot where enough is known to support comprehension, but where what is not known is still substantial enough to make the lesson challenging. This range along the measurement continuum just above the student's measure is known as the Zone of Proximal Development (Vygotsky, 1978) and is valued for indicating the range of curriculum content the student is developmentally ready to learn (Griffin, 2007). When measures are appropriately targeted, learning is maximized and measurement error is minimized. The same kind of strategy has proven useful in prescribing rehabilitation therapies (Chang & Chan, 1995) and likely has other as yet unexplored applications.

Targeting must be a key element in any future technology roadmap for education. Though there is no substitute for attention to other substantive aspects of the educational process, this indicator is of potentially central importance as a summary indicator of how accurately and precisely educational outcomes are represented, and how efficiently instructional interventions are implemented.

Rasch measurement isolates and focuses attention on empirical and theoretically tractable test item difficulty scale orders and positions. Then it estimates student abilities relative to that scale and describes them in terms of the probabilities of successful comprehension up and down the scale, whether or not all of the items potentially available have actually been administered. The goal of education, after all, is not to teach students only how to deal with the actual concrete problems encountered in instruction and assessment. The goal is rather to teach students how to manage any and all problems of a given type at a given level of difficulty.

Though a dialectic between part and whole is necessary, we cheat students and society when education becomes fixated on particular content and neglects the larger context in which skills are to be applied. The overall principle is effectively one of mass customization. Instruction and assessment, or any bidirectional method of simultaneous representation and intervention, benefits from forms of quantification coordinating substantive content with metrics that remain stable and constant no matter which particular test, survey, or assessment items are involved. The same principles apply in any other enterprise focused on intangible outcomes, such as health care, social services, or human resource management. We short change ourselves by failing to demand mediating instruments enabling a kind of virtual coordination of improvement, purchasing, hiring, and other investment decisions across different individuals, firms, agencies, and arenas in the economy. The architecture of probabilistic models open to the integration of new items and samples embodies the principles of invariance characteristic of the mediating instruments needed for aligning legally and geographically separated firms' decisions within a common inferential framework.

Of course, even though it has been almost 60 years since Rasch (1960) first did his foundational research (Andrich, 1988; Bond & Fox, 2007; Wright, 1999) on reading, integrating assessment and instruction on the basis of the Rasch Reading Law is not yet the norm in educational practice. Accordingly, most instruction is not integrated with assessment, and few examination results are reported so as to illustrate the alignment of a developmental continuum with the curriculum. Furthermore, and more specifically, most reading instruction is not appropriately targeted at individual students' Zones of Proximal Development. This is problematic, given that reading abilities within elementary school classrooms can easily range from two grade levels below to two grade levels above the reading difficulty of the textbook.



Figure 3.1, patterned on the second figure in Moore (1965), describes what may be referred to as Stenner's Law: the expectation that the number of precision reading measures estimated will double every two years, with no associated increase in cost. The number of measures made per student each year increases as reading curricula targeting reading materials at student-specific reading levels are brought on line. Figure 3.1 has historical validity in that the line begins not long after the 1960 introduction of Rasch's work in Chicago, is in the range of 350,000 in the 1970s, during the Anchor Test Study (Rentz & Bashaw, 1977), and was about 20–30 million in the period of 2005–2008, which is approximately how many measures were being produced annually at that time by users of the Lexile Framework for Reading (Stenner, et al., 2006).

Other projections of this kind analogous to those provided by Moore (1965) and to those subsequently developed within the microprocessor industry (Miller & O'Leary, 2007) may come to serve as a platform for new innovations in industries dominated by investments in human, social, and natural capital (Fisher & Stenner, 2011b).

### QUESTIONS

1. Sustainability is often conceived in a fragmented way focused on the effects and consequences of specific products, manufacturing processes, or policies. How might the expansion of market principles to include forms of capital traditionally externalized change the dialogue about sustainability?
2. Measurement in human resource management, organizational performance assessment, customer relation management, and so on is typically conceived as a local problem addressed via item-specific statistical analyses. How might reconceiving these measurement problems globally in terms of industry-wide standards change the outcomes of decision-making processes?
3. Jensen (2001) suggests that the multivalued corporate objective functions embodied in balanced scorecard and double- and triple-bottom-line accounting methods provide managers with handy excuses for avoiding responsibilities concerning the ongoing viability of their organizations. How might technologies such as item banking and adaptive instrument administration support the alignment and coordination of those functions essential to sustainable profits?

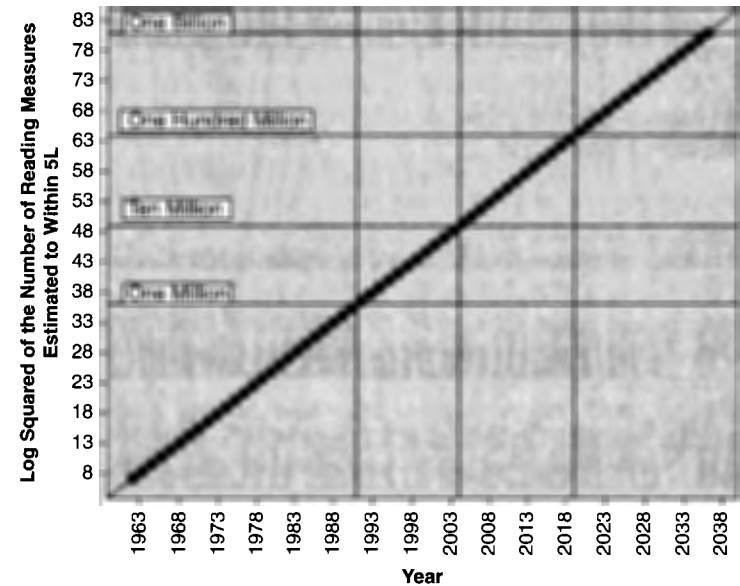


Figure 3.1 Rate of Increase in Number of Precision Reading Measures Estimated.

4. Textbook and curriculum producers in the education industry have an increasingly strong basis for confidence in steady increases to the numbers of precision measures made of students' reading abilities and of book and article reading complexities. How might a plot like that shown in figure 3.1 (above) function in the education industry the way Moore's law has in the microprocessor industry?

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# BUSINESS ADMINISTRATION EDUCATION

CHANGES IN MANAGEMENT  
AND LEADERSHIP STRATEGIES

Edited by  
**JOAN MARQUES,**  
**SATINDER DHIMAN,**  
and **SVETLANA HOLT**



"A winning package of paradigms that can help us attain greater quality of life for all living beings!"

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A dynamic collaboration of experienced scholars, this timely work shares their rich blend of experiences and insights on emerging paradigms. They call for greater awareness and explore effects of change in education, and analyze the global context and the future. This multifaceted work will assist students, scholars, and practitioners in attaining and maintaining excellence in an evolving world.

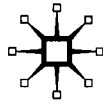
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BUSINESS ADMINISTRATION EDUCATION

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Disclaimer: This book is a compilation of ideas in chapter format, contributed by different educators who represent a variety of disciplines and backgrounds. It should be noted that each chapter reflects the views of the contributing author and not necessarily of the entire contributing group or the editors.

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## FROM THE EDITORS

This book is the fruit of collaboration among 12 experienced scholars, who understood the necessity to change paradigms, and enrolled in a postdoctoral program focused on management and marketing. Their reasons were as diverse as their backgrounds: some had been involved in management teaching for a long time, while others had been focusing on philosophy, sociology, linguistics, and a number of other disciplines. In 2010, they met for an intense “Bridge to Business” training, which they jokingly labeled “boot camp.” Through their hard work and sleepless nights, a warm friendship of mutual respect, personal and professional support, and shared learning emerged, and *The Dirty Dozen* as they fondly became known by their course facilitators, decided to continue their relationship, and convert it into a product that would entail a blend of their old and new passions, their experiences, their awareness of change in business, education, and the global society as a whole. Their most important aim was to share this product with those who, like them, wanted to expand their horizons on the changing worlds of business, education, and the global society.

When, therefore, the idea for a book with 12 chapters emerged, all members of the team were elated. Unfortunately, three of the members were unable to actively participate, but their support and spirit are included here as well.

*Business Administration Education: Changes in Management and Leadership Strategies* is divided into three parts, all centered on the common theme of emerging paradigms. Part 1, “Emerging Paradigms in Business Management,” invites readers to consider leading with greater awareness from here onward, be it in personal or in professional settings. This part particularly calls for a holistic view on internal as well as external stakeholders and refrains from mindlessly accepting the status quo. Part 2, “Emerging Paradigms in Business Education,” explores the effects of change in the educational environment, first explaining the essence of empathy and emotional

intelligence in today's professional performance, then continuing and illustrating how these aspects could be included in business education. Part 3, "Emerging Paradigms: New Horizons" includes the global context, first, by providing an overview of the many dimensions of change that happened at this level and, subsequently, by focusing in on more specific topics such as the influence of cultural ideologies on ethical performance and notes on entrepreneurship. This final part ends with a view on the future by way of an illustrative analysis of the upcoming workforce: the Millennials.

*Business Administration Education: Changes in Management and Leadership Strategies* is dedicated to all 12 members of *The Dirty Dozen*, their course facilitators at Tulane University's A. B. Freeman School of Business, most notably their program coordinator, "Captain" Victor Cook, and all scholars and practitioners who will read this work and hopefully generate some positive insights from it. We hope that our collective effort will assist you in successfully reaching your goals in life, and we look forward to your feedback.

Sincerely,

*The Dirty Dozen Editors' Team:*

*Joan Marques, Satinder Dhiman, and Svetlana Holt*

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## EMERGING PARADIGMS IN BUSINESS MANAGEMENT